Behavioural Finance

Prasanna Chandra

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Dr Chandra has conducted executive seminars for a number of organizations like TCS, Infosys, Tata Motors, ITC, NIIT, Tata Steel, Sasken Communications, BHEL, Bharat Shell, ANZ Grindlays, HMT, Canara Bank, Vysya Bank, ONGC, Wipro, GAIL, Microsoft, Motorola, and Tata Power.

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To
My Readers

Preface

Standard finance, which is also known as rational finance or traditional finance or neoclassical finance (hereafter these terms will be used interchangeably), has four building blocks: investor rationality, market efficiency, mean-variance portfolio theory, and capital asset pricing model. Standard finance dates back to the late 1950s and early 1960s. In 1961, Merton Miller and Franco Modigliani characterised investors as rational. Eugene Fama described the markets as efficient in 1965. Harry Markowitz prescribed the rules of mean-variance portfolio theory in its basic form in 1952 and in its expanded version in 1959. William Sharpe developed the capital asset pricing model in 1964, which postulates that the expected returns are a function of risk (measured by beta) and risk alone.

For each of the foundation blocks of standard finance, behavioural finance offers an alternative. According to behavioural finance:

- Investors are "normal," not rational.
- Markets are characterised by inefficiencies, even if it is difficult to beat them.
- Investors design their portfolios according to behavioural portfolio theory, not mean variance portfolio theory.
- Expected returns follow behavioural asset pricing theory in which expected returns are determined by factors other than beta.

Science advances through the interplay of theory and empirical work. Academic finance, including behavioural finance, works the same way. The tools of observation in behavioural finance are eclectic. The data may be gathered through surveys, or generated from controlled experiments in the laboratory, or may be occurring naturally.

It must be emphasised that behavioural finance is meant to supplement, rather than supplant, rational finance. The concepts and techniques of rational finance are extremely useful for corporate managers, investors, and others in their financial decision-making. However, when the findings of empirical research are inconsistent with the tenets of conventional theory, new theory has to be developed, which typically builds on the existing knowledge. Thus, behavioural findings will shape the development of the new conventional theory. This makes behavioural finance an exciting field.

This book discusses what we have learnt about financial decision-making and financial markets from the perspective of behavioural sciences.

It is meant to be a textbook for the first course on behavioural finance. It will also help investment practitioners and corporate finance executives in understanding the behavioural dimensions of their decisions.

Organisation of the Book

The book is organised into five parts as follows:

Part I **Neoclassical Finance and Behavioural Challenge** comprises two chapters. Chapter 1 discusses the rational expectations hypothesis, the dominant paradigm in finance and the behavioural challenge thereto. Chapter 2 explains the expected utility theory, portfolio theory, capital asset pricing model, and the efficient markets hypothesis which represent the central tenets of traditional finance.

Part II **Foundations of Behavioural Finance** includes six chapters (3-8). Chapter 3 discusses the heuristics and biases characterising real-life decision makers. Chapter 4 explores the implications of overconfidence and other forms of self-deception which are so pervasive. Chapter 5 presents prospect theory (an alternative to expected utility theory) and mental accounting, two central ideas of behavioural finance. Chapter 6 discusses the theoretical arguments and empirical evidence in defence of and in opposition to the efficient markets hypothesis. Chapter 7 describes the emotional factors and social forces that have a bearing on decision-making. Chapter 8 discusses the neuroscientific underpinnings of observed behaviour.

Part III **Behavioural Aspects of Investing** comprises three chapters (9-11). Chapter 9 discusses how behavioural factors impinge on investment behaviour. Chapter 10 seeks to explain the anomalies and puzzles observed in financial markets with the help of behavioural finance. Chapter 11 explores the principles of value investing, an approach to investing aimed at countering behavioural biases.

Part IV **Behavioural Corporate Finance** includes two chapters (12 and 13). Chapter 12 looks at how psychological forces bear on corporate finance decisions. Chapter 13 discusses how an organisation can be made psychologically smart.

Part V **Other Insights** includes one chapter (14) that provides insights from diverse sources, which illuminate different facets of finance.

Ancillary Material

To enhance the utility of the book for students and instructors, the following ancillary material is available.

- **Additional Problems**: A number of additional problems have been provided for students who want to practice more. These may be downloaded from the online learning center of the book.
- **Solutions Manual and PowerPoint Presentation**: A solution manual providing solutions to the end of the chapter problems and cases and power point presentations of all chapters are hosted on the online learning center of this book. This can be accessed

by the instructors who adopt the book. They may contact McGraw Hill Education for assistance in accessing the solutions manual and power point presentation.

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I have tried to weave together the rich and varied contributions of these scholars in a coherent tapestry. I hope that you will find the book readable and useful.

I am deeply indebted to Richard Ponarul, Professor of Finance, California State University, Chico for providing materials over the years that kindled my interest in the subject, carefully reviewing the manuscript, and contributing a section on 'Academic Research on Value Investing.'

I am thankful to Venugopal Unni for developing the ancillary materials and to Pushpalatha for her help in preparing the manuscript.

I am grateful to Vibha Mahajan, S. Girish, Hemant Jha, Laxmi Singh, Atul Gupta, and others at McGraw Hill Education for their contribution in bringing out this book.

I look forward to receiving suggestions for improving the future editions of this book.

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Contents

A Note from the Author

Financial economics seems to be in the midst of a paradigmatic shift, from a neoclassical-based paradigm to a behaviourally based paradigm.

As Werner Erhard and Michael Jensen noted in 2015 "The progress in economics and finance over the last two-plus decades—founded on the paradigm—altering insights from psychology about human behaviour by scholars such as Kahneman, Tversky, Thaler, Sunstein and others—has been huge. This paradigmatic revolution has allowed the profession to focus on the existence and significant impact of widespread counter-to-self-interest behaviour that was hitherto unnoticed, ignored, or dismissed."

Traditionally, financial economics adopted the neoclassical framework of economics. In this framework financial decision makers possess von Neumann–Morgenstern preferences over uncertain wealth distributions and use Bayesian techniques to form appropriate statistical judgments based on the data at their disposal.

Psychologists studying decision making behaviour have produced ample evidence to demonstrate that people do not behave as if they have von Neumann–Morgenstern preferences and people do not form judgments in accordance with Bayesian principles. Rather they systematically behave in a manner different from both. Behavioural psychologists have proposed theories that throw light on the causes and effects associated with these systematic departures.

Behavioural finance enriches the standard finance tool box by drawing on insights from psychology, neuroscience, sociology, organisational behaviour, and law. As a result, financial analysis is based on more realistic assumptions about individuals.

In standard finance (also called neoclassical finance or traditional finance), hypotheses are generated from the logically coherent structure of neoclassical economics. In behavioural finance facts drive the creation or renewal of a theory. As Werner De Bondt commented on behavioural approach: "Research methods are mainly inductive not deductive. We collect facts based on experiments, or questionnaires, or observation—and we organize them into a smaller number of superfacts. One might say we draw maps."

Three Central Themes of Behavioural Finance

The three central themes of behavioural finance are:

- Heuristics and biases
- Frame dependence
- Inefficient markets

Heuristics and Biases Finance practitioners rely on heuristics or rules of thumb. Here is an example of a rule of thumb: "Invest in a mutual fund which has the best five-year record because past performance is the best predictor of future performance." In general, the rules of thumb are imperfect and predispose practitioners to biases. Standard finance, in contrast, assumes that practitioners process data rationally and are not prone to biases.

Frame Dependence Standard finance postulates that practitioners view all decisions through the transparent objective lens of risk and return. Indeed, frame independence lies at the core of the Modigliani–Miller approach to corporate finance. The essence of frame independence was put vividly by Miller as follows: 'If you transfer a dollar from your right pocket to your left pocket, you are no wealthier. Franco and I put that rigorously.' Frame-independent investors pay attention to changes in their total wealth because that eventually determines how much they can spend on goods and services.

In contrast, behavioural finance argues that, apart from objective considerations, practitioners' perceptions of risk and return are influenced by how decision problems are framed.

Inefficient Markets Standard finance postulates that the markets are efficient, meaning that the price of each security reflects its fundamental value. Behavioural finance contends that heuristics and biases and framing effects cause a divergence between fundamental values and market prices.

PART I

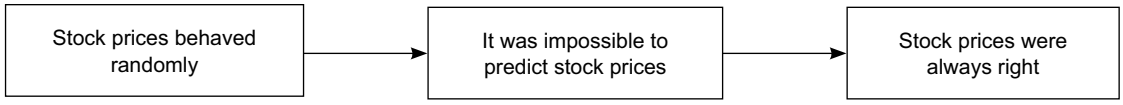
Neoclassical Finance and Behavioural Challenge

Chapter **1**

Rational Markets Hypothesis and the Challenge of Behaviouralists[1]

In October 2008, Alan Greenspan, the most influential central banker ever, admitted that he erred in understanding how the world works, "That's precisely the reason I was shocked, because I had been going for forty years or more with considerable evidence that it was working exceptionally well." During these forty years, the notion that financial markets were rational held sway and profoundly influenced public policy. The faith in the wisdom of financial markets led to an explosion of new financial instruments and increasing financialisation of the global economy. Celebrating this development, Alan Greenspan commented, "These instruments enhance the ability to differentiate risk and allocate it to those investors most able and willing to take it."

While the notion that financial markets knew a lot has been around since the days of Adam Smith, the 20th century version of rational market theory was more precise and more extreme. It ran as follows:



This oversimplification of rational markets was found useful, so useful that it took a life of its own.

In some ways, the story of rational markets hypothesis was intertwined with the resurgence of pro-market ideology after World War II. But the rational markets hypothesis was not, at its core, driven by a political ideology. Rather, it was a scientific proposition, derived from a vigorous mid-century fervour for objective, mathematical, and statistical analysis of financial markets.

[1]This chapter draws heavily on Justin Fox, *The Myth of the Rational Market*, Harper Collins Publishers, 2009.

From mid-1960s the rational markets hypothesis gained ascendance and increasingly dominated public debate, government decision-making, and private investment policy up to 2008. As J.M. Keynes had written long back, "The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood." He further added, "Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist."

This chapter surveys the developments in finance from the early 20th century to the present. It traces the rise of rational markets hypothesis and discusses the challenge posed by behaviouralists. It is divided into five sections as follows:

- Intellectual underpinnings
- The rise of the rational markets hypothesis
- Impact on Wall Street and the corporates
- The challenge of behaviouralists
- Synthesis and future horizons

1.1 ✦ INTELLECTUAL UNDERPINNINGS

The two main schools of thought in economics in the early 20th century were neoclassicists and institutionalists. While neoclassical economists viewed economics as the study of rational individuals maximising utility, institutionalists took a broader view and recognised the role of institutions and customs.

Irving Fisher was a leader of neoclassical economics and Wesley Mitchell a pioneer of institutionalists. Neoclassical economists build their theories through a process of deduction and institutionalists develop their findings through induction.

Irving Fisher's book *The Nature of Capital and Income* published in 1906, hailed as "one of the principal building blocks of all present day economic history," established his international reputation. As Justin Fox put it, "He is perhaps not the father, but certainly a father of modern Wall Street."

Irving Fisher was fascinated by the concept of equilibrium (in which competing influences balanced each other) which was crucial to the early development of chemistry and physics. Since equilibrium analysis lends itself naturally to mathematical treatment (all it takes is just an equal sign), it appealed to the mathematically inclined Fisher. His doctoral dissertation was the most sophisticated mathematical treatment yet of economic equilibrium, which Paul Samuelson lauded as "the greatest doctoral dissertation in economics ever written." Deeply influenced by physical sciences, Fisher also designed and built a contraption of interconnected water-filled cisterns that he referred to as "the physical analogue of the ideal economic market." By the way, Adam Smith's notion of an "invisible hand" that steered selfish individuals toward producing socially beneficial results had hinted toward the concept of economic equilibrium.

In the early 1930s, John von Neumann, a Hungarian mathematician, wrote a paper on the mathematics of economic equilibrium which significantly reshaped the discussion of the subject. This perhaps provided the impetus to Kenneth Arrow and John Debreu to develop a far

more logically consistent and mathematically sophisticated version of economic equilibrium. The Arrow-Debreu model provided an elegant mathematical proof of the existence of Adam Smith's invisible hand. More importantly, it allowed for uncertainty. To achieve equilibrium under uncertainty, they assumed the existence of "complete" securities market. A complete securities market is a market in which you can bet on or insure against every possible future state of the world. For example, you can enter into a contract which says that if Brazil wins the 2022 World Cup in Soccer, you would be willing to give a seminar on 'Advances in Behavioural Finance' to the doctoral students of IIM Bangalore, provided the NDA is in power at the Centre in India. A "complete" securities market, however, does not exist in the real world and Arrow spent the rest of his academic career in exploring the consequences of the divergence between economic reality and economic theory.

1.2 ✦ THE RISE OF THE RATIONAL MARKETS HYPOTHESIS

The excitement generated by the Arrow–Debreu model and other theoretical breakthroughs of the era was contagious. It spread to almost every branch of economics, including the recalcitrant discipline of finance. The seminal developments in finance were:

- Modern corporate finance
- Portfolio theory and capital asset pricing model
- Random walk and efficient markets hypothesis

• Modern Corporate Finance

Until the late 1950s, finance was taught in business schools as a mix of common sense, institutional practices, judgment, and tradition that had very little to do with economics. This separation could be traced to the philosophy of Harvard Business School, set up in 1908, where its founding fathers were convinced that the new school should emphasise the practical, eschew academic theories, and rely on "case method" of teaching which it imported from Harvard Law School.

Things, however, began changing in the late 1950s. The task of reshaping the study of finance in the image of modern mathematical economics was begun by two conventional economists, Franco Modigliani and Merton H. Miller, who worked at Carnegie Tech's new business school set up in early 1950s. Carnegie Tech (renamed CMU in 1967) had overhauled its engineering education in the 1940s to lay emphasis on scientific and mathematical rigour in place of the traditional rule-of-thumb trade school instruction. It planned to do the same for management education and hired promising young economists, operations research experts, and behavioural scientists.

Franco Modigliani and Merton H. Miller (M&M) wrote two seminal papers in which they developed mathematical theories based on rational behaviour and argued that the 'capital structure' policy and the 'dividend' policy of the firm did not matter under certain ideal conditions (no taxes, etc.). (Incidentally, both Franco Modigliani and Merton H. Miller became Nobel laureates in economics). In the words of Robert Merton, another Nobel laureate in economics: "The Modigliani–Miller work stands as the watershed between 'old finance,'

an essentially loose connection of beliefs based on accounting practices, rules of thumb and anecdotes, and modern financial economics, with its rigorous mathematical theories and carefully documented empirical studies."

M&M, however, did not figure out how to calculate the cost of capital. In their celebrated 1958 paper, they said that the calculation of cost of capital "must be deferred to a subsequent paper."

• Portfolio Theory and Capital Asset Pricing Model

Operations research—the use of mathematical and statistical theory for decision making—originated in the 1930s in the United Kingdom to solve military problems. It soon spread across the Atlantic and played a crucial role in helping the Allies win World War II.

After the end of the war, operations research (OR) efforts were directed to peacetime uses, such as stock market investing. In 1952, Harry Markowitz, a graduate student at Chicago, published his landmark paper in which he developed an approach to portfolio selection that optimally balanced risk and return and laid the foundation for a new, quantitative approach to finance. Harry Markowitz developed an approach that helps an investor to achieve his optimal portfolio position. Hence, the portfolio theory, in essence, has a normative character as it prescribes what a rational investor should do. For this seminal work, he received the Nobel prize in economics.

William Sharpe and others asked the follow-up question: If rational investors follow the Markowitzian prescription, what kind of relationship exists between risk and return? Essentially, the capital asset pricing model (CAPM) developed by them is an exercise in positive economics. It is concerned with two key questions:

- What is the relationship between risk and return for an efficient portfolio?
- What is the relationship between risk and return for an individual security?

The CAPM, in essence, predicts the relationship between the risk of an asset and its expected return. This relationship is very useful in two important ways. First, it produces a benchmark for evaluating various investments. For example, when we are analysing a security we are interested in knowing whether the expected return from it is in line with its fair return as per the CAPM. Second, it helps us to make an informed guess about the return that can be expected from an asset that has not yet been traded in the market. For example, how should a firm price its initial public offering of stock?

Although the empirical evidence on the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical applications. No wonder, the CAPM is a centrepiece of modern financial economics and William Sharpe, its principal originator, was awarded the Nobel prize in economics.

Incidentally when Sharpe submitted his paper to the *Journal of Finance*, it received a chilly response and one reviewer pointed out that the assumptions underlying the model were absurdly unrealistic. Undeterred, Sharpe resubmitted the paper citing Milton Friedman's influential paper 'Methodology of Positive Economics' in which he argued persuasively that the value of a model depends not on the realism of its assumptions, but on the validity of its conclusions.

Milton Friedman, a Nobel laureate in economics, the author of the influential paper 'Methodology of Positive Economics,' was the most outstanding monetary economist of the 20^{th} century and an ardent votary of free markets. A leader of the Chicago School of Economics (which dominated the world of economics for almost half a century), Friedman was deeply influenced by the book *The Road to Freedom* written by Frederick Hayek, his senior at Chicago University.

• Random Walk and Efficient Markets Hypothesis

In 1953, Maurice Kendall, a distinguished statistician, presented a somewhat unusual paper before the Royal Statistical Society in London. Kendall examined the behaviour of stock and commodity prices in search of regular cycles. Instead of discovering any regular price cycle, he found each series to be "a wandering one, almost as if once a week the Demon of Chance drew a random number… and added it to the current price to determine the next week's price." Put differently, prices appeared to follow a random walk, implying that successive price changes are independent of one another.

In 1959, two highly original and interesting papers supporting the random walk hypothesis were published. In one paper, Harry Roberts showed that a series obtained by cumulating random numbers bore resemblance to a time series of stock prices. In the second paper, Osborne, an eminent physicist, found that the stock price behaviour was similar to the movement of very small particles suspended in a liquid medium—such movement is referred to as the Brownian motion.

A random walk means that successive stock prices are independent and identically distributed. Therefore, strictly speaking, the stock price behaviour should be characterised as a submartingale, implying that the expected change in price can be positive because investors expect to be compensated for time and risk. Further, the expected return may change over time in response to change in risk.

Inspired by the works of Kendall, Roberts, and Osborne, a number of researchers employed ingenious methods to test the randomness of stock price behaviour. By and large, these tests have vindicated the random walk hypothesis. Indeed, in terms of empirical evidence, very few ideas in economics can rival the random walk hypothesis.

One of the most important economists of all time, Paul Samuelson was, as he liked to say, "the last generalist in economics." While financial market studies were just a side activity for him, his intervention was crucial to the triumph of the random walk. When the empirical evidence in favour of the random walk hypothesis seemed overwhelming, the academic researchers asked the question: What is the economic process that produces a random walk? Paul Samuelson, the consummate economic theorist, provided the answer in his paper, "Proof That Properly Anticipated Prices Fluctuate Randomly," published in the spring 1965 issue of *Industrial Management Review.*

Eugene Fama came to Chicago as an MBA student in 1960. Prior to that he had studied at Tufts University where he crunched numbers for a stock market newsletter published by one of his professors. With this experience he was attracted by the random walk work of Harry Roberts, a statistics professor. Fama stayed on for his doctorate under the tutelage of Merton H. Miller. His 1964 doctoral dissertation laid out the clearest explanation yet of why stock

prices behave randomly. According to Fama, stock prices did not behave randomly because news relevant to stock prices occurred randomly or investors' opinions were randomly distributed along a bell curve. Rather, "sophisticated traders"—fundamentalists and chart readers—would profitably exploit any non-random patterns in the market and, in the process, make them go away. That meant chart-reading successes were necessarily fleeting. However, this was not necessarily true of what he called "superior intrinsic value analysts." Fama wrote: "In a dynamic economy, there will always be new information which causes intrinsic values to change over time. As a result, people who can consistently predict the appearance of *new* information and evaluate its effects on intrinsic values will usually make larger profits than people who do not have this talent."

Existence of enough "superior analysts" would, Fama said, "insure that actual market prices are, on the basis of all *available* information, best estimates of intrinsic values." Fama called this state of affairs "efficient market." While economists used this term earlier to denote a well-functioning market, it had never been defined quite this way. Fama wrote, "In an efficient market, the actions of many competing participants should cause the actual price of a security to wander randomly about its intrinsic value."

After finishing his dissertation in 1964, Fama became a faculty at the Graduate School of Business (GSB), University of Chicago, and was joined by a whole new crowd of quantitatively-oriented, computer-savvy students who were beginning to make waves. Michael Jensen, Myron Scholes, and Richard Roll were amongst the most prominent of them.

Jensen, Scholes, and Fama pioneered an approach that became known as "event study" to test how quickly the market reacted to new information relating to events such as stock splits, mergers and acquisitions, corporate earnings announcements. Numerous such studies established beyond reasonable doubt that financial markets did a wonderful job of reflecting new information.

Merrill Lynch and CRSP In 1946, Louis Engels, the head of advertising and marketing for Merrill Lynch, composed one of the great print advertisements of all time. It was titled "What everybody ought to know… About the Stock and Bond Business." Running more than six thousand words and taking a full page in the *New York Times*, it answered questions such as "What Do Stocks Cost?" and "How Do You Do Business with a Broker?" The phenomenal response to the ad prompted a publisher to ask Engels to write a book on the subject. So Engels wrote *How to Buy Stocks* which sold more than four million copies.

In 1960, Engels wanted to run an ad claiming that stocks were good investments for ordinary investors, but Securities Exchange Commission (SEC), the regulatory body in the US, told Engels that such a claim could be made only with proper evidence to support it. Engels called his alma mater GSB, University of Chicago for advice and spoke to James Lorie. After consulting with a few colleagues, Lorie suggested that a study of long-term stock returns was in order. Engels agreed and Merrill Lynch funded the Center for Research on Security Prices, which came to be known popularly by its acronym, CRSP (pronounced "crisp"). James Lorie headed the centre and chose Lawrence Fisher as his deputy. Fisher embarked on the herculean task of compiling thirty-five years of price and dividend data on every stock ever traded on NYSE. After more than three years of painstaking work, they reported in January 1964 that, over the period 1926-1960, stocks earned an average return of 9 per cent. They went

further and found that randomly generated portfolios performed as well as mutual funds-put more colourfully, monkeys with darts could match the performance of mutual funds. This was indeed a revelation. As *Business Week* reported:

> "For a sizable area of Wall Street-mutual funds, security analysts, investment advisers and the like—the study should prove unsettling. Everybody in this area makes his money, to one degree or another, by selling his skill to less expert."

In a speech at the twenty-fifth anniversary of the New York Society of Security Analysts in 1962, Benjamin Graham said, "Neither the Financial Analysts as a whole nor the investment funds as a whole can expect to 'beat the market,' because in a significant sense they (or you) *are* the market."

He continued, sounding somewhat like a Chicago economist:

> "Analysts do in fact render an important service to the community in their study and evaluation of common stocks. But this service shows itself not in spectacular results achieved by their individual selections but rather at fixing at most times and for most stocks of a price level which fairly represents their comparative values, as established by the known facts and reasonable estimates about the future."

1.3 ✦ IMPACT ON WALL STREET AND THE CORPORATES

The lesson that it is futile to try to beat the market had profound impact on Wall Street and the corporates. In particular, it led, directly or indirectly, to the following:

- Emergence of index funds
- Development of risk-adjusted performance measurement
- Rise of derivatives
- Acceptance of the shareholder value principle

• Emergence of Index Funds

The Massachusetts Investors Trust (MIT) marked the beginning of the modern mutual fund industry. The MIT was set up as an open-ended *mutual fund*, owned by those who put money into it. So, it was run as a non-profit entity whose board was answerable to the fund's investors. Other funds that followed MIT were actually controlled by for-profit investment advisers, though they came under the rubric 'mutual.'

As the mutual fund industry grew it became more preoccupied with beating the market. Even though it was becoming harder to do that, thanks to intensifying competition, the money managers were obsessed with doing just that. To beat the market they ignored risk and loaded up on extremely speculative stocks. When the market soared, as it did for the most of 1960s, the speculative stocks rose even more. The aggressive managers attributed their superior performance to their skill. As one of them wrote in the *Financial Analysts Journal*, in 1966: "The improved performance of certain institutions in the management of their funds is the natural outcome of better trained, more energetic, younger men in command."

Old-timers were not convinced. In an article in the following issue of the *Financial Analysts Journal*, one of the founding members of the Financial Analysts Federation lamented:

> "Behind the ever more elaborate formulae for measuring rate of return—and they will become more elaborate as computers become more used—there is one vital problem: How much risk was incurred? By hindsight it makes no difference. More important, it is impossible to quantify. But that vital part in the equation exists and there is no point sweeping it under the rug."

The old guard was right that risk should be considered in measuring performance. The practitioners of quantitative finance offered solutions based on portfolio theory and capital asset pricing model. Three measures were suggested: the Treynor measure, the Sharpe measure, and the Jensen measure.

Initially, these measures did not gain popularity. As the stars of the go-go years of nineteen sixties started faltering, it became evident that their spectacular performance during most of the sixties was because they took hare-brained risks. After adjustment for risk, their performance was nothing to write home about. Jensen and others argued that the *average v*alue of the investment advice provided by the mutual fund industry was not just zero, but less than zero.

The mutual fund debacles and the academic research suggested the need for low-cost "unmanaged" mutual funds. While the concept of such a fund was mooted by two Chicago graduate students in 1960, Lipper, a global leader in supplying mutual fund information, was perhaps the first to formally ask the SEC to launch what it called a "stock average fund" that would have thirty Dow stocks. According to Lipper, the SEC did not respond. Perhaps it was not ready for such a strange idea quite yet. Wells Fargo too was interested but could not offer an index fund to retailers for a different regulatory reason. Finally, in 1976, Vanguard, under the leadership of John Bogle, offered the first index fund.

The launch of Vanguard index fund was helped by the literary groundwork laid in the preceding years, in particular, by a book written by Burton Malkiel and an essay by Paul Samuelson. Burton Malkiel, a Princeton economist, published his book *A Random Walk Down Wall Street* in 1973 which popularised the notion of efficient market hypothesis as no other work. It was hailed by *Forbes* as a classic and Paul Samuelson called it "Dr. Spock of investment." While the first edition of the book couldn't recommend index mutual funds as they didn't exist, yet the book certainly played an important role in making index investing respectable-incidentally, Bogle himself had not read the book before he launched the Vanguard Index Fund. More directly on the subject was a 1974 essay by Paul Samuelson in the *Journal of Portfolio Management* in which he pleaded for someone, *anyone* to launch an index fund for small investors. A year later, Charles Ellis, a pension consultant, wrote an article titled, "The Loser's Game," which argued against active management.

One may argue that even without these writings and the efficient market hypothesis, index funds would have been created. But that seems improbable. As Justin Fox put it, "The work of ivory tower scholars had launched a new school of investing, one that would survive and flourish in the decades to come. It was one of the great practical triumphs in the history of social sciences."

• Development of Risk-Adjusted Performance Measurement

The imprudence of investors in the 1960s showed up in the 1970s, when neither bonds nor blue chips proved safe, providing a huge scope for the new approach to risk, return, and diversification developed by Harry Markowitz two decades earlier. Called 'modern portfolio theory, ' it gained some acceptance in the institutional world of investing and then received a huge boost from Washington.

In response to several corporate bankruptcies that left pensions unpaid, Congress passed a pension-reform legislation in 1974, called The Employee Retirement Income Security Act (ERISA). Prudence was no longer a legal concept based on tradition. It was redefined in conformity with the scientific dictates of modern portfolio theory (MPT).

In MPT, risk is defined as variance and not as a vague, hard-to-quantify thing that can be assessed only judgmentally. As a number, variance is estimated mainly by looking at past variability. This may appear somewhat odd: While finance scholars argued that future stock price movements cannot be predicted by looking at past stock price movements, they accepted the idea of using past stock volatility to predict future stock volatility.

Perhaps there was a reason. As Fischer Black, a prominent risk engineer of the 1970s, said: "Estimating variances is orders of magnitude easier than estimating… expected returns." There is no economic law that says volatility is predictable; at the same time, there is no economic law that says that volatility is not predictable. As Justin Fox remarked: "If the direction of stock prices could be predicted, there would be free lunch for all. If the volatility could be predicted, that just meant more work for finance professors."

Further, there was empirical evidence that long-run stock price volatility displayed reasonable constancy, despite the leaps and plunges suggested by Benoit Mandelbrot. Based on an examination of a century of stock market data, Barr Rosenberg of UC-Berkeley observed:

> "If you cut it in half, basically the variance in the first half and the variance in the second half were the same. That's not by chance. That means that our particular society settles in with a certain amount of surprise being acceptable and indeed interesting. Too much is too much, too little is too little, so that's quite mysterious."

With the ascendance of modern portfolio theory, the demand for quantitative finance services grew. Barr Rosenberg offered "Barr's better betas" (also called "bionic betas") which were more acceptable to money managers than the simpler versions offered earlier. Ibbotson Associates provided data on "equity risk premium."

Armed with Barra's (or some other firm's) measure of a stock's beta and Ibbotson's measure of equity risk premium, one could compute a company's cost of capital. Remember that when Franco Modigliani and Merton Miller launched their assault on old-style finance in the 1950s, they had left the issue of cost of capital unanswered. Later a procedure to do that evolved and it soon became the standard practice for investment bankers, consultants, corporate finance executives, and students.

• Rise of Derivatives

Having addressed the big questions of risk and return in the first great wave of quantitative finance from early 1950s to early 1970s, a small band of inquisitive finance professors began

the second wave in which they focused on how the prices of different securities related to one another. The quest began with the mundane search for a formula for valuing an option on a share of equity stock. While Paul Samuelson had thought about this issue earlier, the real breakthrough occurred when Fisher Black and Myron Scholes developed the now famous Black–Scholes option pricing model that was published in 1973 in the *Journal of Political Economy*, a journal of the University of Chicago. Strange as it may sound, the Chicago economists who ran the journal wondered why they should care about such an obscure and somewhat disreputable financial instrument.

At that time, options were created in an ad hoc manner by brokers and traded over-the-counter. All this changed when the Chicago Board Options Exchange (CBOE), the first organised options exchange in the world, was launched in April 1973. It was a rare occurrence in the field of finance when a seminal theoretical breakthrough, the development of Black–Scholes option pricing model, coincided with a major institutional development, the establishment of CBOE.

Robert Merton, a scholar at MIT, figured out a different way of deriving the option pricing formula. Merton's approach, which is mathematically more elegant, set the tone for future work in mathematical finance. Merton and Scholes shared the Nobel prize in economics in 1997—Black died the year before, otherwise he too would have been its co-recipient.

The starting point of Merton's version was that two portfolios with equivalent returns and risk profile should sell for the same price. Otherwise, arbitrageurs would step in and bring about price parity. Franco Modigliani and Merton Miller too had invoked the arbitrage argument in their path-breaking 1958 paper.

In a way, Merton's formula relied only on the efficient working of the market. While CAPM is an economic theory, Merton's formula for option valuation is pure finance. As Stephen Ross put it, "Neoclassical finance is a theory of sharks, and not a theory of rational *homo economicus*." Arbitrageurs are the sharks who exploit risk-free opportunities and dissipate them.

Merton-style finance led to a different understanding of risk. In the CAPM, risk could be manipulated and controlled, but not completely eliminated, not even in theory. In the Merton's version of the no-arbitrage model, risk can be eliminated completely by choosing the right combination of securities.

Kenneth Arrow had proposed in the 1950s that economic equilibrium can be achieved in the face of uncertainty, if there are securities available for every possible state of the future. That seemed like a theoretical ideal then. By the mid-1970s, thanks to option-pricing theory, the financial world was moving in that direction, as proclaimed by Stephen Ross, one of Arrow's students. Ross wrote in 1976, "Although there are only a finite number of marketed capital assets, shares of stocks, bonds, or as we shall call them 'primitives,' there is a virtual infinity of options or 'derivative' assets that the primitives may create."

The rise of derivatives for handling a wide-range of risks became one of the great financial stories of the next quarter century.

• Shareholder Value

The initial impact of the efficient markets hypothesis was in financial markets and those who made a living from it. Since the stocks traded on the markets represent corporate ownership,

the efficient markets hypothesis began to influence corporate America. Before we examine this, let us look at some aspects of corporate governance.

The public limited company, which is owned by a number of shareholders protected with limited liability, has been a major organisational innovation. It allows for efficient sharing of risk among many investors and enables professional managers to run the company.

However, the public limited company gives rise to possible conflicts between managers and shareholders due to the separation of ownership and control. Adam Smith had recognised, very perceptively, the agency problem in his classical work *The Wealth of Nations* published in 1776:

> "Like the stewards of a rich man, they (managers) are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company."

Two centuries later, Michael Jensen and William Meckling provided a formal analysis of the 'agency problem' in their seminal paper titled "Theory of the Firm: Managerial Behaviour, Agency Costs, and Ownership Structure," published in August 1976 issue of *The Journal of Financial Economics*.

The essence of agency problem is that self-interested managers may squander corporate resources over uneconomic, value-destroying projects and activities. This problem is more serious in companies that have substantial free cash flows (free cash flows represent the excess of internal accruals over what is required to undertake profitable NPV – positive projects). Free cash flows tend to be high in mature industries with limited growth projects. On the other hand, in high growth industries where internal accruals are less than what is needed for supporting profitable investment opportunities, managers are less likely to squander resources over uneconomic projects.

Agency costs are borne by the principals and the agents, perhaps more by the latter if the principals are smart. Hence, it is in the interest of the principals as well as the agents to find ways and means of minimising the agency costs.

By the 1920s, corporations had become so important that scholars began to look again at the separation of ownership and control that Adam Smith was concerned with. Adolf Berle Jr. and Gardiner Means researched the subject intensively and published the book *The Modern Corporation and Private Property,* which was hailed as "epoch making." Berle and Means argued that corporations had become so large and powerful that competitive forces alone were not enough to rein them. According to them, the only remedy to control big corporations was to "develop into a purely neutral technocracy, balancing a variety of claims by various groups in the community and assigning to each a portion of the income stream on the basis of public policy rather than private cupidity."

The views of Berle and Means were stated more rigorously in the theory of 'monopolistic competition' advanced by Edward Chamberlin. His argument was that large American corporations could set prices at will and consumers were helpless. So, there was a need to regulate them. Harvard economist John Kenneth Galbraith brilliantly popularised this view in a series of bestselling books such as *The New Industrial State* and *The Affluent Society* published in the 1950s and 1960s. Galbraith's eloquence was truly impressive. He was perhaps the last great representative of the literary, institutionalist tradition.

The need for regulation, however, was contested by Arron Director, George Stigler, Milton Friedman, and others from the University of Chicago. They argued that regulation was bad and free markets good. Milton Friedman arrogated to himself the task of presenting the ideas of Chicago colleagues to the still largely hostile outside world. When consumer activist Ralph Nader argued that corporations ought to be held to high standards of civic responsibility, Friedman had a different view. He said: "There is one and only one social responsibility of business – to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud."

Galbraith's portrayal of a static economic landscape dominated by corporate bosses was fairly true of the 1950s and 1960s. But in 1970s, upstart overseas competitors, helped by the advent of the shipping container (which substantially reduced the cost of transport), challenged American giants. The intense competitive environment that emerged lent credence to the position of Friedman. The Chicago group proved right that even mighty corporations were subject to economic laws and there was hardly any justification in regulating them.

In the process of defending free enterprise, the Chicago group overlooked the separation of ownership and control. After all, Berle and Means were worked up about the corporation because of this, in the first place. Not to worry. Michael Jensen, along with his University of Rochester colleague William Meckling, was getting ready to rescue and reinvent this phenomenon.

Reprising Berle's argument about the separation of ownership and control, Jensen and Meckling gave it a different name "agency costs" and represented it with a set of equations in their seminal article published in 1976. They saw the solution to this problem in the efficient market, not in governmental intervention. Since stock prices "fully reflect all available information," companies whose executives do not act in the interest of shareholders will be penalised with lower stock prices. The stock market performed the job of monitoring managerial behaviour. Such monitoring reduced agency costs and goaded corporations to behave more rationally. As Justin Fox observed: "Jensen and Meckling wanted to rely upon the stock market's collective judgment to resolve conflicts of interest that had plagued scholars, executives, and shareholders for generations."

The precipitous drop in the S&P 500 from 1973 through 1977 clearly signalled that Corporate America had to shape up.

How could executives be made responsive to the verdict of the stock market? One option was to persuade them to create shareholder value and offer suitable incentives for doing so. Alfred Rappaport, Joel Stern, and others emphasised the importance of creating shareholder value and set up consulting practices—such as Alcar, Stern Stewart & Company, Marakon Associates, BCG and Holt Value Associates—to guide companies in creating shareholder value. Concepts and tools such as "shareholder value analysis," "economic value added," "market value added," "cash flow return on investment," and "total shareholder return" became part of finance lexicon and incentive compensation in many companies was linked to shareholder value metrics.

The other option was the market for corporate control. The public opinion on this has always been ambivalent. In the 1950s, takeover specialists, then called "proxyteers," gained

prominence on the American corporate scene. New Jersey Senator Harrison Williams was opposed to takeovers. He said, "In recent years, we have seen proud old companies reduced to corporate shells after white-collar pirates have seized control." Corporate managers understandably maintained a strong anti-takeover lobby in Washington. In the meanwhile, most critics of corporate America—John Kenneth Galbraith, Ralph Nader, and others who came from the political left—were not willing to support Wall Street raiders.

Henry Manne, a legal scholar with interest in corporate governance, became a champion of mergers and takeovers. Scorned in the legal literature because they diminished competition and reduced consumer choice, mergers and takeovers, Manne argued, appear a lot better if you looked at what he dubbed "the market for corporate control" and not just "the market for products." He said, "Only the take-over scheme provides some assurance of competitive efficiency among corporate managers and thereby affords strong protection to the interests of vast numbers of small, non-controlling shareholders." Manne assumed "a high positive correlation between corporate managerial efficiency and the market price of shares of that company." Eugene Fama and others had not yet delivered the "proof" of market efficiency, but Manne could anticipate it. While Senator Williams still got an anti-takeover law passed in 1968, Manne's ideas helped make the final William's Act less draconian than what was initially proposed. It allowed for a launch of a hostile takeover, but with prior warning.

The rise of the junk bond market in the late 1970s fuelled a takeover boom in 1980s. Buyout firms like KKR and lone rangers such as Carl Icahn transformed the corporate landscape with what appeared like great brutality and waste. Many commentators lamented that buyout artists were hurting American competitiveness while Japan and Germany were building their industrial might. Persuaded by their arguments, state legislatures killed the takeover boom.

Michael Jensen, however, was convinced that takeovers were beneficial as they made American economy stronger. With evangelical fervour, he preached the merits of takeovers to the present and future business leaders of America, the most hostile audience possible. He shot into prominence. As Justin Fox wrote, "This stance made him controversial, and about as famous as a business school professor can get. It also made him the intellectual father of what became corporate orthodoxy and even a sort of national creed in the 1990s."

Jensen told the *Times* in 1985, "The takeover market provides a unique, powerful, and impersonal mechanism to accomplish the major restructuring and redeployment of assets continually required by changes in technology and consumer preferences."

The idea that corporations are meant to be run for the benefit of owners has been there since the dawn of the modern corporation. What was new was the expansive argument of Jensen's worldview. As one leftist critic grudgingly conceded: "The great advantage of Jensenism is that, when combined with an uncritical acceptance of the efficient markets religion, it amounts to a unified field theory of economic regulation: all-knowing financial markets will guide real investment decisions towards their optimum, and with the proper set of incentives, owner-managers will follow this guidance without reservation."

1.4 ✦ THE CHALLENGE OF BEHAVIOURALISTS

Even when the rationalist model was on the ascent in the world of economics and finance, the not-so rational aspects of human nature began to find its ways into economics. The major challenges emanating from behavioural economics were in the form of:

- Deviation from rationality
- Possibility of beating the market
- Divergence between market prices and fundamental values
- Pervasiveness of irrational forces
- Misleading signals from the market forces

• Deviation from Rationality

By the mid-1950s, economists in general accepted von Neumann and Morgenstern's expected utility and Henry Savage's statistical axioms as gospel truth and built their models on these foundations. In 1950s, Herbert Simon, an economics maverick at Carnegie Tech's Graduate School of Industrial Administration (GSIA), who later got Nobel prize in economics, argued that people don't have the brainpower and time to make decisions so they take shortcuts and rules for them. People don't "optimise," but "satisfice" (a combination of "satisfy" and "suffice"). Since Simon was a leading light at GSIA, the economists there listened to him, but chose to ignore him. As Simon wrote in his memoirs, "I heckled the GSIA economists about their ridiculous assumptions of omniscience and they increasingly viewed me as the main obstacle to building 'real' economics in the school."

Simon led a project on decision making process in a paint factory in Pittsburgh, following his "satisficing" approach in which he enlisted fellow faculty member Franco Modigliani and Modigliani's student John Muth. No sooner was the study over, Muth fought back: "It is sometimes argued that the assumption of rationality in economics leads to theories inconsistent with, or inadequate to explain, observed phenomena, especially over time… Our hypothesis is based on exactly the opposite point of view: that dynamic economic models do not assume enough rationality." Muth argued that even though every individual or corporation need not make rational guesses about the future, on average, they were similar to the predictions of the most sophisticated models.

This "rational expectations" hypothesis was akin in spirit to the efficient markets hypothesis, although it had a broader sweep and less evidence to support it. Initially, it went nowhere, but as Keynesian economic policy faltered in the 1970s, several scholars, notably Robert Lucas, propagated it. With amazing rapidity, rational expectation model became the credo at the Chicago Economics Department. Even Paul Samuelson admitted that if compelled to choose between the "two extreme archetypes" of old-style Keynesianism and Lucas's rational expectations, he would choose the latter.

While Herbert Simon's disputes with mainstream economists triggered the rational expectations hypothesis, Daniel Kahneman and Amos Tversky built upon Simon's ideas to challenge mainstream economics and its reliance on von Neumann and Morgenstern's version of decision making under uncertainty. Daniel Kahneman, a psychologist, felt that human statistical reasoning might not accord with the models used in economics. He along with Amos

Tversky began conducting experiments which revealed gaps between the tenets of decision making and actual decision making by even experts. They wrote "People rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors." Put simply, people follow shortcuts and rules of thumb that sometimes work and sometimes don't.

Kahneman and Tversky argued that von Neumann and Morgenstern's description of decision making under uncertainty was not correct. How do then people really assess uncertain prospects? Kahneman and Tverksy provided the answer in their article on "prospect theory" published in *Econometrica*, perhaps the most mathematical of the major academic journals in economics. The article was rigorous and filled with equations and hence, appealed to mathematically-inclined economists and the choice of *Econometrica* turned out to be very propitious as it attracted the attention of economists. As Justin Fox put it, "It had just what it took to become a hit among economists who were getting more and more interested in asking subversive questions but didn't want to lose their chance at tenure by sounding too much like psychologists."

Richard Thaler was the first and most eager among the economists who were deeply influenced by the work of Kahneman and Tversky. Hersh Shefrin, Meir Statman, and Werner De Bondt and a few other adventurous young economists at other schools joined this movement which came to be called behavioural economics, despite its moorings in cognitive- not behavioural-psychology. Among established economists, George Akerlof of UC-Berkeley was probably the most supportive.

In his famous 1954 essay on economic methodology, Milton Friedman dismissed the use of questionnaires (that psychologists employ) and experiments (of hard sciences) for economists. The former were too silly, and the latter not feasible. Behavioural economics challenged the first judgment and experimental economics sought to overturn the second. Edward Chamberlin of Harvard and his student, Vernon Smith, pioneered the development of experimental economics. In 2002, Vernon Smith shared the Nobel prize in economics with Daniel Kahneman.

The growing body of evidence documenting systematic departure from the dictates of rational economic behaviour prompted a Chicago conference on "the behavioural foundations of economic theory." Stars from both sides of the rationalist divide, including the redoubtable Merton Miller, were present. In his paper, Miller admitted that cognitive psychology might explain why some individual investors and individual corporations might depart from rationality. But finance was not about such explanations. He argued "That we abstract from all these stories in building our models is not because the stories are uninteresting, but because they are too interesting and thereby distract us from the pervasive market forces that should be our principal concern." The market, he asserted, was rational because the "pervasive market forces" pushed security prices toward their correct, fundamental values.

• Possibility of Beating the Market

To commemorate the fiftieth anniversary of *Security Analysis*, Columbia Business School hosted a conference in 1984. The book which became the bible of security analysts was conceived in

Benjamin Graham's course on security analysis that he taught at Columbia in the late 1920s. To debate the impact of this classic work, the organisers invited two speakers, Warren Buffett, a Graham student and an outstanding value investor, and Michael Jensen, a leader of the Efficient Markets Hypothesis, who had asserted few years earlier that there was "no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis."

Jensen explained that extensive academic research had shown that analysis of publicly available data was almost worthless, at least as a means of outperforming the market. The great success of some practitioners of Graham's principles, he argued, could be dismissed as luck. Jensen said, "If I survey a field of untalented analysts, all of whom are doing nothing but flipping coins, I expect to see some who have tossed two heads in a row and even some who have tossed ten heads in a row."

Popularised by William Sharpe, the coin-flipping analogy has become a staple of MBA education. According to this analogy, if a million people flip a balanced coin, about 500000 will get a head and the balance a tail. Those who get a head continue the game and those who get a tail quit the game. In the second round about 250000 get a head. In the third round about 125000 get a head. By the end of the tenth round nearly 975 people get a head. A straight run of 10 heads may persuade these people to believe that they have great skill in tossing coins. In reality, their success is due to chance not skill. Finance academics believe that the stock market works pretty much the same way: the chance factor will ensure that some investors will have a long streak of successes.

In response to the argument of academics that coin-flipping orangutans would achieve the same result as a bunch of successful investors, Buffett gave a fitting reply: "If you found that 40 per cent came from a particular zoo in Omaha, you could be pretty sure you were on to something. So you would probably go out and ask the zoo-keeper about what he's feeding them, whether they have special exercises, what books they read, and who knows what else."

Expressing admiration for Buffett, Michael Jensen said, "One of the things I came away from that was Warren Buffett was one of the smartest people I've ever met, and wise. He could play on my turf without making mistakes. It's not by accident that he's worth billions."

• Divergence between Market Prices and Fundamental Values

In their 1970 book *Predictability of Stock Market*[2], Clive Granger and Oskar Morgenstern provide a kind of alternate view of the efficient markets hypothesis. Both were big time economists. Clive Granger got the Nobel prize in economics in 2002 for unrelated work and Oscar Morgenstern was the co-author of Neumann-Morgenstern model for decision making under uncertainty, a model that dominated economics and finance.

They did not see the findings on efficient markets hypothesis in the same light as finance professors. They said that *The Money Game* authored by journalist George A.W. Goodman (Adam Smith) and not some academic journal article provided "probably the most perceptive account of stock market behaviour."

In his book, Goodman devoted an entire chapter on random walk, but rejected it. Instead he argued, "that in the long run future earnings represent present value and that in the short

[2] Published by D.C. Heath & Co, Lexington, Mass., 1970.

run the dominant factor … was the elusive *Australopithecus,* the temper of the crowd." Clive Granger and Oscar Morgenstern seemed to endorse this view. They wrote, "The random-walk hypothesis did not say that price changes are unpredictable: it says they are not predictable using (linear) combinations of previous price changes. It is conceivable that one could introduce other variables which did have some predictive values."

More importantly, they argued that it was erroneous to believe that stock prices reflected intrinsic values, which according to them "are supposed to reflect fundamentals of their companies, such as capital equipment, inventories, unfilled orders, profits." They went on to say, "Most of these items, and the values attached to them, will hardly fluctuate as fast and as far as stock prices do. It is a subterfuge going back at least to Adam Smith and David Ricardo to say that market prices will always oscillate around the true (equilibrium). But since no methods are developed to separate the oscillations from the basis, this is not an empirically testable assertion and it can be disregarded."

Eugene Fama suggested that the EMH may be tested by seeing if stock price movements conformed to the dictates of a risk-return model like the CAPM.

This, however, is only a relative test. As Justin Fox wrote, "It might reveal whether stock price movements made sense in relation to each other and the overall market, but was no help in showing whether the overall market is correctly priced."

Challenging the EMH, Robert Shiller, a Nobel laureate in economics, argued that the excessive volatility of stock prices could not be explained by fundamental factors. Devising, in effect, a non-event study, he looked at cases where prices moved but nothing of consequence happened.

To argue that stock prices were right because it was hard to predict them was, according to Shiller, "one of the most remarkable errors in the history of economic thought. It is remarkable in the immediacy of its logical error and the sweep and implication of its consequences."

Lawrence Summers, a Harvard professor, who later became the U.S. Treasury Secretary, was an ally of Shiller. He too, like Shiller, had a flair for combining advanced mathematics and provocative rhetoric. Summers said that it was an 'idiot's market, rather than a 'rational market.' He goaded Fisher Black, a luminary in the world of finance and a leading efficient marketer "How many finance professors are included in the Forbes 400? How many of the people who are there believe that the market is efficient?" Persuaded, Black called Summers' idiots as "noise traders." In his 1985 presidential address to the American Finance Association, aptly titled "Noise", Black said, "Noise makes financial markets possible, but also makes them imperfect." Noise causes prices to diverge from intrinsic values and also makes it impossible to tell what those intrinsic values are. Proposing a diluted version of efficient market, Black said, "We might define an efficient market as one in which price is within a factor of 2 of value, i.e., the price is more than half of value and less than twice value … By definition, I think all markets are efficient almost all of the time. 'Almost all' means at least 90%." Commenting on this, Justin Fox wrote, "It was a loose, pragmatic, Ben Graham-ish definition, befitting a man who a year before had left MIT for a job at Goldman Sachs." As Black observed, "Markets look lot less efficient from the banks of Hudson than the banks of Charles."

Most finance professors ignored the Shiller–Summers attack against the efficient markets, but Robert Merton, a Nobel laureate in economics and Shiller's classmate in graduate school defended the rational markets hypothesis. He argued that instead of asking the question

"Why are stock prices so much more volatile than (measured) consumption, dividends, and replacement costs? Perhaps general economists will begin to ask questions like Why do (measured) consumption, dividends, and replacement costs exhibit so little volatility when compared with rational stock prices?"

However absurd it may appear, perhaps science works this way. As Thomas Kuhn put it in his insightful book *The Structure of Scientific Revolutions*, "Normal science ... is predicated on the assumption that the scientific community knows what the world is like. Much of the community's success of the enterprise derives from the community's willingness to defend that assumption, if necessary at considerable cost."

What was Eugene Fama, the father of EMH, doing as this controversy raged? After being a spectator for a while, he came back in a 1991 sequel in which he said, "EMH passed the acid test of scientific usefulness." It was, however, different from saying that the market is perfectly rational or efficient. According to Fama, the lesson from Shiller and Summers was "that irrational bubbles in stock prices are indistinguishable from rational time-varying expected returns. There was no way to be sure that the market was irrationally volatile or not." Perhaps Fama, without repudiating the efficient market theory, shook its foundation in a way no one could have done.

• Pervasiveness of Irrational Forces

In 1985, Andrei Shleifer, an MIT graduate student, thought that he had assembled convincing evidence against the efficient markets hypothesis. He discovered that, beginning September 1976 – Vanguard had launched the first retail index a month before that – the new stocks being added to the S&P 500 performed better than the rest of the market. Since nothing had changed about these businesses in terms of their intrinsic value, such things should not happen in an efficient market.

Shleifer presented his findings at the annual meeting of the American Finance Association. Myron Scholes, who was asked to critique the paper, said: "This paper reminds me of my rabbi back in Palo Alto. My rabbi, when he gives his sermon on Saturday, always begins with a little story about something that happened to his family back in the shtetl, and then he generalises from that little episode to some big moral about the whole world. That's what this paper reminds me of. It's rabbi economics."

This criticism ringed like Merton Miller's argument about the need to focus on "pervasive forces" and not anomalous quirks. Shleifer took the criticism seriously and began his quest for pervasive market forces that caused market irrationality.

Shleifer, a prolific researcher, had other interests as well. He published path-breaking articles on corporate governance, the economics of transition (from communism to market economies), and macro-economics. In 1999, he won the John Bates Clark Medal as the top American economist under forty.

Despite his forays into other areas, Shleifer continued his quest for an explanation which was more than 'Rabbi economics.' He was looking for "pervasive forces" rather anomalous quirks. And that pervasive force, according to Shleifer and his co-researcher Robert Vishny was the presence of "noise traders" and the "limits to arbitrage."

The argument of behaviouralists rests on two key assumptions:

1. Some investors—they call them noise traders—are not rational as their demand for risky assets is influenced by beliefs or sentiments that are not fully supported by fundamentals.
2. Arbitrage operation by rational investors tends to be limited as there are risks associated with it.

• Misleading Signals from the Market Forces

With enough evidence that stock prices can deviate significantly from their intrinsic value, the argument that financial markets should always set the priorities for corporations and for society lost some of its force.

Michael Jensen, a leading advocate of EMH, realised that overvaluation can trigger organisational forces that destroy value. Some conspicuous examples are Enron, WorldCom, and AOL. Enron and WorldCom struggled to meet expectations baked in their stock prices, manipulated their earnings, and self-destructed. Entertainment conglomerate Time Warner sold itself to a grossly overvalued Internet company, AOL, and destroyed nearly $50 billion of its value.

As Jensen wrote, "Like taking heroin, manning the helm of an overvalued company feels great at first. If you're the CEO or CFO, you're on TV, investors love you, your options are going through the roof, and the capital markets are wide open. But as heroin users learn, massive pain lies ahead."

In order to mitigate the agency problem, Jensen had advocated the use of incentive compensation that aligned the interests of managers with shareholders. As the shareholder value principle spread across corporate America, executive salaries rose. CEO pay rose so sharply that it attracted criticism in the media and from politicians. Surprisingly, a group of scholars, who met at the University of Rochester, defended the rise in executive pay. They reached the consensus "that executive salaries are determined by the market, and that changes in compensation are strongly related to company performance."

But when Jensen and Murphy subsequently analysed fifteen years of CEO pay at 250 big companies, they found to their dismay that there was no correlation between pay and performance. In a *Harvard Business* review article published in 1990, they wrote, "Is it any wonder then, that so many CEOs act like bureaucrats rather than the value – maximising entrepreneurs companies need to enhance their standing in world markets?" These were perhaps the most influential words written by Jensen. CEOs, shareholder activists, compensation consultants, corporate board members, and others agreed that CEOs should be paid for performance.

Incentive compensation in the form of stock options became quite pervasive. However, most of the stock options were poorly designed and had dysfunctional consequences. They rewarded managers for absolute performance, not relative performance; they vested too soon; they motivated managers to manage quarterly earnings to stimulate short-term price increases so that they could cash out their options.

Jensen, a champion of the notion that financial markets knew best and that financial-market-based incentives were a key to a more productive world, realised that the missing element in his models of corporate behaviour was integrity. As Justin Fox wrote about Jensen: "Now

he was acknowledging that these incentives weren't enough. If market participants failed to follow a particular non-market-determined norm—integrity—markets wouldn't work. The market couldn't govern itself."

1.5 ✦ SYNTHESIS AND FUTURE HORIZONS

Richard Thaler, a leader of behavioural economics, wrote a regular column for the *Journal of Economic Perspectives*, a publication started in 1987 by the American Economic Association to update increasingly specialised economists on developments in different corners of the discipline. Joseph Stiglitz, one of the founding editors, gave Thaler more space in an "attempt to broaden the horizons of the profession."

Thaler's growing clout made him a prized commodity. GSB, University of Chicago appointed him as a professor of behavioural sciences, because Merton Miller opposed his appointment as a finance faculty. Of course, nothing could stop a professor of behavioural sciences from teaching and writing about finance, which Thaler did. He even began practising finance by co-founding Fuller & Thaler Asset Management which was managing several billion dollars using strategies based "the behavioural edge."

Thaler became a respected, *wealthy* professor at the school that still regarded itself as the bastion of modern neoclassical finance. The award of Nobel prize in economics to Daniel Kahneman (Thaler's close friend and psychology mentor) and Vernon Smith, an experimental economist, added further legitimacy to Thaler's work.

At a session honouring Irving Fisher during the 1997 meeting of the American Economic Association, Thaler described how the writings of Irving Fisher, the forefather of modern finance, were infused with behavioural reasoning. He said, "Fisher… helped.. introduce mathematics to economics. Young economists are taught modern concepts (equations, diagrams and the like) but rarely go back and read the surrounding text… . It is time to stop neglecting the words and time to start updating our equations to include these behavioral factors."

Many economists and finance scholars were aware that people sometimes made weird choices. In the U.S., the shift to worker-directed plans, mainly 401(k), revealed how people committed mistakes. The 401(k)ers were prone to "naive diversification" (they spread their investments more or less equally across different funds), were daunted by choice (participation in 401(k) declined with more funds being available), invested a high percentage of their 401(k) assets in their own company's stock, and did not save enough to ensure comfortable retirement, and so on.

To combat the problem of inadequate savings, Thaler and Shlomo Benartzi devised an innovation plan, called SMaRT, a not-quite-acronym for "save more tomorrow." Under this plan, 401(k)ers agree to an automatic increase in their contribution rate when they get pay raise, as a default option. SMaRT plan did improve the average savings rate significantly wherever it was implemented.

The success of SMaRT led to a remaking of the 401(k) along the lines suggested by behavioural research. Instead of daunting 401(k)ers with a bewildering array of choices, plans were built along a sensible default option in the form of a life-cycle fund, wherein the investment mix changed with age, or a portfolio which is periodically rebalanced along Markowitzian lines.

Harry Markowitz, Bill Sharpe, and Roger Ibbotson got involved in such a shift in some way or the other. They came to appreciate the importance of behavioural research. Law makers noticed, too. The Pension Protection Act, 2006, encouraged companies to guide the savings and investment choices of their employees along the behavioural lines.

Thaler joined forces with Chicago law professor Cass Sunstein to apply behavioural ideas to other areas. They called their guided approach "libertarian paternalism," and demonstrated how it could improve Medicare prescription plans, lending regulation, public schools, and marriage. This approach had significant influence. As Justin Fox put it, "Just as the law and economics movement that emerged from Chicago gave intellectual backing to the great deregulation of the 1970s through the 1990s, Sunstein became a leading proponent of a new behavioural law and economics movement that aimed to guide a rethink of law and regulation." When Obama was elected as the President of the U.S. in 2008, he appointed his friend Sunstein as his regulation czar. David Cameron, leader of Conservative Party in U.K., became an outspoken fan of Thaler and Sunstein's work.

While behavioural research passed the test of scientific usefulness, some concerns still remained:

- Politicians and bureaucrats are also people, subject to behavioural flaws. Can they be expected to steer other's decisions?
- The bulk of research in finance still revolves around markets and prices, not individual decisions. Does behavioural theory offer any answers here?
- The bounty of behavioural quirks creates a problem. As Merton Miller would say, "There's only one theory of efficient markets… There are hundreds of theories of inefficient markets." Justin Fox put it differently: "One could come up with a plausible-sounding behavioural explanation for just about every market phenomenon. But if they were all *different*, that didn't amount to much of a theory of market behaviour."

Despite these concerns, behavioural finance is *clearly* more than just a collection of curiosities, or self-cancelling tendencies. According to behavioural research, the most consistent human trait is overconfidence, which persuades investors to think that they know more about a stock's value than they actually do. Overconfidence explains excess volatility, momentum, and huge trading volumes.

Overconfidence, however, does not provide a theory of asset prices. It only explains why asset prices overshoot their fundamentals, a view that can coexist with efficient markets hypothesis defined somewhat loosely. Fama wrote in 1965, "In an efficient market, the actions of many competing participants would cause the actual price of a security to wander randomly about its intrinsic value." Even behaviourists subscribed to this idea, except that they argued that this wandering can cause discrepancy between security prices and intrinsic values for years on end. As John Maynard Keynes observed decades ago that the market can remain irrational much longer than investors can remain solvent.

Even Fama and Kenneth French seemed to veer to this when they looked at what would happen in a market with lots of "misinformed" investors in a theoretical paper published in 2007. They wrote, "Offsetting actions by informed investors do not typically suffice to cause the price effects of erroneous beliefs to disappear with the passage of time." They added, "For price to converge to rational values, the beliefs of misinformed investors must converge to those of the informed, so eventually there is complete agreement about old news."

Alternative Approaches

While behaviourists found a lot of holes in the edifice of rational markets finance, they didn't abandon that edifice. They continue to use the equilibrium framework imposed on the field by Irving Fisher a century ago. They still trust Merton Miller's "pervasive forces."

Is equilibrium the best metaphor for economic activity? Economists of Austrian tradition and American institutionalists were not comfortable with equilibrium analysis. However, they were marginalised as their approach lacked the precision and clarity of equilibrium economics—precision that was inspired by 19th century physics.

So something interesting happened when, in the 1980s, the physicists evinced interest in economics again. In the intervening century, revolutionary changes such as the theory of relativity, quantum mechanics, and Heisenberg's principle of uncertainty, had occurred in physics. Many physicists were excited about chaos theory—the study of how simple initial causes led to dramatic consequences.

In 1984, a group of physicists started the Santa Fe Institute for promoting interdisciplinary research in which scholars with diverse backgrounds would explore chaos and complexity—a catchall phrase for all evolving and adaptive phenomena, including the ones that defy prediction. Computer simulation became a favorite research tool at Santa Fe.

In 1987, Santa Fe Institute organised its first conference on 'The Economy as an Evolving Complex System.' At this conference, the interaction between physicists and economists was not very productive. Physicists felt that the economists were not willing to give more weight to irrationality and feedback effects in their models and economists complained of the high brow attitude of physicists. As Steven Durlauf said, "I think overall the physicists didn't have much of an impact. They didn't come up with very interesting models. They had very stupid agents."

Subsequent work by Brian Arthur, an economist, J. Doyne Farmer, a physicist, and others brought greater realism to economic agents. However, so far that work has not really penetrated the mainstream academic work.

Even as they resisted the influence of Santa Fe Institute, economists have been taking steps away from relying more or less exclusively on equilibrium. This is most visible in the study of long-term economic growth, which, by definition, cannot rely on the metaphor of equilibrium. Hence, the subject was somewhat neglected by mathematical economists. Economists are now describing better the dynamics of growth and change, by abandoning the concept of equilibrium while sticking with math. In the new growth theory, the key word is "endogenous"—that which arises from within. Earlier it was assumed that growth was caused by "exogenous" factors. As Justin Fox put it, "Explaining a spurt in economic growth requires a *deus ex machina* such as the discovery of the Americas or the invention of the electric motor. In the new growth theory, the technological drivers of growth are depicted as the result of economic forces and decisions."

Applying the concept of endogenously generated change to explain short-term market fluctuations seems to be a more difficult task. In recent years, some researchers have begun to do just that. Their models are typically populated by rational but half-informed agents who make mistakes, but learn and adapt. As a result, the market never settles down into a stable equilibrium. Instead, it constantly changes and occasionally goes bonkers. "Adaptive

market hypothesis," "adaptive rational equilibrium," "efficient learning," and "rational belief equilibria," are a few such market models. Developed by Andrew Lo, of MIT the "adaptive market hypothesis" has been discussed elsewhere in this book.

SUMMARY

- The 20th century version of rational market theory was more precise and extreme. It ran as follows: Stock prices behaved randomly → It was impossible to predict stock prices → Stock prices were always right. This oversimplification of rational markets was found so useful that it took a life of its own.
- The two main schools of thought in economics in the early 20th century were **neoclassicists** and **institutionalists.** While neoclassical economists viewed economics as the study of rational individuals maximising utility, institutionalists took a broader view and recognised the role of institutions and customs.
- The excitement generated by the Arrow–Debreu model of equilibrium was contagious. It spread to almost every branch of economics, including the recalcitrant discipline of finance. The major developments in finance were: modern corporate finance, portfolio theory, capital asset pricing model, and efficient markets hypothesis.
- Franco Modigliani and Merton H. Miller wrote two seminal papers in which they developed mathematical theories based on rational behaviour and argued that the 'capital structure' policy and the 'dividend' policy of the firm did not matter.
- Harry Markowitz developed an approach that helps an investor to achieve his optimal portfolio position. Hence, **portfolio theory**, in essence, has a normative character as it prescribes what a rational investor should do.
- William Sharpe and others asked the follow-up question: If rational investors follow the Markowitzian prescription, what kind of relationship exists between risk and return? To answer this question, they developed the **capital asset pricing model** or CAPM. Although the empirical evidence on the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical applications.
- In 1950s, Maurice Kendall and others examined the behaviour of stock prices and found that stock prices appeared to follow a random walk, implying that successive price changes are independent of one another.
- When the empirical evidence in favour of random walk hypothesis seemed overwhelming, the academic researchers asked the question: What is the economic process that produces a random walk? Paul Samuelson, the consummate economic theorist, provided the answer in his paper, "Proof That Properly Anticipated Prices Fluctuate Randomly," published in the spring 1965 issue of *Industrial Management Review.*

- In his 1964 doctoral dissertation, Eugene Fama laid out the clearest explanation of why stock prices behaved randomly. Existence of enough "superior analysts" would, Fama said, "insure that actual market prices are, on the basis of all *available* information, best estimates of intrinsic values." Fama called this state of affairs "**efficient market**." Fama wrote, "In an efficient market, the actions of many competing participants should cause the actual price of a security to wander randomly about its intrinsic value."
- If the market is efficient, it is not possible to beat the market. The lesson that it is futile to beat the market had profound impact on Wall Street and the corporates. In particular, it led, directly or indirectly, to the following: development of index funds, development of risk-adjusted performance measurement, rise of derivatives, and acceptance of the shareholder value principle.
- The mutual fund debacles of early 1970s and the academic research suggested the need for low-cost "unmanaged" mutual funds. In 1976, Vanguard, under the leadership of John Bogle, offered the first index fund. In the years to come index funds gained in popularity. As Justin Fox put it, "The work of ivory tower scholars had launched a new school of investing, one that would survive and flourish in the decades to come. It was one of the great practical triumphs in the history of social sciences."
- The imprudence of investors in the 1960s showed up in the 1970s, providing a huge scope for the new approach to risk, return, and diversification developed by Harry Markowitz in the 1950s. Called '**modern portfolio theory,**' it gained some acceptance in the institutional world of investing and then received a huge boost from Washington.
- After addressing the big questions of risk and return in the first wave of quantitative finance from early 1950s to early 1970s, a small band of inquisitive finance professors began the second wave in which they focused on how the prices of different securities related to one another. Fisher Black and Myron Scholes developed the now famous Black-Scholes **option pricing model** in 1973, the year in which the Chicago Board of Options Exchange (CBOE), the first organised options exchanges in the world, was also set up—it was a rare occurrence in the field of finance when a seminal theoretical breakthrough coincided with a major institutional development.
- Robert Merton, a scholar at MIT, figured out a different way of deriving the option pricing formula. In a way, Merton's formula relied on the **arbitrage mechanism.** As Stephen Ross put it, "Neoclassical finance is a theory of sharks, and not a theory of rational **homo economicus**." Arbitrageurs are the sharks who exploit risk-free opportunities and dissipate them.
- In the Merton's version of the no-arbitrage model, risk can be eliminated completely by choosing the right combination of securities. The rise of derivatives for handling a wide range of risks became one of the great financial stories of the next quarter century.
- Since the stocks traded on the markets represent corporate ownership, the efficient markets hypothesis began to influence corporate America. How could executives be

made responsive to the verdict of the stock market? One option was to persuade them to create **shareholder value** and offer suitable incentives for doing so.

- Alfred Rappaport, Joel Stern, and others emphasised the importance of creating shareholder value and set up consulting practices—such as Alcar, Stern Stewart & Company, Marakon Associates, BCG and Holt Value Associates—to guide companies in creating shareholder value. Henry Manne, a legal scholar with interest in corporate governance, became a champion of mergers and takeovers. Scorned in the legal literature because they diminished competition and reduced consumer choice, mergers and takeovers, Manne argued, appear a lot better if you looked at what he dubbed "**the market for corporate control**" and not just "the market for products." Michael Jensen, another champion of takeovers, said, "The takeover market provides a unique, powerful, and impersonal mechanism to accomplish the major restructuring and redeployment of assets continually required by changes in technology and consumer preferences."
- Even when the **rationalist model** was on the ascent in the world of economics and finance, the not-so rational aspects of human nature began to find its ways into economics. The major challenges emanating from **behavioural economics** were in the following forms: deviation from rationality; possibility of beating the market; divergence between market prices and fundamental values; pervasiveness of irrational forces; and misleading signals from the market forces.
- Herbert Simon, a Nobel laureate in economics, challenged the assumption of rationality. He argued that people don't "optimise," but "**satisfice**" (a combination of "satisfy" and "suffice"). Daniel Kahneman and Amos Tversky built upon Simon's ideas to challenge mainstream economics and its reliance on rationality.
- There is evidence that superior investors can beat the market, contrary to what EMH says.
- According to Andrei Shleifer and Robert Vishny, market irrationality stems from two pervasive forces, viz, presence of "**noise traders**" and "**limits to arbitrage**".
- With enough evidence that stock prices can deviate significantly from their intrinsic value, the argument that financial markets should always set the priorities for the corporations and for the society lost some of its force.
- The growing recognition of **behavioural finance** led to some useful practical applications such as SMaRT, an innovative plan to combat the problem of inadequate savings and remaking of the 401(k) plan in the U.S. Richard Thaler and Cass Sunstein joined forces to apply behavioural ideas to other areas. They called their guided approach **libertarian paternalism**, and demonstrated how it could improve Medicare prescription plans, lending regulation, public schools, and marriage.
- The bounty of behavioural quirks creates a problem. As Justin Fox put it, "One could come up with a plausible-sounding behavioural explanation for just about every market phenomenon. But if they were all different, that didn't amount to much of a theory of market behaviour".

- Despite these concerns, behavioural finance is clearly more than just a collection of curiosities or self-cancelling tendencies. According to behavioural research, the most consistent human trait is **overconfidence**.
- While behaviouralists found a lot of holes in the edifice of rational markets finance, they didn't abandon that edifice. They continue to use the equilibrium framework imposed on the field by Irving Fisher a century ago.
- Since 1990s, however, economists have been taking steps away from relying more or less exclusively on equilibrium. This is most visible in the study of long-term economic growth. In the new growth theory, the key word is "**endogenous**"—that which arises from within.
- Applying the concept of endogenously generated change to explain short-term market fluctuations seems to be a more difficult task. In recent years, some researchers have begun to just do that. Their models are typically populated by rational but half-informed agents who make mistakes, but learn and adapt. As a result, the market never settles down into a stable equilibrium. Instead, it constantly changes and occasionally goes bonkers. "Adaptive market hypothesis," "adaptive rational equilibrium," "efficient learning," and "rational belief equilibria," are a few such market models.

DISCUSSION QUESTIONS

1. Discuss the beginnings of modern corporate finance, exemplified by the works of Franco Modigliani and Merton H. Miller.
2. Trace the evolution of portfolio theory and capital asset pricing model.
3. Discuss the evolution of random walk and efficient markets hypothesis.
4. Discuss the origins of index funds.
5. Discuss the development of risk-adjusted performance measurement.
6. Discuss the rise of derivatives.
7. Discuss the impact of the efficient markets hypothesis on shareholder value principle.
8. What departures from rationality were pointed by Herbert Simon and others?
9. Discuss the Shiller–Summers attack on the efficient markets hypothesis.
10. What are the pervasive irrational forces according to Andrei Shleifer and Robert Vishy?
11. What are the implications of misleading signals from the market?
12. What are the concerns that still remain while behavioural research passed the test of scientific usefulness?
13. What is the alternative to equilibrium as the best metaphor for economics?

■ ■

Chapter **2**

Foundations of Rational Finance

Finance is concerned with how individuals and organisations acquire and allocate resources over time, taking into consideration the associated risks. While the earlier literature on finance considered psychological influences, since 1950s the field of finance has been dominated by the rational model which assumes individuals are rational and markets are efficient.

The rational finance model has led to remarkable advances in the theory and practice of finance. However, it has its limitations as pointed out by the burgeoning literature on behavioural finance.

This chapter discusses briefly the central theories of modern finance. It is organised into six sections as follows:

- Expected utility theory
- Modern portfolio theory
- Capital asset pricing model
- Efficient markets hypothesis
- Agency theory
- Influence of psychology

2.1 ✦ EXPECTED UTILITY THEORY

Expected utility theory is concerned with people's preferences with respect to choices that have uncertain outcomes (gambles). According to this theory, if certain axioms are fulfilled, the subjective value of a gamble for an individual is the statistical expectation of the values the individual assigns to the outcomes of that gamble.

Certain conditions have to be satisfied for an individual to have rational preferences. To understand these conditions, let us introduce some notation. Suppose an individual is faced with a choice between two outcomes, A and B. The symbol $>$ indicates strong preference, thus $A > B$ means that A is always preferred to B. The symbol $\sim$ indicates indifference so that $A \sim B$ means the individual values the two outcomes equally. Finally, the symbol $\geq$ suggests weak preference, so that $A \geq B$ means that the individual prefers A or is indifferent between A and B.

The von Neumann-Morgenstern Axioms

According to expected utility theory, the following axioms define a *rational* decision maker. These axioms are referred to as von Neumann-Morgenstern axioms as they were laid down by John von Neumann and Oskar Morgenstern.

Completeness The individual has well defined preferences and can always choose between any two alternatives:

- Axiom: For every A and B either $A > B$ or $A \leq B$
  In words, the individual either prefers A to B, or is indifferent between A and B, or prefers B to A.

Transitivity As an individual decides according to the completeness axiom, the individual also decides consistently.

- Axiom: For every A, B and C with $A \geq B$ and $B \geq C$ we must have $A \geq C$.
  In words, if the individual prefers, A to B, and B to C, then he must prefer A to C.

Independence If two gambles are mixed with a third one, the individual will maintain the same preference order as when the two are presented independently of the third one.

- Axiom: Let A, B and C be three lotteries with $A \geq B$, and let $t \in (0, 1)$; then $t\,A + (1 - t)\,C > t\,B + (1 - t)\,C$.

Continuity When there are three lotteries (A, B, C) and the individual prefers A to B and B to C, then it should be possible to mix A and C in such a manner that the individual is indifferent between this mix and the lottery B.

- Axiom: Let A, B and C be lotteries with $A \geq B \geq C$; then there exists a probability p such that $p\,A + (1 - p)\,C$ is equally good as B.

Omission of Irrelevant Alternatives The individual ignores irrelevant alternatives in deciding between alternatives. For example, in evaluating two (or more) alternatives, the individual ignores outcomes that occur with equal probability under both alternatives being considered.

Frame Independence The individual cares only about outcomes and the probabilities with which they occur and not how they are presented or bundled.

Utility Maximisation

Utility reflects the satisfaction derived from a particular outcome – ordinarily an outcome is represented by a "bundle" of goods. The utility function, denoted as $U(*)$ assigns numbers to possible outcomes such that preferred choices are assigned higher numbers. Suppose you have to choose between two sandwiches plus one chocolate bar or one sandwich plus two chocolate bars. If you prefer the latter, it means that:

$$U(1 \text{ sandwich, } 2 \text{ chocolate bars}) > U(2 \text{ sandwiches, } 1 \text{ chocolate bar})$$

Note that numerical values have not been assigned to $U(*)$ so far. This is because the ordering of outcomes by a utility function is what really matters. A rational individual will consider all

possible bundles of goods that satisfy his budget constraint and then choose the bundle that maximises his utility.

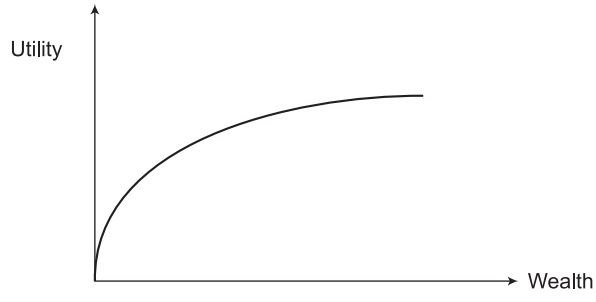
When only a single good is being considered, then ranking under certainty is simple. Given the principle of non-satiation, the more the better. As an example, consider the utility of wealth. Mathematically, the utility of wealth can be defined in various ways. One of the mathematical functions commonly used is the logarithmic function. This means that the utility derived from wealth w is $U(w) = \ln(w)$. Exhibit 2.1 shows the utility of wealth as per the logarithmic function.

Exhibit 2.1 Logarithmic Utility of Wealth

Wealth (in ₹10,000)	*U(w) = ln(w)*
1	0
2	0.6931
5	1.6094
7	1.9459
10	2.3026
20	2.9957
30	3.4012
50	3.9120
100	4.6052

Exhibit 2.2 represents this utility function graphically. Note that as wealth increases, the slope of the utility function gets flatter.

Exhibit 2.2 Utility Function



Expected Monetary Value

So far we ignored uncertainty. In the real world, however, there is a great deal of uncertainty about outcomes. How should one decide when faced with risky gambles? Economists, mathematicians, and philosophers, have long pondered over this question. This section looks at how their thinking evolved over time.

For long, mathematicians had assumed that gambles are assessed by their expected monetary value (EMV). For example, the EMV of a gamble which pays 10,000 with a probability of 0.70 and 1000 with a probability of 0.3 is:

$$0.7 \times 10{,}000 + 0.3 \times 1{,}000 = 7300$$

In 1713, Nicholas Bernoulli exposed the weakness of the EMV criterion. He asked what is the value of a gamble that pays two pounds if you toss a coin and it comes up head once, or four pounds if it comes up heads twice in a row, or eight pounds if it come up heads thrice in a row, so on and so forth? The expected value of such a gamble is:

$$(1/2 \times 2) + (1/4 \times 4) + (1/8 \times 8) + \ldots = 1 + 1 + 1 \ldots = \infty$$

This seems crazy because no one would pay that much for such a gamble.

Daniel Bernoulli's Solution

Daniel Bernoulli, a younger cousin of Nicholas Bernoulli, suggested a solution to that problem 25 years later in 1738 and published it in the *St. Petersburg Journal* (that is why it was called St. Petersburg paradox). Daniel suggested that the solution to the paradox was simply that further increments in expected wealth don't increase utility in the same proportion. Put differently, expected wealth has diminishing marginal utility. This means that the utility function is concave as shown in Exhibit 2.2.

Daniel Bernoulli pointed out that people do not evaluate gambles by their EMV. He observed that most people abhor risk and hence, choose a sure thing that is less than expected value. In effect, people are willing to pay a premium to avoid the uncertainty. His reasoning was simple: people's choices are based on psychological values of outcomes (utilities) and not dollar values. The psychological value of a gamble is the average of the utilities of various possible outcomes, each weighted by its probability; it is not the weighted average of possible dollar outcomes.

Daniel Bernoulli argued that diminishing marginal value of wealth is what explains risk aversion. Here is an example of diminishing marginal value of wealth.

Wealth (million)	1	2	3	4	5	6	7
Utility (units)	10	18	25	31	36	40	43

You can see that adding 1 million to a wealth of 1 million yields an increment of 8 units of utility, but adding 1 million of wealth to a wealth of 6 million adds only 3 units of utility.

Consider the following choice:

Have 4 million with certainty → Utility: 31

Equal chance to have 2 million or 6 million → Utility: $(18 + 40)/2 = 29$

The expected value of the "sure thing" and the gamble are the same (4 million) but the utility of the "sure thing" is more.

Daniel Bernouilli offered a solution to the famous "St. Petersburg paradox." More important, his analysis of risk attitudes in terms of preferences for wealth is still part of economic analysis even after almost 300 years.

• Expected Utility

Developed by John von Neumann and Oskar Morgenstern, expected utility theory attempts to define rational behaviour in face of uncertainty. It is a *normative theory* as it prescribes how people *should* behave rationally. A *positive theory*, on the other hand, describes how people actually behave.

Expected utility theory is really a theory that deals with risk, not uncertainty. A risky situation is one where the possible outcomes are defined with well-defined probabilities associated with them. An uncertain situation is one where you cannot assign probabilities or define the list of possible outcomes.

For all practical purposes, decision-making under risk is concerned with wealth. Suppose there are two states of the world. If the first state occurs your wealth will be ₹1,000,000 and if the second state occurs your wealth will be ₹5,000,000. The probabilities associated with these two levels of wealth are 0.3 and 0.7. In formal terms, a *prospect* is a series of wealth outcomes, with well-defined probabilities associated with them. The above prospect, let us call it $P1$, can be represented in the following format.

$$P1\ (0.3, ₹1{,}000{,}000, ₹\ 5{,}000{,}000)$$

When there are two outcomes, as in the above case, the first number is the probability of the first outcome (the probability of the second outcome will be the complementary probability), and the next two numbers represent the two possible outcomes. If only one rupee figure is given, as in $P(0.4, ₹1{,}500{,}000)$, it means that the second outcome is "0".

How is the expected utility of a prospect calculated? The expected utility of a prospect is calculated as follows:

$$U(P) = \sum_{i=1}^{n} p_i U(O_i) \tag{2.1}$$

where $U(P)$ is the expected utility of the prospect, p_i is the probability associated with the ith possible outcome, O_i is the ith possible outcome, and $U(O_i)$ is the utility of O_i.

To illustrate, the expected utility of $P1$ is:

$$U(P1) = 0.3U\ (1{,}000{,}000) + 0.7U(5{,}000{,}000)$$

If the utility of wealth is defined by a logarithmic function, the expected utility of $P1$ is:

$$U(P1) = 0.3\ (4.6052) + 0.7\ (6.215) = 1.382 + 4.351 = 5.733$$

Expected utility is order-preserving (i.e. ordinal), so it can be used to rank risky alternative. For a given individual, it is also cardinal, in the sense that it is unique up to a positive linear transformation.

• Risk Attitude

There is ample evidence that, in general, people are risk averse. However, they are willing to assume risk, if they are compensated for the same. Suppose stocks A and B offer the same expected return, but stock B is riskier than stock A. If you are like most people, you would choose stock A. To invest in stock B, you will ask for a higher expected return so that you are compensated for bearing higher risk.

We will discuss about the trade-off between risk and return in the following sections. For now let us understand what is meant by risk attitude.

The risk attitude of a person is reflected in his utility function. Going back to *P*1, we find that the expected value of wealth is:

$$E(W) = 0.3\ (1{,}000{,}000) + 0.7\ (5{,}000{,}000) = 3{,}800{,}000 = E(P1)$$

It may be noted that the expected value of wealth is the same as the expected value of the prospect. The utility of this expected value of wealth is:

$$U[E(W)] = \ln\ [3{,}800{,}000] = U[E(W)] = \ln\ [380] = 5.940$$

The expected utility of the prospect, $U(P_1)$, as we saw before is 5.733. So, in this case, we find that:

$$U[E(W)] > U[P1] \tag{2.2}$$

Thus, if a person's utility of wealth is described by a logarithmic function, he would prefer the expected value of a prospect to the prospect itself. Such a person dislikes risk and we say that he is *risk-averse*.

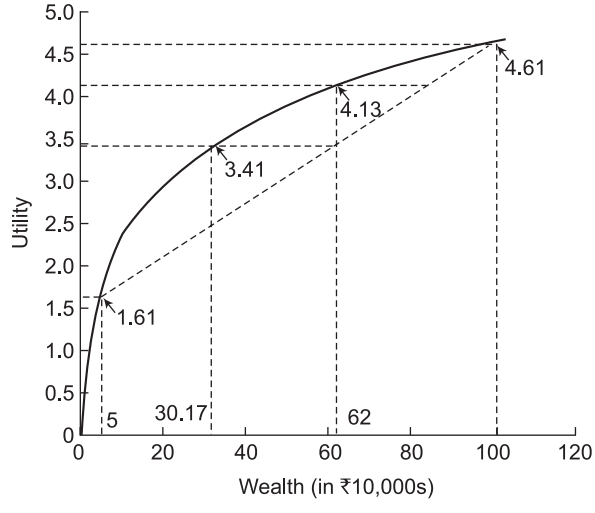
In general, if a person has a concave utility function as shown in Exhibit 2.2 (logarithmic utility function, is an example of a concave utility function), he is risk-averse. For such a person,

$$U[E(P)] > U(P) \tag{2.3}$$

A risk-averse person would have the expected value of the prospect with *certainty* rather than take a gamble for an uncertain outcome.

A risk-averse person would be willing to sacrifice something for certainty. The certainty equivalent of a prospect is the certain level of wealth which makes the decision maker indifferent between the prospect and that certain level of wealth. The certainty equivalent of *P*1, given the logarithmic utility function, is ₹3,088,900. As Exhibit 2.3 shows, a wealth of 308.89 (in ₹10,000s) provides a utility that equals the expected utility of *P*1.

Exhibit 2.3 Utility Function of a Risk-averse Individual



$$U[308.89] = U[P1] = 0.3\ (4.6052) + 0.7\ (6.215) = 5.733$$

Thus, in this case the decision maker considers a certain amount of ₹3,088,900 as equivalent to $P1$.

Generally, people are risk-averse, but some people like risk. Such people are called risk seekers. The utility function of a risk seeker is convex, as in:

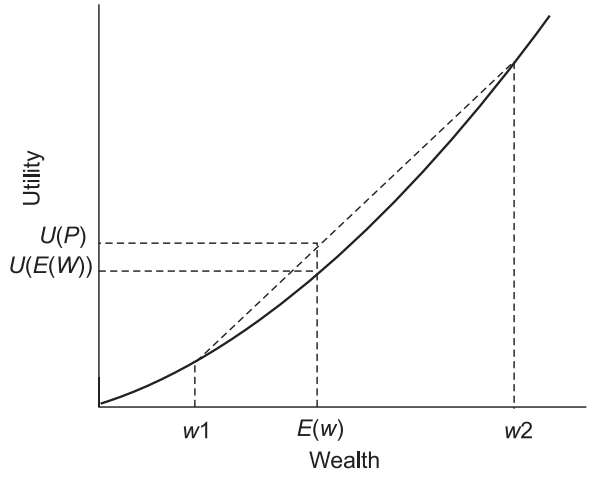
$$U[P] > U[E(P)] \tag{2.4}$$

This means that the utility of prospect is greater than the utility of the expected value of the prospect. Exhibit 2.4 shows the utility function of a risk seeker. Thus, a risk seeker would prefer a gamble on an uncertain outcome rather than take the expected value of the prospect with certainty.

Finally, some people are risk-neutral—they lie between risk averters and risk seekers. They care only about expected values as risk does not matter to them. For a risk-neutral individual:

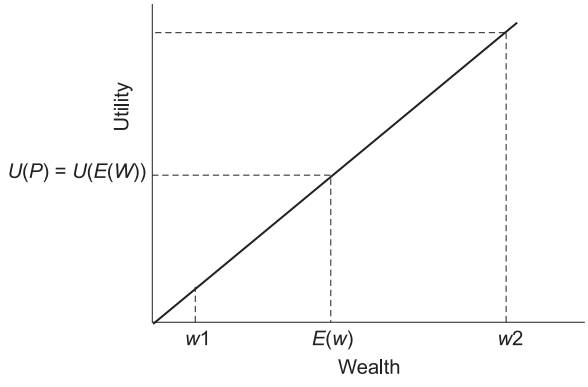
$$U[E(P)] = U[P] \tag{2.5}$$

Exhibit 2.4 **Utility Function of a Risk Seeker**



For a risk-neutral individual, the utility of the expected value of the prospect is equal to the expected utility of the prospect. This means that the utility function for a risk-neutral individual is a straight line as illustrated in Exhibit 2.5. In our previous example, a risk-neutral individual would be indifferent between a prospect with a 30% chance of wealth of ₹1,000,000 and 70% chance of wealth of ₹5,000,000 and a wealth of ₹3,800,000 with certainty.

Exhibit 2.5 Utility Function for a Risk-neutral Individual



• Allais Paradox

In this book, we will discuss a number of observed behaviours which appear to be inconsistent with the tenets of the rational finance model. We will examine here, a violation of the expected utility theory.

Designed by Maurice Allais, a Nobel laureate in economics, the **Allais paradox** shows an inconsistency between actual observed choices and the predictions of expected utility theory.

Consider the two situations shown in Exhibit 2.6. In situation 1, people can choose between Prospect A and Prospect A*, and in Situation 2, people can choose between B and B*.

Exhibit 2.6 Prospect Choices

Situation 1			
Prospect A		Prospect A*	
$1,000,000	100%	0	1%
		$1,000,000	89%
		$5,000,000	10%
Situation 2			
Prospect B		Prospect B*	
0	89%	0	90%
$1,000,000	11%	$5,000,000	10%

When these situations are presented to many people, a large number of people choose A over A* in Situation 1 and B* over B in Situation 2. It can be demonstrated that such preferences violate expected utility theory.

If utility theory is used to rank outcomes, a preference for A over A^* means $U(A) > U(A^*)$. According to utility theory

$$U(A) = U(\$1{,}000{,}000)$$

$$U(A^*) = 0.89U(\$1{,}000{,}000) + 0.1U(\$5{,}000{,}000)$$

$U(A) > U(A^*)$, means

$$U(\$1{,}000{,}000) > 0.89U(\$1{,}000{,}000) + 0.1U(\$5{,}000{,}000)$$

Simplifying this, we get:

$$0.11U(\$1{,}000{,}000) > 0.1U(\$5{,}000{,}000)$$

Similarly, if expected utility theory holds, a preference for B^* over B, implies:

$$0.1U(\$5{,}000{,}000) > 0.11U(\$1{,}000{,}000)$$

This is inconsistent with the earlier result and this inconsistency is referred to as the Allais paradox.

From the above table, it is clear that if we disregard the 89% chance of winning (the common outcome), then 1A and 2A have the same pay off; likewise 1B and 2B have the same payoff.

The Allais Paradox is a counterexample to the independence axiom. Independence means that if a person is indifferent between two gambles, L_1 and L_2, then he is indifferent between L_1 combined with another gamble L_3 and L_2 combined with L_3. However, as we have seen in the above example, this principle is violated. This violation is known as the "common consequences problem."

2.2 ✦ MODERN PORTFOLIO THEORY

The expected utility theory says that in the face of uncertainty individuals maximise the utility expected across possible states of the world. For a financial asset, like an equity stock, that has innumerable possible outcomes, it is not a manageable proposition. However, if we assume that investors are risk averse and investor preferences can be defined in terms of the mean and variance of returns, it is possible to quantify the tradeoff between risk and return. This is what the modern portfolio theory and the capital asset pricing model do. This section discusses the modern portfolio theory and the following section reviews the capital asset pricing model.

Portfolio theory, originally proposed by Harry Markowitz in the 1950s, was the first formal attempt to quantify the risk of a portfolio and develop a methodology for determining the optimal portfolio. Prior to the development of portfolio theory, investors dealt with the concepts of returns and risk somewhat loosely. Intuitively smart investors know the benefit of diversification which is reflected in the traditional adage "Do not put all your eggs in one basket". Harry Markowitz was the first person to show quantitatively why and how diversification reduces risk. In recognition of his seminal contributions in this field he was awarded the Nobel Prize in Economics in 1990.

Risk and Return for Individual Assets

Modern portfolio theory assumes that investors are risk averse and preferences (utilities) are defined in terms of the mean and variance of returns.

The return on a risky asset is considered as being a random variable which is normally distributed. This means that the return of an asset for the next period is determined by a probability distribution that is described by two parameters, viz, expected value and variance (or its square root; standard deviation). Since these two parameters are not observable, in empirical finance it is a common practice to estimate them using historical data. For this purpose, we often use a sample of data, collected *ex post*.

With n observations of the historical return of asset i, the mean return is computed as follows:

$$\overline{R}_i = 1/n \sum_{t=1}^{n} R_{i,t} \tag{2.6}$$

where $\overline{R_i}$ is the mean return on asset i, $R_{i,t}$ is the return on asset i during the t th period, and n is the number of periods over which historical return data is gathered.

The mean return is the best estimate of the expected value of the true distribution.

The sample variance of returns, σ_i^2 is computed as follows:

$$\sigma_i{}^2 = \frac{1}{n-1} \sum_{t=1}^{n} (R_{i,t} - \overline{R_i})^2 \tag{2.7}$$

And the sample standard deviation of returns is:

$$\sigma_i = \sqrt{\sigma_t^2} \tag{2.8}$$

To illustrate, consider the returns from a stock over a 6 year period:

$R_1 = 15\%$, $R_2 = 12\%$, $R_3 = 20\%$, $R_4 = -10\%$, $R_5 = 14\%$, and $R_6 = 9\%$

The variance and standard deviation of returns are calculated below:

Period	*Return* $\overline{R_i}$	*Deviation* $(R_i - \overline{R})$	*Square of deviation* $(R_i - \overline{R})^2$
1	15	5	25
2	12	2	4
3	20	10	100
4	–10	–20	400
5	14	4	16
6	9	–1	1
	$\sum R_i = 60$ $\overline{R} = 10$		$\sum (R - \overline{R}) = 546$

$$\sigma^2 = \left(\frac{\sum (R_i - \overline{R})^2}{n-1} \right) = 109.2 \quad \sigma = \left(\frac{\sum (R_i - \overline{R})^2}{n-1} \right)^{1/2} = \left(\frac{546}{6-1} \right)^{1/2} = 10.45$$

• Risk and Return of a Portfolio

A portfolio comprises of two or more assets. Smart investors know that combining several assets in a portfolio usually leads to risk reduction, thanks to the benefit of *diversification*. Remember the old adage which says, "don't put all your eggs in the same basket."

To understand the quantitative impact of diversification on risk (variability), let us consider a portfolio of two assets. As long as the returns on the two assets do not move in perfect lockstep, diversification reduces risk. *Covariance* and *correlation* are statistical measures of how random variables are related. If the two variables tend to move in the same (opposite) direction, the covariance and correlation are positive (negative).

The correlation of a sample including n returns for assets 1 and 2 is:

$$\rho_{12} = \frac{\sigma(R_1, R_2)}{\sigma_1 \sigma_2} \tag{2.9}$$

$\sigma(R_1, R_2)$ is the covariance between returns on assets 1 and 2, and σ_1 and σ_2 are standard deviations of returns on assets 1 and 2. While the covariance can take any positive or negative value, the correlation always lies between –1.0 and +1.0.

Given information on how the returns for the two assets are correlated, we can compute the portfolio mean return and portfolio variance for two asset portfolios as follows:

$$\overline{R}_p = w_1 \overline{R}_1 + w_2 \overline{R}_2 \tag{2.10}$$

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2 \tag{2.11}$$

where $\overline{R}_\rho$ is portfolio mean return, w_1 and w_2 are the weights associated with assets 1 and 2 ($w_1 + w_2 = 1$), $\overline{R}_1$ and $\overline{R}_2$ are the mean returns for assets 1 and 2, σ_ρ^2 is the variance of the portfolio return, σ_1^2 and σ_2^2 are the variance of the returns for assets 1 and 2, and ρ_{12} is the coefficient of correlation between the returns on assets 1 and 2.

As long as ρ_{12} is less than 1, σ_p will be less than the weighted average of the standard deviations of returns for the two assets.

For a 3-asset portfolio, the portfolio mean return and portfolio variance are as follows:

$$\overline{R}_p = w_1 \overline{R}_1 + w_2 \overline{R}_2 + w_3 \overline{R}_3 \tag{2.12}$$

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2 + 2 w_1 w_3 \rho_{13} \sigma_1 \sigma_3 + 2 w_2 w_3 \rho_{23} \sigma_2 \sigma_3 \tag{2.13}$$

In general, for a portfolio of n assets

$$R_p = \sum_{i=1}^{n} w_i R_i \tag{2.14}$$

$$\sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma(R_i, R_j) \tag{2.15}$$

• Efficient Portfolio

Given the expected return and standard deviation of returns of a portfolio, how should the investor choose? In choosing an optimal portfolio, we will begin with a two-asset portfolio and then look at an n-asset portfolio.

For the sake of simplicity, suppose there are only two stocks, *A* and *B*, and a risk-free asset (RF) in a market. The expected returns, standard deviation of returns, and correlations of returns between these assets are shown in Exhibit 2.7. Note that by definition the risk-free asset (RF) has a zero standard deviation of returns and zero correlation with other assets.

$$E(R_p) = \sum_{i=1}^{n} w_i \, E(R_i) \tag{2.16}$$

$$\sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i \, w_j \, \sigma \, (R_i, R_j) \tag{2.17}$$

Exhibit 2.7 Return Characteristics of Various Assets

	Expected Return	*Standard Deviation of Returns*
• Stock A	12%	20%
• Stock B	20%	40%
• Risk-free Asset (R_f)	8%	0%
• Correlation between *A* and *B*	–0.20	
• Correlation between *A* and R_f	0	
• Correlation between *B* and R_f	0	

Suppose you put 90% of your funds in stock A and 10% of your funds in stock B. The expected return for this portfolio is:

$$E(R_p) = 0.90 \, (12\%) + 0.1 \, (20\%) = 12.80\%$$

The variance of portfolio returns is:

$$\sigma_p^{\,2} = 0.90^2 \times 0.20^2 + 0.10^2 \times 0.4^2 + 2 \, (0.90) \, (0.10) \, (–0.20) \, (0.20) \, (0.40) = .0311$$

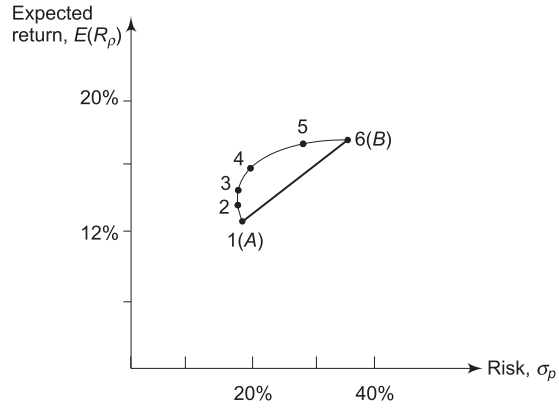
So, the standard deviation of portfolio returns is:

$$\sigma_p = \sqrt{.0311} = 0.1764 \text{ or } 17.64\%$$

You can combine stocks A and B in your portfolio in a number of ways by simply changing the proportions of funds allocated to them. Some of the options available to you are shown below:

Portfolio	*Proportion of A* W_A	*Proportion of B* W_B	*Expected return* $E(R_p)$	*Standard deviation* σ_p
1(A)	1.00	0.00	12.00%	20.00%
2	0.90	0.10	12.80%	17.64%
3	0.759	0.241	13.93%	16.27%
4	0.50	0.50	16.00%	20.49%
5	0.25	0.75	18.00%	29.41%
6(B)	0.00	1.00	20.00%	40.00%

Exhibit 2.8 Portfolio Options



The six options described above are plotted graphically in Exhibit 2.8. A few important points about this graph may be noted:

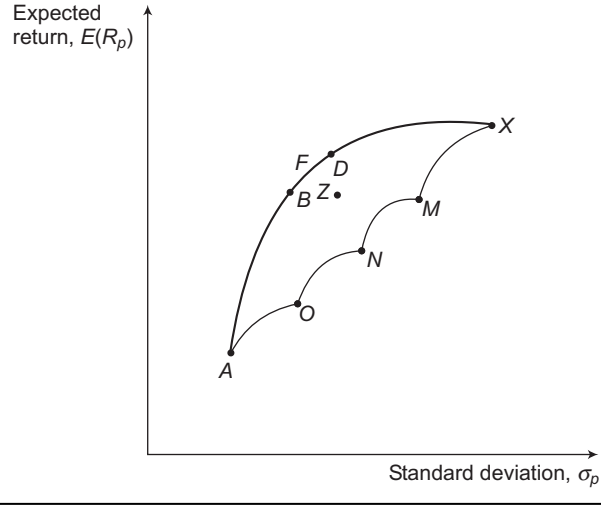
1. The benefit of diversification arises when the correlation between the two securities is less than 1. Because the correlation between securities *A* and *B* is –0.20 (which is less than 1), the effect of diversification can be seen by comparing the curved line between points *A* and *B* with the straight line between *A* and *B*. The straight line represents the risk–return possibilities by combining *A* and *B*, if the correlation coefficient between the two stocks had been 1. Since the curved line is always to the left of the straight line, the diversification effect is illustrated in the figure.
2. Portfolio 3 represents the minimum variance portfolio (MVP) or more accurately the minimum standard deviation portfolio. Though the term, MVP is commonly used in the literature, it is actually the minimum standard deviation portfolio because the x-axis represents standard deviation.
3. The investor considering a portfolio of *A* and *B* faces an *opportunity set* or *feasible set* represented by the curved line *AB*. By choosing an appropriate mix between the two securities, the investor can achieve any point on the curved line.
4. The curve bends backward between points *A* and 3 (the minimum variance portfolio). This means that for a portion of the feasible set, standard deviation decreases although expected return increases. You may ask: How can an increase in the proportion of the riskier security *B* result in a reduction of portfolio risk? This happens because of the diversification effect. Since the returns on *A* and *B* are negatively correlated, they tend to move in different directions. Thus, an addition of a small amount of *B* provides a hedge to a portfolio composed only of *A*. Of course, the curve bends backward only for some length. As the proportion of *B* increases in the portfolio, the standard deviation of the portfolio increases. Technically, a backward bend occurs when $\rho \leq 0$; it may or may not occur when $\rho > 0$.
5. No investor would like to invest in a portfolio whose expected return is less than that of the MVP. For example, no investor would choose portfolio 2. This portfolio has less

expected return and more standard deviation than the MVP. Clearly, it is dominated by the MVP. Although the entire curve from *A* to *B* is feasible, investors would consider only the segment from 3 to *B*. This is called the efficient set or the efficient frontier. Points lying along the efficient frontier are called efficient portfolios.

• Efficient Frontier for the *n*-Security Case

In a 2-security case, a curved line delineates all possible portfolios. In a multi-security case, the collection of all the possible portfolios is represented by the broken-egg shape region, referred to as the feasible region, shown in Exhibit 2.9. Obviously, the number of possible portfolios in that region is virtually endless. However, the investor need not feel unduly overwhelmed by the bewildering range of possibilities shown in Exhibit 2.9 because what really matters to him is the northwest boundary of the feasible region which is defined as the thick dark line. Referred to as the efficient frontier, this boundary contains all the efficient portfolios. It may be useful to clarify here what exactly an efficient portfolio is. A portfolio is efficient if (and only if) there is no alternative with (i) the same $E(R_p)$ and a lower σ_p, (ii) the same σ_p and a higher $E(R_p)$, or (iii) a higher $E(R_p)$ and a lower σ_p. Thus, in Exhibit 2.9 while all the feasible portfolios are contained in the region AFXMNO, only the portfolios which lie along the boundary AFX are efficient. AFX represents the efficient frontier. All other portfolios are inefficient. A portfolio like *Z* is inefficient because portfolios like *B* and *D*, among others, dominate it. The efficient frontier is the same for all investors because portfolio theory is based on the assumption that investors have homogeneous expectations.

Exhibit 2.9 Feasible Region



We have merely defined what is meant by a set of efficient portfolios. How can this set be actually obtained from the innumerable portfolio possibilities that lie before the investor? The set of efficient portfolios may be determined with the help of graphical

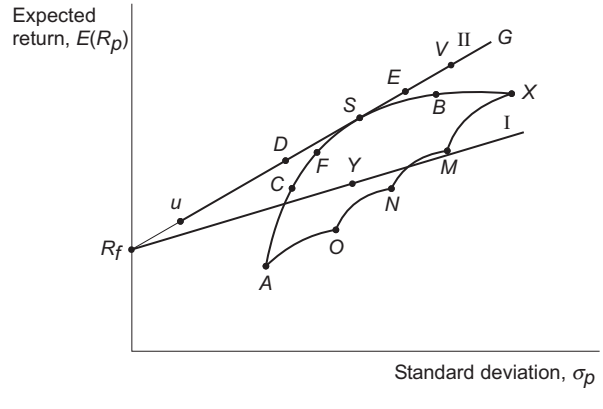
analysis, or calculus analysis, or quadratic programming analysis. The major advantage of graphical analysis is that it is easier to grasp. Its disadvantage is that it cannot handle portfolios containing more than three securities[1]. The calculus analysis can grapple with the *n*-dimensional space. However, the calculus method is not capable of handling constraints in the form of inequalities. Quadratic programming analysis is the most versatile of all the three approaches. It can handle any number of securities and cope with inequalities as well. For all practical purposes, the quadratic programming approach is the most useful approach.

Technically, the quadratic programming approach manipulates the portfolio weights to determine efficient portfolios. The procedure followed is as follows. A desired expected return, say 9 per cent, is specified. Then all portfolios (combinations of securities) that produce 9 per cent expected returns are considered and the portfolio that has the smallest variance (standard deviation) of return is chosen as the efficient portfolio. This is continued for other levels of portfolio return, 10 per cent, 11 per cent, 12 per cent, and so on, until all the possible expected returns are considered. Alternatively, the problem can be solved by specifying various levels of portfolio variance (standard deviation) and choosing the portfolios that offer the highest expected return for various levels of portfolio variance (standard deviation).

• Riskless Lending and Borrowing

Exhibit 2.9 assumes that all the securities on the efficient set are risky. Let us introduce yet another opportunity. Suppose that investors can also lend and borrow money at a risk-free rate of R_f as shown in Exhibit 2.10. Since R_f is a risk-free asset it has a zero correlation with all the points in the feasible region of risky portfolios. So a combination of R_f and any point in the feasible region of risky securities will be represented by a straight line. Consider point Y, a portfolio of risky securities. Investors can combine R_f and Y and reach any point along the straight line from R_f to Y and even beyond—to go beyond they have to leverage. We refer to this as line I.

Exhibit 2.10 Lending and Borrowing Opportunity



[1] At the most portfolios of four securities may be handled, if three-dimensional analysis is used.

Although the investor can reach any point on line I, no point on this line is optimal. To see this, consider line II which runs from R_f to S and beyond. Line II is the tangent to the efficient set of risky securities, so it provides the investor the best possible opportunities. You can see that line II dominates line I—for that matter, it dominates any other line between R_f and any point in the feasible region of risky securities.

Thus, with the opportunity of lending and borrowing, the efficient frontier changes. It is no longer AFX. Rather, it becomes R_fSG because R_fSG, as is clear from Exhibit 2.10, dominates AFX. For every point on AFX, there is at least one point on R_f SG which is superior to the point on AFX. For example, compared to C on AFX, D on R_fSG offers a higher expected return for the same standard deviation; likewise, compared to B on AFX, E on R_fSG offers the same expected return with a lower standard deviation; and so on.

Since R_fSG dominates AFX, every investor would do well to choose some combination of R_f and S. A conservative investor may choose a point like U, whereas an aggressive investor may choose a point like V. However, note that both investors choose some combination of R_f and S. While the conservative investor weights R_f more in his portfolio, the aggressive investor weights S more in his portfolio (in fact, in his portfolio, the weight assigned to R_f is negative and that assigned to S is more than 1).

Thus, the task of portfolio selection can be separated into two steps: (a) Identification of S, the optimal portfolio of risky securities. (b) Choice of a combination of R_f and S depending on one's risk attitude. This is the import of the celebrated **separation theorem**, first enunciated by James Tobin, a Nobel laureate in economics.

2.3 ✦ CAPITAL ASSET PRICING MODEL

Harry Markowitz developed an approach that helps an investor achieve his optimal portfolio position. Hence, portfolio theory, in essence, has a normative character as it prescribes what a rational investor should do.

William Sharpe and others asked the follow-up question: If rational investors follow the Markowitzian prescription, what kind of relationship exists between risk and return? Essentially, the capital asset pricing model (CAPM) developed by them is an exercise in positive economics. It is concerned with two key questions:

- What is the relationship between risk and return for an efficient portfolio?
- What is the relationship between risk and return for an individual security?

The CAPM, in essence, predicts the relationship between the risk of an asset and its expected return. This relationship is very useful in two important ways. First, it produces a benchmark for evaluating various investments. For example, when we are analysing a security, we are interested in knowing whether the expected return from it is in line with its fair return as per the CAPM. Second, it helps us to make an informed guess about the return that can be expected from an asset that has not yet been traded in the market. For example, how should a firm price its initial public offering of stock?

Although the empirical evidence on the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical applications. No wonder, the CAPM is a centerpiece of modern financial economics and William Sharpe, its principal originator, was awarded the Nobel prize in economics.

The CAPM is based on the following assumptions:

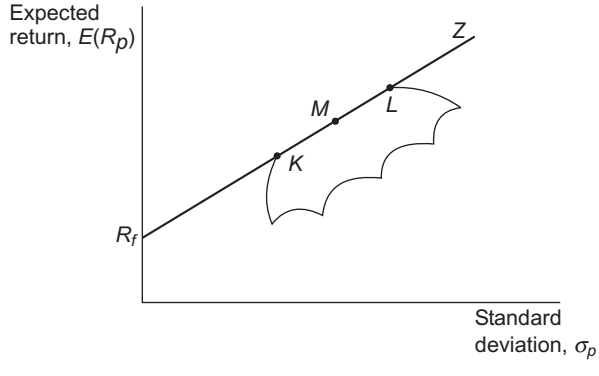
- Investors are risk averse.
- Security returns are normally distributed.
- The utility function of investors is quadratic.
- Investors have homogeneous expectations – they have identical subjective estimates of the means, variances, and covariances among returns.
- Investors can borrow and lend freely at a riskless rate of interest.
- The market is perfect: there are no taxes; there are no transactions costs; securities are completely divisible; the market is competitive.
- The quantity of risky securities in the market is given.

Looking at these assumptions, one may feel that the CAPM is unrealistic. However, the value of a model depends not on the realism of its assumptions, but on the validity of its conclusions. Extensive empirical analysis suggests that there is a lot of merit in the CAPM.

Capital Market Line

In our discussion of portfolio theory, we learnt that rational investors would choose a combination of R_f and S (S represents the point on the efficient frontier of risky portfolios where the straight line emanating from R_f is tangential to the efficient frontier). If all investors attempt to purchase the securities in S and ignore securities not included in S, prices of securities would be revised. On the one hand, prices of securities included in S would rise and hence, their expected returns will fall. This would shift S, along with other points which share securities with S, downward. On the other hand, prices of securities not included in S will fall, leading to an increase in their expected return. Consequently, points representing portfolios in which these securities are included will shift upward. As this process continues, the efficient frontier of risky securities will flatten as shown in Exhibit 2.11. Finally, the set of prices reached would be such that every security will enter at least one portfolio on the linear segment KML. Of course, the market portfolio would itself be a point on that linear segment.

Exhibit 2.11 Adjustment of the Efficient Frontier



Portfolios which have returns that are perfectly positively correlated with the market portfolio are referred to as efficient portfolios. Obviously, these are portfolios that lie on the linear segment.

For efficient portfolios (which includes the market portfolio), the relationship between risk and return is depicted by the straight line $R_f MZ$. The equation for this line, called the capital market line (CML), is:

$$E(R_j) = R_f + \lambda \sigma_j \tag{2.18}$$

where $E(R_j)$ is the expected return on portfolio j, R_f is the risk-free rate, λ is the slope of the capital market line, and σ_j is the standard deviation of portfolio j.

Given that the market portfolio has an expected return of $E(R_M)$ and standard deviation of σ_M, the slope of the CML can be obtained as follows:

$$\lambda = \frac{E(R_M) - R_f}{\sigma_M} \tag{2.19}$$

where λ, the slope of the CML, may be regarded as the "price of risk" in the market.

• Security Market Line

As discussed above, as far as efficient portfolios are concerned, there is a simple linear relationship between expected return and standard deviation. What about individual securities and inefficient portfolios? Typically, the expected return and standard deviation for individual securities will be below the CML, reflecting the inefficiency of undiversified holdings. Further, such points would be found throughout the feasible region with no well-defined relationship between their expected return and standard deviation. However, there is a linear relationship between their expected return and their covariance with the market portfolio. This relationship, called the security market line (SML), is as follows:

$$E(R_i) = R_f + \left(\frac{E(R_M) - R_f}{\sigma_M^2} \right) \sigma_{iM} \tag{2.20}$$

where $E(R_i)$ is the expected return on security i, R_f is the risk-free return, $E(R_M)$ is the expected return on market portfolio, σ_M^2 is the variance of return on market portfolio, and σ_{iM} is the covariance of return between security i and market portfolio.

In words, the SML relationship says:

Expected return on security i = Risk-free return + (Price per unit of risk) Risk

The price per unit of risk is:

$$\frac{E(R_M) - R_f}{\sigma_M^2}$$

The measure of risk is: σ_{iM}

In Eq. (2.20), the risk of a security is expressed in terms of its covariance with the market portfolio, $\sigma_{iM.}$

Can we find a standardised measure of risk? Fortunately, we can find a standardised measure of systematic risk, popularly called beta (β), by taking advantage of the relationship

$$\beta_i = \frac{\sigma_{iM}}{\sigma_M^2} \tag{2.21}$$

which reflects the slope of a linear regression relationship in which the return on security i is regressed on the return on the market portfolio.

Thus, the SML is popularly expressed as

$$E(R_i) = R_f + [E(R_M) - R_f]\,\beta_i \tag{2.22}$$

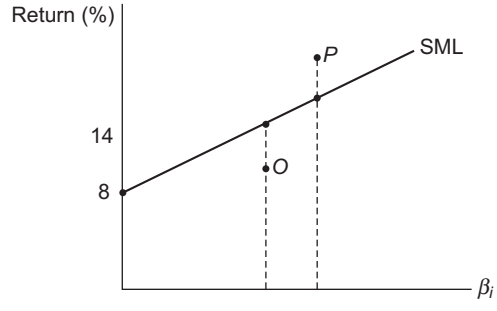
In words, the SML relationship says:

Expected return on security i = Risk-free return + Market risk premium × Beta of security i.

The SML which reflects the expected return-beta relationship is shown in Exhibit 2.12. Note that the slope of the SML is the market risk premium.

Assets, which are fairly priced, plot exactly on the SML. Under-priced securities plot above the SML, whereas over-priced securities plot below the SML. The difference between the actually expected return on a security and its fair return as per the SML is called the security's **alpha,** denoted by α.

Exhibit 2.12 The Security Market Line



• Empirical Evidence on CAPM

Beta, a product of academic research, was initially viewed with disdain and suspicion by the investment community. However, it was gradually accepted, as the initial empirical evidence supported it. The earlier resistance turned into enthusiasm. Beta indeed became very fashionable in the 1970s and the investment industry in the U.S. began manufacturing and supplying beta on a large scale. Along with the spread of the beta cult, the capital asset pricing and its various extensions have been subjected to rigorous scrutiny and testing.

According to the capital asset pricing model, the expected return on a security is:

$$E(R_i) = R_f + \beta_i\,[E(R_M) - R_f] \tag{2.23}$$

The ideal way to test the CAPM would be to observe investors' expectations of betas and expected returns on individual securities and the market portfolio and then compare the expected return on each security with its return predicted by the CAPM. Unfortunately, this procedure is not practical since information on investor expectations is very sketchy.

In practice, researchers have tested the CAPM using *ex post data*, rather than *ex ante* data. They have examined the relationship between the security beta and realised return.

$$\bar{R}_i = v_0 + v_1 \beta_i + e_i \tag{2.24}$$

where $\bar{R}_i$ is the realised return on security i, v_0 is the intercept, β_i is the estimated beta of security i, and v_1 is the slope coefficient.

If the CAPM holds:

- The relationship should be linear. This means that terms like β_i^2, if substituted for β_i, should not yield better explanatory power.
- v_0, the intercept, should not be significantly different from the risk-free rate, R_f
- v_1, the slope coefficient, should not be significantly different from $R_M - R_f$
- No other factors such as company size or total variance should affect R_i
- The model should explain a significant portion of variation in returns among securities.

Numerous empirical studies have been conducted to test the CAPM. Without going into the details of the individual studies, let us note the following general conclusions that emerge from these studies.

- The relation appears to be linear.
- In general v_0 is greater than the risk-free rate and v_1 is less than $R_M - R_f$. This means that the actual relationship between risk (as measured by beta) and return is flatter than what the CAPM says.
- In addition to beta, some other factors, such as standard deviation of returns, price – earnings multiple and company size, too have a bearing on return.
- Beta does not explain a very high percentage of the variance in returns among securities.

While reviewing the empirical evidence, bear in mind two important problems. First, the studies use historical returns as proxies for expectations. This assumes that the expected returns will be the same as the realised returns. Second, the studies use a market index as a proxy for the market portfolio. Richard Roll has argued persuasively that since the 'true' market portfolio (which in principle must include all assets—financial, real, as well as human—and not just equity stocks), cannot be measured, the CAPM cannot be tested.

Notwithstanding the problems mentioned above, the CAPM is the most widely used risk return model. Its popularity may be attributed to the following factors:

- Some objective estimate of risk premium is better than a completely subjective estimate or no estimate.
- CAPM is a simple and intuitively appealing risk-return model. Its basic message that "diversifiable risk does not matter is accepted" by nearly every one.
- While there are plausible alternative risk measures, no consensus has emerged on what course to plot if beta is abandoned. As Richard Brealey and Stewart Myers say: "So the capital asset pricing model survives not from a lack of competition but from a surfeit".

The situation perhaps may change as additional evidence is gathered in favour of arbitrage pricing model and operational guidelines for applying that model are developed further. As of now, however, the CAPM appears to be the model of choice in practice.

2.4 ✦ EFFICIENT MARKETS HYPOTHESIS

In the mid-1960s, Eugene Fama introduced the idea of an "efficient" capital market to the literature of financial economics. Put simply, the idea is that the intense competition in the capital market leads to fair pricing of debt and equity securities.

This is indeed a sweeping statement. No wonder, it continues to stimulate insight and controversy even today. Benjamin Friedman refers to efficient markets hypothesis as a "credo," a statement of faith and not a scientific proposition. Warren Buffett, perhaps the most successful investor of our times, has characterised the market as "a slough of fear and greed untethered to corporate realities."

For most financial economists, however, the efficient markets hypothesis is a central idea of modern finance that has profound implications.

An understanding of the efficient markets hypothesis will help you to ask the right questions and save you from a lot of confusion that dominates popular thinking in finance.

• Random Walk and Search for Theory

In 1950s, pioneering work done by distinguished statisticians and physicists, such as Maurice Kendall, Harry Roberts, Osborne and others, found that stock prices behaved like a random walk.

A random walk means that successive stock prices are independent and identically distributed. Therefore, strictly speaking, the stock price behaviour should be characterised as a submartingale, implying that the expected change in price can be positive because investors expect to be compensated for time and risk. Further, the expected return may change over time in response to change in risk.

Search for Theory When the empirical evidence in favour of the random walk hypothesis seemed overwhelming, the academic researchers asked the question: What is the economic process that produces a random walk? They concluded that the randomness of stock prices was the result of an efficient market. Broadly, the key links in the argument are as follows:

- Information is freely and instantaneously available to all the market participants.
- Keen competition among market participants more or less ensures that market prices will reflect intrinsic values. This means that they will fully impound all available information.
- Prices change only in response to new information that, by definition, is unrelated to previous information (otherwise it will not be new information).
- Since new information cannot be predicted in advance, price changes too cannot be forecast. Hence, prices behave like a random walk.

• What is an Efficient Market

An efficient market is one in which the market price of a security is an unbiased estimate of its intrinsic value. Note that market efficiency does not imply that the market price equals

intrinsic value at every point in time. All that it says is that the errors in the market prices are unbiased. This means that the price can deviate from the intrinsic value but the deviations are random and uncorrelated with any observable variable. If the deviations of market price from intrinsic value are random, it is not possible to consistently identify over or under-valued securities.

Richard Roll adds his own nuance. He says: "In an efficient financial market, costless trading policies will not generate 'excess returns' … This is often thought to imply something about the amount of 'information' reflected in asset prices. However, it really doesn't mean that prices reflect all information nor even that they reflect publicly available information. Instead, it means that the connection between unreflected information and prices is too subtle and tenuous to be easily or costlessly detected."

In a very provocative article, titled "Noise," which appeared in the July 1986 issue of *Journal of Finance*, Fischer Black defines an efficient market as one in which the price is more than half of value and less than two times the value. According to him, by this definition almost all markets are efficient at least 90 per cent of the time.

• Misconceptions about the Efficient Markets Hypothesis

The efficient markets hypothesis has often been misunderstood. The common misconceptions about the efficient markets hypothesis are stated below along with the answers meant to dispel them.

Misconception	*The efficient markets hypothesis implies that the market has perfect forecasting abilities*.
Answer	The efficient markets hypothesis merely implies that prices impound all available information. This does not mean that the market possesses perfect forecasting abilities.
Misconception	*As prices tend to fluctuate, they would not reflect fair value.*
Answer	Unless prices fluctuate, they would not reflect fair value. Since the future is uncertain, the market is continually surprised. As prices reflect these surprises, they fluctuate.
Misconception	*Inability of institutional portfolio managers to achieve superior investment performance implies that they lack competence.*
Answer	In an efficient market, it is ordinarily not possible to achieve superior investment performance. Market efficiency exists because portfolio managers are doing their job well in a competitive setting.
Misconception	*The radom movement of stock prices suggests that the stock market is irrational*.
Answer	Randomness and irrationality are two different matters. If investors are rational and competitive, price changes are bound to be random.

2.5 ✦ AGENCY THEORY

In proprietorships, partnerships, and cooperative societies, owners are actively involved in management. But in companies, particularly large public limited companies, owners typically are not active managers. Instead, they entrust this responsibility to professional managers who may have little or no equity stake in the firm. There are several reasons for the separation of ownership and management in such companies:

- Most enterprises require large sums of capital to achieve economies of scale. Hence it becomes necessary to pool capital from thousands or even hundreds of thousands of owners. It is impractical for many owners to participate actively in management.
- Professional managers may be more qualified to run the business because of their technical expertise, experience, and personality traits.
- Separation of ownership and management permits unrestricted change in owners through share transfers without affecting the operations of the firm. It ensures that the 'know-how' of the firm is not impaired, despite changes in ownership.
- Given economic uncertainties, investors would like to hold a diversified portfolio of securities. Such diversification is achievable only when ownership and management are separated.

While there are compelling reasons for separation of ownership and management, a separated structure leads to a possible conflict of interest between managers (agents) and shareholders (principals). Though managers are the agents of shareholders, they are likely to act in ways that may not maximise the welfare of shareholders.

In practice, managers enjoy substantial autonomy and hence have a natural inclination to pursue their own goals. To prevent from getting dislodged from their position, managers may try to achieve a certain acceptable level of performance as far as shareholder welfare is concerned. However, beyond that their personal goals like presiding over a big empire, pursuing their pet projects, diminishing their personal risks, and enjoying generous compensation and lavish perquisites tend to acquire priority over shareholder welfare.

The lack of perfect alignment between the interests of managers and shareholders results in **agency costs** which may be defined as the difference between the value of an actual firm and value of a hypothetical firm in which management and shareholder interests are perfectly aligned.

To mitigate the agency problem, effective monitoring has to be done and appropriate incentives have to be offered. Monitoring may be done by bonding managers, by auditing financial statements, by limiting managerial discretion in certain areas, by reviewing the actions and performance of managers periodically, and so on.

Incentives may be offered in the form of cash bonuses and perquisites that are linked to certain performance targets, stock options that grant managers the right to purchase equity shares at a certain price, thereby giving them a stake in ownership, performance shares given when certain goals are achieved, and so on.

The design of optimal compensation contract depends on several factors such as the extent to which the actions of managers are observable, the degree of informational asymmetry between managers and shareholders, the differences in the time horizons of managers and

shareholders, the differences in the risk tolerance of managers and shareholders, and the adequacy of performance metrics.

Good corporate governance, including optimal compensation contract design, is important for maximising the value of the firm and optimising the allocation of capital in the economy. In this book we will discuss how behavioural factors improve our understanding of the principal-agent problem and how agency costs can be minimised.

2.6 ✦ THE INFLUENCE OF PSYCHOLOGY

In this chapter, we have briefly discussed important theories that represent the core of rational model of finance. In this book we will look at the evidence challenging the validity of the rational model of finance. This evidence suggests that psychological influences, which have been brushed aside by the rational model of finance, seem to matter. Hence, in recent decades many researchers have looked at how human psychology shapes financial decision-making and financial markets. The efforts of these researchers has led to the emergence of behavioural finance, a relatively new field.

The votaries of the rational model have, however, criticised behavioural finance as it lacks a unified theory. But, such criticism, cannot detract from the need to recognise the importance and relevance of psychology in understanding the behaviour of investors, finance practitioners, managers, and financial markets. This need was recognised decades ago by John Maynard Keynes, regarded by many as the most influential economist of twentieth century. Here is a passage from his seminal work *The General Theory of Employment, Interest, and Money*, published in 1936.

> "If I may be allowed to appropriate the term *speculation* for the activity of forecasting the psychology of the markets, and the term *enterprise* for the activity of forecasting the prospective yield of assets over their whole life, it is by no means always the case that speculation predominates over enterprise. As the organisation of investment markets improves, the risk of the predominance of speculation does, however, increase. In one of the greatest investment markets in the world, namely, New York, the influence of speculation (in the above sense) is enormous. Even outside the field of finance, Americans are apt to be unduly interested in discovering what average opinion believes average opinion to be; and this national weakness finds its nemesis in the stock market."

While the theory that currently dominates finance teaching provides a useful framework for thinking about finance problems, it has its limitations. So, it should be taught less inflexibly and more pragmatically. As Robert Shiller put it, "For me, alternative views that must be incorporated into our teaching include those promoted by the other social sciences: psychology, sociology, political science, and anthropology. For me, maintaining a proper perspective on alternative views means also incorporating historical analysis. For me, too, we must also keep in view the fundamental importance of institutions, our established organisations, practices, laws-and remind our students that these must be taken into account before judging any economic model."

SUMMARY

- Expected utility theory is concerned with people's preferences with respect to choices that have uncertain outcomes (gambles). According to this theory, if certain axioms are fulfilled, the subjective value of a gamble for an individual is the statistical expectation of the values the individual assigns to the outcomes of that gamble.
- Utility reflects the satisfaction derived from a particular outcome—ordinarily an outcome is represented by a "bundle" of goods. The utility function, denoted as $U(*)$ assigns numbers to possible outcomes such that preferred choices are assigned higher numbers.
- Daniel Bernoulli offered a solution to the famous "St. Petersburg paradox." More important, his analysis of risk attitudes in terms of preferences for wealth is still part of economic analysis after almost 300 years.
- Developed by John von Neumann and Oskar Morgenstern, expected utility theory attempts to define rational behaviour in face of uncertainty. It is a *normative theory* as it prescribes how people *should* behave rationally. A *positive theory*, on the other hand, describes how people actually behave.
- In general, if a person has a concave utility function (logarithmic utility function is an example of a concave utility function), he is risk-averse. For such a person,

  $$U[E(P)] > U(P)$$

- Generally, people are risk averse, but some people like risk. Such people are called risk seekers. The utility function of a risk seeker is convex, as in:

  $$U[P] > U[E(P)]$$

- Finally, some people are risk-neutral—they lie between risk averters and risk seekers. They care only about expected values as risk does not matter to them. For a risk-neutral individual:

  $$U[E(P)] = U[P]$$

- Designed by Maurice Allais, a Nobel laureate in economics, the **Allais paradox** shows an inconsistency between actual observed choices with the predictions of expected utility theory.
- **Portfolio theory**, originally proposed by Harry Markowitz in the 1950s, was the first formal attempt to quantify the risk of a portfolio and develop a methodology for determining the optimal portfolio. Prior to the development of portfolio theory, investors dealt with the concepts of returns and risk somewhat loosely.
- Modern portfolio theory assumes that investors are risk averse and preferences (utilities) are defined in terms of the mean and variance of returns.
- A portfolio comprises of two or more assets. Smart investors know that combining several assets in a portfolio usually leads to risk reduction, thanks to the benefit of

diversification. Remember the old adage which says, "don't put all your eggs in the same basket."

- Given information on how the returns for the two assets are correlated, we can compute the portfolio mean return and portfolio variance for two asset portfolios as follows:

$$\bar{R}_p = w_1 \bar{R}_1 + w_2 \bar{R}_2$$

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2$$

A portfolio is efficient if (and only if) there is no alternative with (i) the same $E(R_p)$ and a lower σ_p, (ii) the same σ_p and a higher $E(R_p)$, or (iii) a higher $E(R_p)$ and a lower σ_p.

- We have merely defined what is meant by a set of efficient portfolios. How can this set be actually obtained from the innumerable portfolio possibilities that lie before the investor? The set of efficient portfolios may be determined with the help of graphical analysis, or calculus analysis, or quadratic programming analysis. The major advantage of graphical analysis is that it is easier to grasp. Its disadvantage is that it cannot handle portfolios containing more than three securities.
- Thus, the task of portfolio selection can be separated into two steps: (a) Identification of S, the optimal portfolio of risky securities. (b) Choice of a combination of R_f and S depending on one's risk attitude. This is the import of the celebrated **separation theorem**, first enunciated by James Tobin, a Nobel laureate in economics.
- William Sharpe and others asked the follow-up question: If rational investors follow the Markowitzian prescription, what kind of relationship exists between risk and return? Essentially, the **capital asset pricing model** (CAPM) developed by them is an exercise in positive economics. It is concerned with two key questions:
  - What is the relationship between risk and return for an efficient portfolio?
  - What is the relationship between risk and return for an individual security?
- Although the empirical evidence on the CAPM is mixed, it is widely used because of the valuable insight it offers and its accuracy is deemed satisfactory for most practical applications. No wonder, the CAPM is a centerpiece of modern financial economics and William Sharpe, its principal originator, was awarded the Nobel prize in economics.
- This relationship, called the security market line (SML), is as follows:

$$E(R_i) = R_f + \left(\frac{E(R_M) - R_f}{\sigma_M^2} \right) \sigma_{iM}$$

- In the mid-1960s, Eugene Fama introduced the idea of an "**efficient**" capital market to the literature of financial economics. Put simply, the idea is that the intense competition in the capital market leads to fair pricing of debt and equity securities.

- The lack of perfect alignment between the interests of managers and shareholders results in **agency costs** which may be defined as the difference between the value of an actual firm and value of a hypothetical firm in which management and shareholder interests are perfectly aligned.
- To mitigate the agency problem, effective monitoring has to be done and appropriate incentives have to be offered. Monitoring may be done by bonding managers, by auditing financial statements, by limiting managerial discretion in certain areas, by reviewing the actions and performance of managers periodically, and so on.
- Incentives may be offered in the form of cash bonuses and perquisites that are linked to certain performance targets, stock options that grant managers the right to purchase equity shares at a certain price thereby giving them a stake in ownership, performance shares given when certain goals are achieved, and so on.
- This evidence suggests that psychological influences, which have been brushed aside by the rational model of finance, seem to matter. Hence, in recent decades many researchers have looked at how human psychology shapes financial decision-making and financial markets. The efforts of these researchers has led to the emergence of behavioural finance, a relatively new field.

SOLVED PROBLEMS

1. Rakesh Gupta's utility function for wealth is: $u(w) = w^{2/3}$

   Suppose Rakesh Gupta has a 20% chance of wealth of ₹3,000,000, 30% chance of wealth of ₹2,000,000, and 50% chance of wealth of ₹1,000,000.

   a. What is the expected value of wealth?

   b. Is Rakesh Gupta risk averse, risk neutral, or risk-seeking?

   c. What is Rakesh Gupta's certainty equivalent for the prospect?

   Solution

   a. The expected value of wealth is:

   $$0.2 \times 3{,}000{,}000 + 0.3 \times 2{,}000{,}000 + 0.5 \times 1{,}000{,}000 = ₹1{,}700{,}000$$

   b. Given the utility function $u(w) = w^{2/3}$ let us look at the utility for four levels of wealth, viz., ₹0, ₹1,000,000, ₹2,000,000, and ₹3,000,000.

   $u(0) = 0$

   $u(1{,}000{,}000) = 10{,}046$

   $u(2{,}000{,}000) = 15{,}951$

   $u(3{,}000{,}000) = 20{,}905$

   From these numbers, it is clear that Rakesh Gupta's utility of wealth function is concave, implying that he is risk-averse.

c. The expected utility of the prospect is:

$$0.2 \times 20{,}905 + 0.3 \times 15{,}951 + 0.3 \times 10{,}046 = 13{,}989$$

The expected utility is 13,989. Since the utility of wealth is $w^{2/3}$, the certain amount that provides an expected utility of 13,989 is:

$$(13{,}989)^{3/2} = ₹1{,}654{,}550$$

2. Neha has the following utility function:

$$u(w) = lnw \quad \text{where } w = \text{wealth}$$

a. What is the expected utility of the following prospects:

P1 (0.6, 400, 800)

P2 (0.8, 5000, 2,000)

P3 (0.4, 6,000, 3,000)

b. What is the certainty equivalent of P2?

Solution

a. The expected utility of P1 is:

$$0.6\ U(400) + 0.4\ U(800) = 0.6 \times 5.99 + 0.4 \times 6.68 = 6.27$$

The expected utility of P2 is:

$$0.8 \times 8.52 + 0.2 \times 7.60 = 8.34$$

The expected utility of P3 is:

$$0.4 \times 8.70 + 0.6 \times 8.01 = 8.29$$

b. The expected utility of P2 is 8.34. Since the utility of wealth is *lnw*, the certain wealth that provides an expected utility of 8.34 is:

$$e^{8.34} = 4{,}188$$

3. During the past five years, the returns on a stock were as follows:

Year	*Return (%)*
1	10
2	12
3	–10
4	–16
5	24

What is the standard deviation of returns?

Solution

Mean return = $(10 + 12 - 10 - 16 + 24)/5 = 4\%$

Standard deviation = $[((10 - 4)^2 + (12 - 4)^2 + (-10 - 4)^2 + (-16 - 4)^2 + (24 - 4)^2)/4]^{1/2}$

$= ((36 + 64 + 196 + 400 + 400)/4)^{1/2} = 16.55\ \%$

4. A portfolio consists of 3 securities, p, q, and r. The proportions of these securities are: $w_p = 0.4$, $w_q = 0.5$, and $w_r = 0.1$. The standard deviations of returns on these securities (in percentage

terms) are: $\sigma_p = 3$, $\sigma_q = 2$, and $\sigma_r = 4$. The correlation coefficients among security returns are $\rho_{pq} = 0.3$, $\rho_{pr} = 0.2$, $\rho_{qr} = 0.5$. What is the standard deviation of portfolio return?

Solution

$$= (0.4^2 \times 3^2 + 0.5^2 \times 2^2 + 0.1^2 \times 4^2 + 2 \times 0.4 \times 0.5 \times 0.3 \times 3 \times 2 + 2 \times 0.4 \times 0.1 \times 0.2 \times 3 \times 4 + 2 \times 0.5 \times 0.1 \times 0.5 \times 2 \times 4)^{1/2}$$

$$= (1.44 + 1 + 0.16 + 0.72 + 0.192 + 0.4)^{1/2} = 1.98$$

5. The risk-free return is 7 per cent and the expected return on market portfolio is 14 per cent. If the required return on a stock is 16 per cent, what is its beta?

Solution

We have: Required return = Risk-free return + Beta(Expected return on market portfolio – Risk-free return)

16 = 7 + Beta(14 – 7)

Beta = 9/7 = 1.29

6. The risk-free return is 8 per cent. The expected return on a stock whose beta is 1.8 is 18 per cent. What is the expected return on the market portfolio?

Solution

We have: 18 = 8 + 1.8(Expected return on the market portfolio – 8)

Expected return on the market portfolio = 10/1.8 + 8 = 13.56 %

PROBLEMS

1. Arvind Sharma's utility function for wealth is: $U(w) = \sqrt{w}$.

   Suppose Arvind Sharma has a 30% chance of wealth of ₹1,000,000, 40% chance of wealth of ₹2,000,000, and 30% chance of wealth of ₹3,000,000.

   a. What is the expected value of wealth?
   b. Graph Arvind Sharma's utility function.
   c. Is Arvind Sharma risk-averse, risk-neutral, or a risk seeker?
   d. What is Arvind Sharma's certainty equivalent for the prospect?

2. Mohan has the following utility function:

   U(*w*) = *ln w* where *w* = wealth

   a. What is the expected utility of the following prospects:
      P1 (0.7, 200, 600)
      P2 (0.6, 3000, 1,000)
      P3 (0.5, 4,000, 2,000)
   b. What is the certainty equivalent of P3?

3. Daniel Kahneman and Amos Tversky presented the following choice problems to a number of respondents.

PROBLEM 1 : Choose between

A : 2500 with probability 0.33
2400 with probability 0.66
0 with probability 0.01

B : 2,400 with certainty

PROBLEM 2 : Choose between

C : 2,500 with probability 0.33
0 with probability 0.67

D : 2,400 with probability 0.34
0 with probability 0.66

In Problem 1, 82 per cent of the respondents chose B, and in Problem 2, 83 per cent of the respondents chose C. This pattern of preferences violates expected utility theory. Why?

4. During the past five years, the returns on a stock were as follows:

Year	*Return (%)*
1	7
2	3
3	–9
4	6
5	10

What is the standard deviation of returns?

5. A portfolio consists of 3 securities, 1, 2, and 3. The proportions of these securities are: $w_1 = 0.3$, $w_2 = 0.5$, and $w_3 = 0.2$. The standard deviations of returns on these securities (in percentage terms) are: $\sigma_1 = 6$, $\sigma_2 = 9$, and $\sigma_3 = 10$. The correlation coefficients among security returns are $\rho_{12} = 0.4$, $\sigma_{13} = 0.6$, $\rho_{23} = 0.7$. What is the standard deviation of portfolio return?
6. The risk-free return is 8 per cent and the expected return on market portfolio is 12 per cent. If the required return on a stock is 15 per cent, what is its beta?
7. The risk-free return is 9 per cent. The expected return on a stock whose beta is 1.5 is 15 per cent. What is the expected return on the market portfolio?

DISCUSSION QUESTIONS

1. State the von Neumann-Morgenstern axioms.
2. What is a utility function?
3. Discuss the weakness of the Expected Monetary Value (EMV) criterion.
4. Discuss Daniel Bernoulli's solution to the St. Petersburg paradox.
5. How is the expected utility of a prospect calculated?
6. Describe the utility functions of a person who is risk-averse, or risk-loving, or risk-neutral.

7. Discuss Allais paradox.
8. How is the risk and return of a portfolio measured?
9. What is an efficient portfolio?
10. What does happen to the efficient frontier when there is an opportunity for riskless lending and borrowing?
11. Explain separation theorem.
12. What questions does the Capital Asset Pricing Model (CAPM) try to answer?
13. Discuss the assumptions underlying the CAPM.
14. Discuss the capital market line and the security market line.
15. Discuss the empirical evidence on CAPM.
16. What is the economic process that produces a random walk?
17. What is an efficient market?
18. Discuss the misconceptions surrounding the efficient market hypothesis.
19. Discuss agency theory.
20. Discuss the influence of psychology on finance.

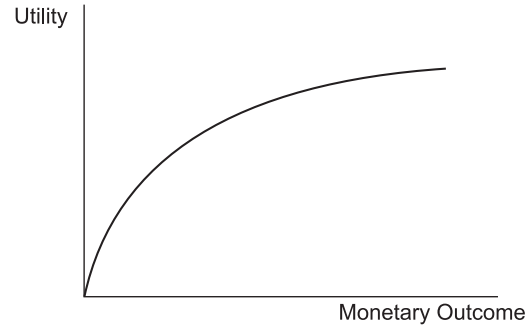
APPENDIX 2A

OBTAINING A PERSON'S UTILITY FUNCTION

How can a person's utility function be obtained? von Neumann and Morgenstern[2] have suggested a method which is as follows:

1. Find the range of monetary outcomes that a person regards as relevant. The end point of this range may be designated as A and B.

Exhibit 2A.1 Utility Function



[2] J. von Neumann and O. Morgenstern, *Theory of Games and Economic Behaviour*, Princeton, N.J: Princeton University Press, 1994.

2. Assign a utility of 0 to A (the lowest outcome) and a utility of 1 to B (the highest outcome).
3. Determine the utility associated with any intermediate value by the following process:
   i. Present the individual with two alternatives. The first alternative consists of the intermediate value X, the utility of which is to be determined. The second alternative consists of a lottery which has two possible outcomes, A and B, with probabilities p_1 and p_2 attached to them ($p_1 + p_2 = 1$).
   ii. Ask the individual to choose one of the alternatives presented in (i) above.
   iii. If the individual chooses the first alternative, revise the second alternative such that it becomes more attractive. This means the value of p_2 should be increased and the value of p_1 should be decreased. If the individual chooses the second alternative, revise it such that it becomes less attractive. This means the value of p_2 should be decreased and the value of p_1 should be increased.
   iv. Ask the individual to choose after the revision of lottery as per step (iii). Continue this till the individual becomes indifferent to both the alternatives.
   v. When the individual becomes indifferent to both the alternatives, the utility of X is simply the value of p_2.
4. Obtain the utility values of several intermediate outcomes and plot the utility function.

An example may be given to illustrate the above procedure. The relevant range for an individual is ₹10,000 and ₹50,000. The utility of ₹10,000 is put as 0 and that of ₹50,000 is put as 1. We wish to find the individual's utility for ₹20,000. We present him with two alternatives:

Alternative 1: A certain gain of ₹20,000

Alternative 2: A lottery which has two possible outcomes –

₹10,000 and ₹50,000 probabilities 0.6 and 0.4, respectively.

We ask him to choose between the two alternatives. He chooses, say, alternative 1. We now modify the second alternative and present him with the following choice situation:

Alternative 1: A certain gain of ₹20,000

Alternative 2: A lottery which has two possible outcomes – ₹10,000 and ₹50,000 with probabilities 0.55 and 0.45, respectively.

He again choose alternative 1. We further modify alternative 2 and present him with the following choice situation:

Alternative 1: A certain gain of ₹20,000

Alternative 2: A lottery which has two possible outcomes –

₹10,000 and ₹50,000 with probabilities 0.5 and 0.5, respectively.

This time he expresses an indifference to both alternatives. From this we infer that this utility for ₹20,000 is 0.5. (This is $0.5 \times 0 + 0.5 \times 1 = 0.5$).

It should be noted that the assigned utility of 0 to the lowest outcome (of the relevant range) and utility of 1 of the highest outcome (of the relevant range). These were chosen arbitrarily. We could choose any other set of values, say 1 and 10 or –12/2 and 111/3. The point to note is that there is no sanctity attached to any set of values because the utility function is unique up to a linear transformation.

■ ■

PART II

Foundations of Behavioural Finance

Chapter 3

Heuristics and Biases

The neoclassical models in economics and finance assume that the typical decision maker has all the information and unlimited cerebral capacity. He considers all relevant information and comes up with an optimal choice under the circumstances using a process called constrained optimisation. To illustrate, consider portfolio theory developed by Harry Markowitz for which he was awarded the 1990 Nobel prize in economics. This theory assumes that investors can analyse the universe of securities, estimate expected returns and variances for all securities as well as co-variances among all securities, define their utility indifference curves for risk and return, and choose the optimal portfolios that maximise their utility.

In the real world, people make decisions with inadequate and imperfect information and have limited cognitive capacity. They rely on heuristics which can lead to biases.

A heuristic is a crude rule of thumb for making judgments about probabilities, future outcomes, and so on. A bias is a tendency toward making judgmental errors. The heuristic and biases approach studies the heuristics people employ to form judgments and the associated biases in those judgments.

Some biases stem from specific heuristics. Availability (the tendency to form judgments based on information which is readily available) and representativeness (the tendency to rely on stereotypes) are examples of such biases.

Although some biases are associated with specific heuristics, other biases stem from a variety of factors such as overconfidence, unrealistic optimism, and the illusion of control.

This chapter discusses how the mind works and explores various heuristics and biases. It is organised into six sections as follows:

- How the mind works: the two systems
- Familiarity and related heuristics
- Representativeness and related heuristics
- Anchoring
- Irrationality and adaptation
- Hyperbolic discounting

3.1 ✦ HOW THE HUMAN MIND WORKS: THE TWO SYSTEMS[1]

For the past several decades, psychologists have studied intensively how the human mind works. They believe that there are two systems in the mind. Psychologists Keith Stanovich

[1] This section draws heavily on Daniel Kahneman's book, *Thinking, Fast and Slow,* Allen Lane, 2011.

and Richard West refer to them as System 1 and System 2. System 1 operates automatically and rapidly. It requires little or no effort and is not amenable to voluntary control. System 2 is effortful, deliberate, and slow. It requires mental activities that may be demanding, including complex calculation. As Daniel Kahneman put it, "The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration."

When we think of ourselves, we identify ourselves with System 2, and think that we form beliefs and make choices in a conscious, deliberate manner. But in reality, System 1, where impressions and feelings originate effortlessly, provides the main inputs for the explicit and deliberate choices of System 2. We can think of the two systems as agents with their individual abilities, limitations, and functions.

Here are some examples of the automatic activities attributable to System 1, in rough order of complexity.

- Detect that one object is nearer than another.
- Discern friendliness in a voice.
- Answer 2 + 1 = ?
- Drive a bicycle on an empty road.
- Comprehend simple sentences.

All these mental events occur automatically and require practically no effort. Some of the capabilities of System 1 are innate skills that we share with other animals such as perceiving the world around us, recognising objects, and avoiding losses. Other capabilities of System 1 are fast and automatic, acquired through prolonged practice. The knowledge relating to these mental events is stored in memory and accessed effortlessly.

System 1 is sometimes called the X-system. It is essentially the emotional approach to decision-making. As James Montier put it, "The X-system is actually the default option, so all information goes first to the X-system for processing. It is automatic and effortless. The judgments made by the X-system are generally based on aspects such as similarity, familiarity, and proximity (in time)." He further added, "Effectively, the X-system is a quick and dirty 'satisfying' system, which tries to give answers that are approximately (rather than precisely) correct. In order for the X-system to believe that something is valid, it may simply need to wish that it were so."

When are we most likely to rely on System 1 (or X)? The following conditions increase the likelihood of depending on System 1:

- The problem is complex and ill-structured.
- Goals are ill-defined and changing.
- Information is ambiguous, incomplete, and changing.
- The stress is high because of high stakes or time pressure.
- Decisions depends on interaction with others.

Investment decisions seem to have one or more of these characteristics and are likely to be guided by System 1.

While the activities of System 1 normally run on an automatic pilot and are involuntary, the operations of System 2 require attention and voluntary effort. Here are some examples of the operations of System 2.

- Identify the clowns in the circus.
- Discern the voice of a friend in a crowded and noisy room.

- Walk at a speed faster than is natural for you.
- Control your behaviour in a social situation.
- Count the number of times the letter *a* occurs in a paragraph.
- Compare two refrigerators for overall value.
- Calculate the product of 13×37.
- Pick holes in a complex argument.

Since human beings have a limited budget of attention, the effortful activities of System 2 interfere with each other. So, it is difficult or impossible for you to perform several activities simultaneously. You may not be able to compute the product of 13×37 while trying to park your car in a narrow space. You can perhaps do several things at once, provided they are easy and undemanding.

• Interaction of the Two Systems

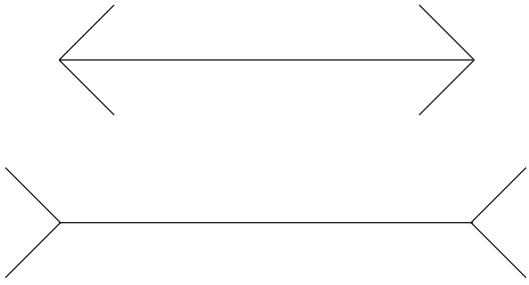
The interaction of System 1 and System 2 is an important theme of this book. Here is a synoptic view of that interaction.

- When we are awake, System 1 and System 2 are both active. System 1 runs in the automatic mode and System 2 is normally in a comfortable 'low-effort mode' which consumes only a fraction of its capacity.
- System 1 generates impressions, intuitions, and impulses that serve as suggestions for System 2. If approved by System 2, impressions and intuitions convert into beliefs and impulses that translate into voluntary action. Most of the time, this works well: You believe your impressions and act on your desires.
- When System 1 runs into a problem – as probably happens when you have to multiply 13 by 37 – it seeks the support of System 2 for detailed and specific processing. System 2 is activated when an event calls for conscious attention or when you have to monitor your behaviour – it is System 2 that helps you to solve a complex multiplication problem or keeps you polite when you are irritated.
- Normally, the division of labour between the two systems is highly efficient, as it minimises effort and optimises performance. As Kahneman put it, "The arrangement works well most of the time because System 1 is generally very good at what it does: its models of familiar situations are accurate, its short-term predictions are usually accurate as well, and its initial reactions to challenges are swift and generally appropriate."

• Illusions

To appreciate the autonomy of System 1 and distinguish between impressions and beliefs, look at Exhibit 3.1. The bottom line looks longer than the one above it, but if you measure the two horizontal lines with a ruler they are in fact identical in length. This is an example of optical illusion called Muller-Lyer illusion.

Exhibit 3.1 Optical Illusion



While your System 2 knows that the lines are equal in length, you will still see the bottom lines as longer. Just as there are visual illusions, there are illusions of thought called cognitive illusions which will be discussed at length in this book.

Can cognitive illusions be overcome? It seems difficult. As Kahneman put it, "Because System 1 operates automatically and cannot be turned off at will, errors of intuitive thought are often difficult to prevent. Biases cannot always be avoided, because System 2 may have no cue to the error." He added, "Even when cues to likely errors are available, errors can be prevented only by the enhanced monitoring and effortful activity of System 2. As a way to live your life, however, continuous vigilance is not necessarily good, and it is certainly impractical." The best we can do is to improve our ability to recognise situations in which such mistakes are likely and try deliberately to avoid such mistakes where the stakes are high. It seems easier to recognise other people's mistakes than our own.

• The Lazy System 2

An important function of System 2 is to monitor and control thoughts and actions prompted by System 1.

Here is a puzzle.

A bat and a ball cost ₹120.
The bat costs ₹100 more than the ball.
What is the cost of the ball?

The number that most probably comes to your mind quickly is ₹20. It is intuitive and appealing, but wrong. If you do the math, you will find the correct answer to be ₹10.

Psychological researchers have given the bat-and-ball puzzle to thousands of university students. They were shocked to find that more than 50 per cent of students at Harvard, MIT, and Princeton failed to give the correct answer. The rate of failure exceeded 80 per cent at less selective universities. Clearly, these students can solve much more difficult problems, but they are tempted to accept a superficially plausible answer that comes readily to mind. What explains this? It appears that people are overconfident and tend to rely heavily on their intuition. They perhaps find cognitive effort somewhat unpleasant and avoid it if possible. As Kahneman put it, "The ease with which they are satisfied enough to stop thinking is rather

troubling. 'Lazy' is a harsh judgment about the self-monitoring of these young people and their System 2, but it does not seem to be unfair."

The Associative Machine

Look at the following words:

Travel Sickness

When you look at these words you experience some unpleasant images and memories. Your mind automatically assumes a temporal sequence and a causal connection between the two. The mechanism that causes these mental events is called the **association of ideas.**

Priming If you hear the word EAT, you are likely to complete the word fragment SO_P as SOUP, but if you hear the word WASH you are likely to complete the word fragment SO_P as SOAP. Psychologists call it as a **priming effect**. It is an example of how the associative machine works. EAT primes the idea of SOUP and WASH primes the notion of SOAP.

Priming is not restricted to just concepts and words. Your actions and emotions can be primed by events outside your realm of awareness. In a classic experiment, John Bargh and his associates asked students of New York University to construct four-word sentences from a set of five words, presented in a scrambled manner. For one group of students, half the scrambled sentences contained words such as *Florida, bald, forgetful,* or *wrinkle*. After they completed the task, they were asked to go for another experiment in an office down the hall. And this short walk was the central focus of the experiment. Unobtrusively, the researchers measured the time it took the participants to get from one end of the corridor to the other. As Bargh had expected, participants who constructed a sentence from words with an elderly theme walked significantly slowly than the others.

Two stages of priming are involved in the "Florida effect." First, the set of words with an elderly theme primes thoughts of old age, even though there is no mention of the word *old*. Second, the thoughts of old age prime a behaviour, walking slowly, which is normally associated with old age. Remarkably all this happens without any awareness.

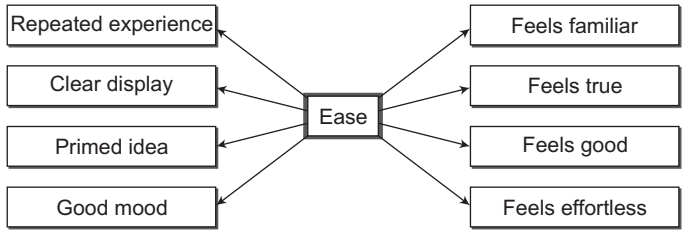
Simple gestures like a smile can unconsciously influence our thoughts and feelings. That is why the common admonition to "be calm and kind" will actually make a person feel calm and kind.

Cognitive Ease

When you are conscious and perhaps even otherwise, your brain is engaged in multiple computations which seek to answer several questions: Is anything new happening? Are things okay? Should I redirect my attention? Does the task require more effort? So on and so forth. It is like a cockpit with a set of dials that show the current values of these variables. System 1 carries out these assessments automatically and one of its functions is to determine whether System 2 has to be pressed into service.

One of the dials measures cognitive ease, and it ranges from "Easy" to "Strained." "Easy" indicates that things are okay – there is no major news or threat that calls for redirecting attention or mobilising effort. "Strained" suggests that a problem exists and there is need to mobilise System 2.

Exhibit 3.2 Causes and Consequences of Cognitive Ease



Cognitive ease is caused when something is displayed clearly or repeated, or primed. It is also induced when you are in a good mood. Conversely, cognitive strain is caused when you read instructions in a poor font, or worded in a convoluted language, or when you are in a peevish mood.

The causes and consequences of cognitive ease are displayed in Exhibit 3.2, which is drawn from Kahneman's classic work *Thinking, Fast and Slow*. It is remarkable that a single dial of cognitive ease is linked to a large network of diverse inputs and outputs.

From Exhibit 3.2 it is clear that illusions occur when judgment is based on cognitive ease. As Kahneman put it, "Anything that makes it easier for the associative machine to run smoothly will also bias beliefs. A remarkable way to make people believe in falsehood is frequent repetition, because familiarity is not easily distinguished from truth. Authoritarian institutions and marketers have always known this fact."

Writing a Persuasive Message

If you want the recipients to believe your message write legibly, use bold fonts, print in bright blue or red, use simple language, keep it brief, and try to make it memorable by using verse, if possible.

• Jumping to Conclusions

According to a theory of believing and disbelieving developed by Daniel Gilbert, System 1 is gullible and credulous, whereas System 2 is unbelieving and doubting. When System 2 is otherwise preoccupied, we tend to be very credulous. Empty persuasive messages, such as commercials, tend to influence people more, when they are tired. The confirmatory bias of System 1 induces uncritical acceptance of suggestions and exaggerates the probability of extreme and unlikely events. The operations of associative memory induce a bias for confirmation. As Kahneman put it, "Contrary to the rules of philosophers of science, who advise testing hypotheses by trying to refute them, people (and scientists, quite often) seek data that are likely to be compatible with the beliefs they currently hold."

Halo Effect If you like the policies of the prime minister, you probably like his appearance and voice as well. It is a manifestation of a psychological phenomenon called 'exaggerated emotional coherence' or 'halo effect.' You tend to like or dislike everything about a person.

• What You See Is All There Is

An essential feature of the associative machine is that it excels in constructing the best possible story based on ideas currently activated and it does not (cannot) allow for information it does not have. As Kahneman put it, "The amount and quality of the data on which the story is based are largely irrelevant. When information is scarce, which is a common occurrence, System 1 operates as a machine for jumping to conclusions." He further added, "Jumping to conclusions on the basis of limited evidence is so important to an understanding of intuitive thinking, and comes up so often in the book, that I will use a cumbersome abbreviation for it, WYSIATI, which stands for what you see is all there is." WYSIATI helps in explaining a long and diverse list of biases of judgment and choice.

• Answering an Easier Question

A remarkable facet of our mental makeup is that we are rarely confounded. True, when we are faced with a question such as $29 \times 83 = ?$, we may be stumped. Ordinarily, however, we have intuitive feelings and opinions about almost everything that we encounter. As Kahneman put it, "You like or dislike people long before you know much about them; you trust or distrust strangers without knowing why; you feel an enterprise is bound to succeed without analysing it."

Substituting Questions How do we generate intuitive opinions on complex matters? As Kahneman explained, "If a satisfactory answer to a hard question is not found quickly, System 1 will find a related question that is easier and will answer it. I call the operation of answering one question in place of another substitution."

The idea of substitution is the core of the heuristics and biases approach developed by Daniel Kahneman and Tversky. For example, if someone is asked the question, "How will the economy do six months from now?" he is likely to substitute that question by: How is the economy doing now? He will substitute the harder question with an easier question.

The Affect Heuristic The likes and dislikes of people determine their beliefs about the world. As Kahneman put it, "Your emotional attitude to such things as irradiated food, red meat, nuclear power, tattoos, or motorcycles drives your beliefs about their benefits and risks. If you dislike any of these things, you probably believe that risks are high and its benefits are negligible." Paul Slovic refers to this phenomenon as **affect heuristic**.

People judge an activity or an alternative not just on what they think about it but also on how they feel about it. As Michael Mauboussin put it, "If they like an activity, they are moved toward judging the risks as low and benefits as high and vice versa. Under this model, affect comes prior to, and directs, judgments of risk and benefit."

The affect heuristic is an example of substitution. A harder question (How do I think about it?) is substituted by an easier question (How do I feel about it?). It seems that the emotional tail wags the rational dog.

So far we described System 2 as a more or less acquiescent monitor that allowed considerable latitude to System 1 or as an active participant in deliberate memory search, complex

analysis, and choice. In the interplay between the two systems, System 2 was considered to be the ultimate arbiter. However, in the realm of attitudes, we see a new side of System 2. As Kahneman explained, "In the context of attitudes, however, System 2 is more of an apologist for the emotions of System 1 than a critic of those emotions – an endorser rather than an enforcer." It appears that the search for information and arguments is biased in favour of existing beliefs.

• The Law of Small Numbers

A telephonic survey of 250 students reveals that 62 per cent support the prime minister. If you are asked to summarise this message in a four-word sentence, you would probably say "youngsters support prime minister." This represents the crux of the story. The sample size (250) and mode of survey (telephonic poll) matter very little. Your summary would be the same if the sample size were 2000. In general, people are not adequately sensitive to sample size.

The belief that small samples closely mirror the population from which they are drawn stems from a tendency to exaggerate the consistency and coherence of what one sees. As Kahneman put it, "System 1 runs ahead of the facts in constructing a rich image on the basis of scraps of evidence. A machine for jumping to conclusions will act as if it believed in the law of small numbers."

Tversky and Kahneman wrote an article titled, "Belief in the Law of Small Numbers." They explained that, "intuitions about random sampling appear to satisfy the law of small numbers, which asserts that the law of large numbers applies to small numbers as well." Hence, they argued that researchers should regard their "statistical intuitions with proper suspicion and replace impression formation by computation whenever possible."

Most problems in decision making under uncertainty call for drawing inferences on the basis of limited data or observations. How many days or months of data do you need to infer that stock prices behave like a random walk? How long and how bright must an investor outperform the market to be ordained as a star?

We tend to draw inferences about stock price randomness or star status of an investor or almost everything by looking at limited data or evidence than is reasonable. Kahneman and Tversky have documented how easily we convince ourselves that the world is like the small sample that we observe and readily extrapolate past performance into future. People form judgments on the basis of impressions drawn from limited evidence. This "belief in small numbers" motivates many applications of behavioural finance.

You can discover such a bias in your thought process by doing a small experiment. Write down a sequence of heads and tails you expect when a fair coin is tossed 50 times. Then actually toss a fair coin 50 times and compare the results with your guesses. Most probably you will find that your guesses implied more reversals of runs of heads or tails than what you observe from the actual tosses. This is a manifestation of a well-documented phenomenon called **gambler's fallacy** which says that bad luck cancels out. Indeed, bad luck cancels out, but this may take some time. While the gambler's fallacy implies that luck will reverse itself soon, there is a converse belief that some gamblers are 'hot' on particular nights when they

seem to be on a winning streak. The **hot hand** notion implies that they will win against the odds.

If such biases were confined only to desperate gamblers affected by greed and delusion, they might not be a cause of much concern. But Kahneman and Tversky found similar biases present amongst participants at academic conferences. So they wrote "acquaintance with formal logic and probability theory does not extinguish erroneous intuitions."

Cause and Chance

We humans are wired to make links between causes and effects. Lewis Wolpert, a renowned biologist, argues that the concept of cause and effect has been a fundamental driver of human evolution. Evolutionarily, it is advantageous to understand the cause–effect relationship. According to Wolpert, the concept of cause-effect relationship, along with language and social interaction led to an increase in size and complexity of the human brain.

In his Faraday lecture, Wolpert expressed eloquently the human desire to close the cause-and-effect loop:

> "(Our ancestors) must have felt uncomfortable about their inability to control or understand such (causeless) events, as indeed many do today. As a consequence, they began to construct, as it were, false knowledge. I argue that the primary aim of human judgment is not *accuracy*, but the avoidance of paralyzing uncertainty. We've a fundamental need to tell ourselves stories that make sense of our lives. We hate uncertainty and find it intolerable."

We have a predilection for causal thinking and this makes us prone to commit serious mistakes in assessing the randomness of truly random events. As an example, suppose you toss a fair coin six times and note down whether it shows head up or tail up. The sequence of heads and tails is clearly random because the events are independent of each other. The number of heads and tails in the last few tosses has no effect whatsoever on what shows up in the next toss. Now consider three possible sequences.

T	T	T	H	H	H
H	H	H	H	H	H
T	H	T	T	H	T

Are the sequences equally probable? The typical intuitive answer is: No. But this answer is wrong. Since the events are independent and both the outcomes H and T are equally likely, any possible sequence of Hs and Ts is as likely as any other. Most people, however, judge THTTHT much more likely than the other two sequences.

Human beings are pattern seekers. We believe that regularities (such as a sequence of six heads) appear not by chance but as a result of causality or of someone's intent. As Kahneman put it, "Random processes produce many sequences that convince people that the process is not random at all. Assuming causality perhaps had evolutionary advantage. It is part of the general vigilance that we have inherited from ancestors."

Polarised Visions of Man

There are two polarised visions of man. One of them is the Utopian Vision associated with Rousseau, Godwin, Thomas Paine, and normative economists. They believe with reason and rationality we can overcome cultural impediments and become a better human race. We can control our nature and transform it in order to achieve, inter alia, happiness and rationality.

The other view is the Tragic Vision of man which holds that there are inherent limitations and flaws in the way we think and act. We have to accept this as a fact for any individual or collective action. According to Nassim Taleb, the proponents of this view include Karl Popper (distrustful of anyone who is confident that he knows anything with certainty), Frederick Hayek and Milton Friedman (suspicion of government), Adam Smith (intention of man), Herbert Simon (bounded rationality), Amos Tversky and Daniel Kahneman (heuristics and biases), the speculator George Soros. Nassim Taleb, author of the insightful book *Fooled by Randomness*, is himself a champion of this view. As he said, "We are faulty and there is no need to bother trying to correct our flaws. We are so defective and so mismatched to our environment that we can just work around these flaws." He added, "As an empiricist, I despise the moralists. I still wonder why they blindly believe in ineffectual methods. Delivering advice assumes that our cognitive apparatus rather than our emotional machinery exerts some meaningful control over our actions. We will see how modern behavioural science shows this to be completely untrue."

• Magical Thinking

Magical thinking may be defined as believing that one event happens as a result of another without any plausible link of causation. Put differently, magical thinking attributes causal relationships between actions and events which seemingly cannot be justified by reason and observation. For example: "A black cat has crossed my path, so something bad will happen" or "I got up on the left side of the bad, so it will rain today." In religion, folk religion, and superstitious beliefs, it is often believed that a certain ritual, prayer, sacrifice, or observance of a taboo will lead to an expected benefit or recompense. Magical thinking may induce people to believe that their thoughts per se can bring about effects in the world.

There is a variant of magical thinking called "quasi-magical thinking." People under the spell of quasi-magical thinking, act as if they erroneously believe that their action influences the outcome, even though they don't really have that belief.

• Wishful Thinking

Wishful thinking means forming beliefs and deciding on the basis of what might be pleasing to imagine instead of relying on evidence, rationality, or reality. It is a way of resolving conflicts between beliefs and desires. Here is a conspicuous example of wishful thinking: Renowned economist Irving Fisher said that "stock prices have reached what looks like a permanently high plateau," just a few weeks before the stock market crash of 1929, which was followed by the Great Depression. Psychological studies have consistently shown that, in general, subjects

believe that positive outcomes are more likely than negative outcomes. Some psychologists believe that positive thinking has a positive influence on behaviour and hence, brings about better results. This is referred to as **pymaglion effect**, the phenomenon whereby higher expectations induce better performance. For example, if, the boss praises his subordinate and expects him to perform better, the subordinate is likely to perform better. A corollary of the Pygmalion effect is the **golem effect**, a phenomenon whereby lower expectations lead to a decrease in performance. The Pygmalion effect and golem effect are forms of self-fulfilling prophecy.

• Bounded Rationality

Perhaps the simplest deviation from the benchmark of full rationality is bounded rationality, introduced by Herbert Simon in 1955, who later got a Nobel prize in economics. Bounded rationality assumes that individuals do not make fully optimal decisions because of cognitive limitations or information-gathering costs.

To cope with complexity, boundedly rational individuals use rules of thumb or heuristics that ensure an acceptable level of performance and, hopefully, do not cause severe bias.

The theory of bounded rationality is a theory of economic decisions making that Simon preferred to call "satisficing," a combination of the words "satisfy" and "suffice." Contrary to what classical economists believed, Simon argued that people do not seek to maximise their benefit from a particular course of action. Due to informational and cognitive limitations, people seek something that is "good enough" or satisfactory. For example, when a person is shopping he will look through things sequentially till he comes across an item that meets his aspiration level and then goes for it.

Simon applied the idea of 'satisficing' to organisations as well as to individuals. Managers behave like shoppers. As he wrote, "Whereas economic man maximizes, selects the best alternative from among all those available to him, his cousin, administrative man, satisfices, looks for a course of action that is satisfactory or good enough." He continued, "Because he treats the world as rather empty and ignores the interrelatedness of all things (so stupefying to thought and action), administrative man can make decisions with relatively simple rules of thumb that do not make impossible demands upon his capacity for thought."

3.2 ✦ FAMILIARITY AND RELATED HEURISTICS

People are comfortable with things that are familiar to them. The human brain often uses the familiarity shortcut in making choices.

• Familiarity

Chip Heath and Amos Tversky conducted an experiment in two stages. In the first stage, the participants were asked a series of general knowledge multiple choice questions with four options. Each multiple choice question had an associated question relating to the level of confidence, where the options ranged from 25% to 100%. With four possible responses, a confidence level of 25% implied pure guessing. Suppose that a particular participant had a

confidence level of 70% (averaged over all questions). In the second stage, the participant was offered a choice of two gambles: one where a payoff was randomly obtained with a 70% probability, and a second where a payoff was obtained if one of his randomly selected answers was correct.

Exhibit 3.3 Competence Bet versus Random Bet

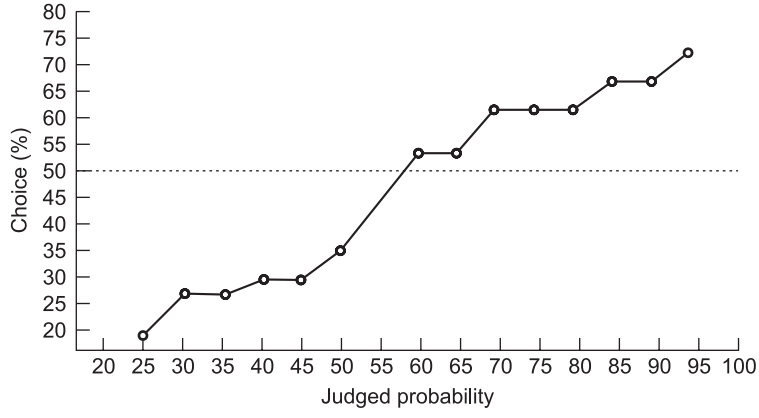


Exhibit 3.3 shows the results of this experiment. When people feel they have competence on the questions, they tend to choose a gamble based on their competence rather than a random lottery. This is clear from the positive relationship between the self-judged probability of being right on the questions and the percentage choosing the competence bet. Note that irrespective of the self-perceived level of knowledge, the probability of success on the bet was viewed by participants as identical for the two alternatives (as per their own statements). For example, if a participant had a confidence level of 40 per cent with his answers being correct, the random lottery would also be successful with a 40 per cent probability. Alternatively, if another participant was 60 per cent comfortable in his answers being correct, then the random lottery would be successful with a 60 per cent probability. This implied that people have a preference for the familiar.

• Ambiguity Aversion

Looking again at Exhibit 3.3, we find that when the judged probability was high, the tendency was to choose the competence bet; when the judged probability was low the tendency was to choose the random bet. While familiarity seems to explain the former, **ambiguity aversion** seems to explain the latter.

In a classic study, Daniel Ellsberg asked participants to bet whether a red (or black) ball could be drawn from two different urns. The first urn was known to contain 50 red balls and 50 black balls; the second urn contained 100 red and black balls in unknown proportions. The participants preferred to draw from the first urn, rather than the second urn. While the unconditional probability of success is identical in both the cases, **ambiguity aversion** drives

people to choose risk (urn 1) to uncertainty (urn 2). Remember risk exists when the probability distribution is known and uncertainty exists when the probability distribution is not known.

• Diversification Heuristic

According to the diversification heuristic, when choices are not mutually exclusive, people like to try a little bit of everything. For example, buffet diners try to sample most, if not all, dishes. Concentrating on just one or two items entails the risk of not liking one's selection and/or missing out a good thing. Shoppers too are likely to behave like this. Itamar Simonson reported that shoppers tend to choose a variety of items (such as different flavours of yogurt) when they plan to make multiple purchases for future consumption.

Simonson argues that such behaviour is caused by certain factors. First, most people have a hardwired preference for variety and novelty. Such preference is more pronounced when multiple purchases are made. Second, future preferences are characterised by some uncertainty. "I may prefer mango yogurt now, but I don't know what I may like after a fortnight?" Diversification reduces risk. Third, diversification saves time and diminishes conflict.

• Functional Fixation

The market often naively extrapolates current earnings, ignoring a great deal of information in the annual report that suggests that the future earnings may be different from current earnings. This tendency to latch on to a single object in a habitual way is referred to by behaviouralists as **functional fixedness** (or **functional fixation**). Functional fixedness leads to a very simplistic approach to a problem. It is seen in analysts who apply a standard multiple to earnings, regardless of the quality of those earnings. Perhaps this is a manifestation of the limited information processing ability of humans. So, when complexity daunts us, we latch on to a summary number like bottom-line earnings for convenience.

• Status Quo Bias and Endowment Effect

Status quo bias implies that people are comfortable with the familiar and would like to keep things the way they have been. The fear of regret that may follow, if the status quo is altered makes people resistant to change. The **endowment effect** says that people tend to place greater value on what belongs to them relative to the value they would place on the same thing, if it belonged to someone else. A concomitant tendency is to put too much emphasis on out-of-pocket expenses and too little on opportunity costs.

3.3 ✦ REPRESENTATIVENESS AND RELATED BIASES

Many financial decisions call for making probability assessment. What is the probability that a particular stock will appreciate? What is the likelihood that the bank rate will fall by 100 basis points? What is the probability that a proposed overseas acquisition will succeed? So on and so forth.

Representativeness refers to the tendency to form judgments based on stereotypes. For example, you may form an opinion about how a student would perform academically in college on the basis of how he has performed academically in school. While representativeness may be a good rule of thumb, it can also lead people astray. For example:

- Investors may be too quick to detect patterns in data that are in fact random.
- Investors may believe that a healthy growth of earnings in the past may be representative of high growth rate in future. They may not realise that there is a lot of randomness in earnings growth rates.
- Investors may be drawn to mutual funds with a good track record because such funds are believed to be representative of well-performing funds. They may forget that even unskilled managers can earn high returns by chance.
- Investors may become overly optimistic about past winners and overly pessimistic about past losers.
- Investors generally assume that good companies are good stocks, although the opposite holds true most of the time.

• Innumeracy

People have difficulty with numbers. In his book *Innumeracy: Mathematical Illiteracy and Its Consequences*, John Paulos noted that "some of the blocks to dealing comfortably with numbers and probabilities are due to quite natural psychological responses to uncertainty, to coincidence, or to how a problem is framed. Others can be attributed to anxiety, or to romantic misconceptions about the nature and importance of mathematics." Trouble with numbers is reflected in the following.

- People confuse between "nominal" changes (greater or lesser numbers of actual rupees) and "real" changes (greater or lesser purchasing power). Economists call this **money illusion**.
- People have difficulty in figuring out the "true" probabilities. Put differently, the odds are that they don't know what the odds are. To illustrate this point consider an example. In a lottery in which six numbers are selected out of fifty, what are the chances that the six numbers will be 1, 2, 3, 4, 5, and 6? Most people think that such an outcome is virtually impossible. The reality, of course, is that the probability of selecting 1 through 6 is the same as the probability of selecting *any* six numbers. As Martin Gardner says: "In no other branch of Mathematics is it easy for experts to blunder as in probability."
- People tend to pay more attention to big numbers and give less weight to small figures.
- People estimate the likelihood of an event on the basis of how vivid the past examples are and not on the basis of how frequently the event has actually occurred.
- People tend to ignore the 'base rate' which represents the normal experience and go more by the 'case' rate, which reflects the most recent experience.

• Probability Matching

Suppose *A* invites *B* to play a game in which *A* tosses a coin and asks *B* to guess the outcome (Head or Tails). If *B* guesses correctly, he gets ₹10, but if he guesses wrongly he loses ₹10. This

game is to be played repetitively for many tosses. Since the coin is chosen by *A*, he can choose a fair coin in which the Probability (Head) = Probability (Tail) = 0.5, or a biased coin in which the Probability (Head) > Probability (Tail) or the other way.

Let us assume that, unknown to *B*, *A* chooses a biased coin in which the Probability (Head) is 0.75 and the Probability (Tail) is 0.25. Since *B* is unaware of this, initially he is likely to assume that it is a fair coin and guess Head or Tail with equal probability in a somewhat random manner. After a while *B* realises that it is a biased coin with the Probability (Head) being far greater than the Probability (Tail).

What should *B* do when he realises that the coin is highly biased in favour of Head? If he is a rational person, he should then guess Head for every coin toss. This strategy would maximise his profit.

Do people behave in this manner? It turns out that when this game is played with subjects in laboratory experiments, they don't guess Head all the time. Even if they know that Probability (Head) = 0.75 and Probability (Tail) = 0.25, they randomise their guesses. And they seem to randomise with approximately the same relative frequency as the underlying probability distribution. Their actual behaviour (guesses) would be something like this: HHHTHHHHTHHHTTHHHHT, while the profit maximising strategy is simply: HHHHHHHHHHHHHHHHHHH.

What is even more puzzling is that if in the middle of the experiment the coin is replaced with another coin which has Probability (Head) = 0.3 and Probability (Tail) = 0.7, the subject, no sooner he learns about it, will change his behaviour and match that frequency as well. Such behaviour is called **probability matching** and interestingly, it seems to be common to ants, fish, pigeons, primates, and so on.

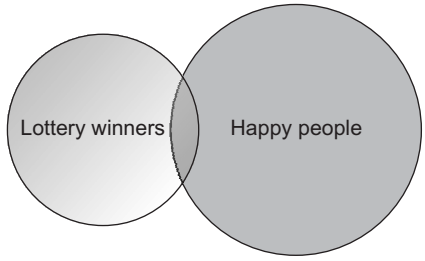
• Conjunction Fallacy

An example of probability-related difficulty is that people often have a poor understanding of the difference between simple probabilities (probability of *A*) and joint probabilities (probability of both *A* and *B*). For example, people often think that the probability that they will win a lottery and be happy is higher than the probability that they will just win a lottery.

It can be easily shown that such a view is erroneous. Suppose that A denotes winning the lottery and *B* denotes being happy, the corresponding probabilities being Probability (*A*) and Probability (*B*). Exhibit 3.4 uses the Venn diagram to demonstrate that the probability a person being both a lottery winner and a happy person at the same time, that is, Probability ($A \cap B$), must be less than Probability (*A*), unless all lottery winners are happy. People who make this mistake are prone to the **conjunction fallacy**.

B can be a class and *A* can be a subset of that class. Or *B* can be a cause and *A* can be a possible consequence of *B*. In the case of the lottery, the image of smiling winners and disappointed losers (the consequence) appears more representative of the class of lottery players (winners and losers) than someone who just wins. So it seems that the probability of being a happy winner is greater than the probability of being a winner.

Exhibit 3.4 Venn Diagram



The conjunction fallacy is a variant of representativeness. Due to the representativeness heuristic, probabilities are evaluated by the degree to which *B* is representative of *A*, that is by the degree to which *B* is similar to *A*. If *B* is highly similar to *A*, the probability that *B* originates from *A* is judged to high. By the same token, if *B* is not similar to *A*, the probability that *B* originates from *A* is judged to be very low.

Uncritical Substitution of Plausibility for Probability

Kahneman describes two scenarios:

- A massive flood somewhere in North America next year that drowns more than 1,000 people.
- An earthquake in California sometime next year, leading to a flood that drowns more than 1,000 people.

Although its probability is smaller, the California earthquake scenario appears more plausible than the North American scenario. These scenarios were presented to different groups, who were asked to evaluate their probability. Contrary to logic, people considered the probability of the California earthquake scenario (the richer and more detailed scenario) to be higher. As Kahneman says, "This is a trap for forecasters and their clients: adding detail to scenarios makes them more persuasive, but less likely to come true."

Base Rate Neglect

Another variant of representativeness is **base rate neglect**. Amos Tversky and Daniel Kahneman conducted an experiment in which they showed the subjects personality sketches, allegedly from a group of professionals comprising of engineers and lawyers. In one treatment, subjects were told that the group comprised of 70% engineers and 30% lawyers; in another treatment, subjects were told that the group comprised of 30% engineers and 70% lawyers. After the subjects were given information about the professional composition of the group, the following sketch was presented.

Dick is a 30-year old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well liked by his colleagues.

The sketch was designed to be neutral so that the subjects were not pushed in one direction or the other. When subjects were asked about Dick's profession, about 50% said that Dick was a lawyer and about 50% said that Dick was an engineer. The surprising thing was that this was true in both the treatments. This means that the subjects ignored the base rate (70% engineers in one treatment and 70% lawyers in another treatment). Put differently, the subjects ignored prior probabilities.

The lawyer/engineer example is an extreme case of base rate neglect. More commonly, however, the base rate (prior information) is considered, but not sufficiently. At this juncture, it is helpful to look at what probability theory tells us about how prior and sample information should be optimally combined.

• Bayesian Updating

Named after Thomas Bayes, Bayes' theorem addresses the question: How should we modify our belief in the wake of additional information?

The theorem can be stated as follows. Starting with a provisional hypothesis about the world, we assign it an initial probability referred to as prior probability or simply the prior. After gathering some additional evidence we use Bayes' theorem to recalculate the probability of the hypothesis that takes into account the new evidence. The revised probability is referred to as the posterior probability or simply the posterior. The Bayes' theorem can be used to optimally update probabilities based on the arrival of new information.

As per the Bayes' theorem

$$P(B/A) = P(A/B)^* [P(B) / P(A)] \quad (3.1)^2$$

Thus, according to the Bayes' theorem, the probability of event B, conditional on event A, is equal to the probability of event A, conditional on event B, multiplied by the ratio of the simple probabilities of event B to event A.

To illustrate, suppose that the simple probabilities of a rainy day (Rain) and of a dry day (Dry), based on historical information for this time of year, are as follows:

$$P(\text{Rain}) = 0.3 \text{ and } P(\text{Dry}) = 0.7$$

You can consult a barometer that predicts the weather fairly well, but not completely accurately. The reliability of the barometer is as follows:

$$P(\text{Rain Predicted}/\text{Rain}) = 0.85$$
$$P(\text{Rain Predicted}/\text{Dry}) = 0.05$$

---

[2] The logic behind Bayes' theorem is as follows:

$$P(A \text{ and } B) = P(B\&A) \quad (1)$$
$$P(A) \times P(B/A) = P(B) \times P(A/B) \quad (2)$$

Hence, $$P(B/A) = P(A/B) \times [P(B)/P(A)] \quad (3)$$

(2) also leads to

$$P(A/B) = P(B/A) \times [P(A)/P(B)] \quad (4)$$

Put differently, conditional on the fact that it did rain, the barometer predicted the rain 85% of the time; and conditional on the fact that it turned out to be dry, the barometer predicted the rain 5% of the time.

Without looking at the barometer, you know that the best prediction of tomorrow's weather is a 30% chance of rain. How should you adjust this base rate if you know that the barometer (the sample) is predicting rain? Since the barometer is predicting rain, there is increased probability of rain. More specifically, as per Bayes' theorem:

$$P(\text{Rain}/\text{Rain Predicted}) = P(\text{Rain Predicted}/\text{Rain}) * [P(\text{Rain})/P(\text{Rain Predicted})]$$

$$= 0.85 * [0.3/P(\text{Rain Predicted})]$$

What is the value of *P* (Rain Predicted)? Or put differently, what is the probability that the barometer predicts rain?

$$P(\text{Rain Predicted}) = P(\text{Rain}) * P(\text{Rain Predicted}/\text{Rain}) + P(\text{Dry}) * P(\text{Rain Predicted}/\text{Dry})$$

$$= 0.3 * 0.85 + 0.7 * 0.05 = 0.29$$

Given this value of *P*(Rain Predicted), we get:

$$P\ (\text{Rain}/\text{Rain Predicted}) = 0.85 * [0.3/0.29] = 0.88$$

This means that if the barometer is predicting rain, the probability of rain, given how accurate the barometer is, 0.88. Put differently, while the prior probability of rain is 0.3, the posterior probability of rain (given the sample information in the form of barometer reading) is 0.88.

Application of Bayes' theorem to real life, assigning prior probabilities and evaluating evidence, is far more complicated than the above example. "Our intuitions are embedded in countless narratives and arguments, and so new evidence can be filtered and factored into the Bayes' probability revision machine in many idiosyncratic and incommensurable ways." People wedded to their priors will try to rescue them from the evidence by using all sorts of ingenious arguments.

Bayes' theorem has made remarkable contributions to advancement of science. It has been used to search for nuclear weapons, devise actuarial tables, determine the false positive rate of mammograms, so on and so forth.

• Availability, Recency, and Salience Bias

Sample data are often assigned undue importance compared to population parameters. This tendency is accentuated when the data are easily available. More so, when the event has occurred recently and is salient.

People tend to judge the frequency of something by the ease with which instances can be recalled. Like other heuristics of judgment, the **availability heuristic** substitutes the harder question (How likely an event is?) with the easier question (Have I seen something like this?).

The availability heuristic says that events that can be easily recalled are deemed to occur with higher probability. While ease of recall should depend mainly on frequency, it is influenced by other factors as well. Suppose you ask a group of people whether more words begin with a *k* or have a *k* in the third position. As it is easier to think of words which begin with *k* than words which have a *k* in the third position, people typically say that more words begin with

k. The reality, however, is that more words have a *k* in the third position relative to those with a *k* in the beginning.

Availability is abetted by two other factors: recency and salience. If something has occurred recently it is likely to be recalled easily (This is referred to as **recency bias**). Likewise, salience contributes to availability. An event which is reported widely in media is deemed to occur with a higher probability (This is referred to as **salience bias)**.

3.4 ✦ ANCHORING

While making a quantitative judgment, people are subconsciously anchored to some arbitrary stimulus. Kahneman and Tversky carried out a famous experiment called the "Wheel of Fortune" experiment in 1974 to demonstrate the phenomenon of anchoring. Participants in this experiment were shown the number generated by the Wheel of Fortune and then asked what percentage of African nations were members of the U.N. The answers given by them were influenced by the random number thrown up by the Wheel of Fortune, although it had no relevance whatsoever to the question asked.

When people are asked to estimate something, they usually start with an initial value and adjust it to generate the final estimate. The adjustment, however, is often inadequate. To illustrate this, consider the following product of eight numbers:

$$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$$

When asked to estimate the final answer to the above product, most people unconsciously multiply the first few numbers in the sequence and then give the answer. In an experimental setting when people were asked this question, the median answer was 512, as against the true answer of 40,320.

The answer changed, however, when the sequence was transposed as follows:

$$8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$$

The median answer in this case was 2,250. While it was an improvement over the earlier estimate it too resulted in a highly insufficient adjustment.

It is strange that people can anchor on completely irrelevant numbers that appear in the problem frame.

• What Explains Anchoring

There are two plausible explanations for anchoring. The first is based on uncertainty relating to the true value. When there is uncertainty, the decision-maker adjusts his answer away from the anchoring value until he enters a plausible range. When the uncertainty is greater, the plausible range is wider and hence, the adjustment will be insufficient. This explanation works best for a relevant anchor.

The second explanation is based on cognitive laziness. Since it requires effort to move away from the anchor and people are cognitively lazy, they tend to stop too early. This explanation works best for irrelevant anchors.

• Anchoring vs. Representativeness

Underweighting of base rate (a variant of representativeness) and anchoring can at times appear conflicting. While the former says that people are overly influenced by sample information (or case rate), the latter says that people tend to pay insufficient attention to sample data.

To reconcile this conflict, let us consider a hypothetical situation that relates to the idea that people are "coarsely calibrated," which means that people see things as black or white, and not as shades of gray. Suppose you are planning to take your family to a park[3]. You listen to the meteorologist on the radio who forecasts a sunny day. Indeed, as you start off to the park, the day is sunny. After a while, some clouds gather. Anchored as you are to your prior view, you ignore the clouds, viewing them as a passing phenomenon. More clouds gather but you console yourself by saying to yourself, "eventually it will turn out to be a sunny day." The sky, however, grows even darker. Because of coarse calibration, you abruptly change your belief and say, "it is now surely going to rain, so let us head back home."

The reality, however, is more complex. At the beginning of the day, the meteorologist had forecasted that it was likely to be a sunny day with some probability of rain. But being coarsely calibrated, you focused on "sunny day" and ignored the possibility of rain. You clung on to this view, despite mounting evidence of potential rain. When the sky turned too dark to ignore, you coarsely transitioned to a view that the probability of rain was 100%, not realising that the dark clouds might blow away. Perhaps the true probability of rain had gone up to 80%. Instead of heading back to home, perhaps you should have remained near the car, ready for a sudden downpour, while resuming you picnic.

3.5 ✦ IRRATIONALITY AND ADAPTATION

Our discussion so far has largely been in the "heuristics and biases" tradition whose thrust is to show how heuristics can lead people astray and where probability misjudgments occur. Some argue that heuristics per se are not flawed, but this view of heuristics.

• Fast and Frugal Heuristics

Gerd Gigerenzer and others look at heuristics more favourably. Heuristics, they argue, help in minimising the time, knowledge, and computation required to make adaptive choices in a rapidly changing real world. They have coined the term fast and frugal heuristics. Their approach is akin to the bounded rationality approach developed by Herbert Simon, a Nobel laureate in economics. Simon posited that it is not possible for human beings to gather information and perform complex computations required for optimisation, as is assumed in economic models. Instead, human beings "satisfice," which means that they do the best, given informational and computational constraints. It is as if our minds have evolved and possess a number of tricks (or heuristics) that enable us to make reasonable decisions.

[3] This example is drawn from Lucy. F. Ackert and Richard Deaves, *Understanding Behavioral Finance*, Cengage Learnings, 2011.

• Response

In their book *Heuristics and Biases: The Psychology of Intuitive Judgment*, Thomas Gilovich and Dale Griffin have provided a historical perspective on the heuristics and biases programme, in response to its critics. They have argued that people sometimes misunderstand the research agenda by equating heuristics with irrationality. However, heuristics are not inherently irrational. Often, heuristics rely on sophisticated underlying processes. The purpose of the heuristics and biases programme is to show when heuristics can lead to biases and what can be done for "debiasing." Also, it would be erroneous to argue that since heuristics have been shaped by evolutionary forces, they are necessarily optimal.

• Prospect Theory, Heuristics and Biases, and Emotions

For pedagogic convenience, we may distinguish between prospect theory, heuristics and biases, and emotions. However, many phenomena that we observe are a manifestation of two or more of these. For example, the status quo bias may be viewed as a manifestation of prospect theory or a heuristic with a potential bias. Likewise, ambiguity aversion has an emotional basis. Indeed, this is true of all heuristics to the extent that they stem from comfort-seeking. Similarly, ambiguity aversion may be viewed as a heuristic with potential for bias or as an expression of an emotion. One can argue that all the heuristics discussed in this chapter are linked in some way to a desire to seek comfort.

3.6 ✦ HYPERBOLIC DISCOUNTING

Traditional finance assumes exponential discounting. Exponential discounting is a time-consistent model of discounting, implying that a constant discount rate is assumed across time. This means that valuation falls by a constant factor per unit of delay, irrespective of the total length of the delay.

For an individual with an exponential discount function, the subjective present value of a rupee received in one year is ∂; of a rupee received in two years is ∂^2; of a rupee received in three years is ∂^3; and so on. This means that the ratio of the subjective value of a rupee at some point in time (say t) to its value one period later in the future is as follows:

$$\partial = \frac{\partial^t}{\partial^{t+1}} = 1 + \infty, \quad t \geq 0 \tag{3.2}$$

It must be emphasised that this ratio is the same across time, implying that preferences are dynamically consistent.

A number of studies, however, have demonstrated that the assumption of constant discount rate is systematically violated. These studies show that people don't use a constant discount rate across time. Rather they do **hyperbolic discounting**, in which valuation falls very rapidly for small delay periods, but then falls slowly for longer delay periods.

To understand hyperbolic discounting consider the following scenario. Suppose a person is given a choice between two payments a smaller payment at time t and a larger payment at time $t + 1$. When t is far off, the person typically prefers the larger payment. But as t nears zero

(now), the person is likely to reverse the preference. As a concrete example, a person will choose ₹1150 in two years instead of ₹1000 a year from now, but the same person will choose ₹1000 now instead of ₹1150 one year hence. This means that preferences are not consistent over time.

Individuals who display such preferences are described as "present-biased" as they lack self-control.

It may be noted that Adam Smith, father of modern economics, had expounded on self-control in his earlier book *The Theory of Moral Sentiments* published in 1759. He portrayed it as a struggle between our "passions" and what he called our "impartial spectator." As he put it, "the pleasure which we are to enjoy ten years hence, interests us so little in comparison with that we may enjoy to-day." In 1871, William Jevons, another economics stalwart, modified Smith's observation about myopia, when he observed that the preference for present consumption over future consumption declines over time. It is a failure of willpower, or, as Arthur Pigou, an eminent economist, famously said that it could be a failure of imagination: "Our telescopic faculty is defective and ..we, therefore, see future failures, as it were, on a diminished scale."

Thus, individuals who use hyperbolic discounting make choices that are inconsistent over time. They make choices today that their future self would not make, despite using the same reasoning. Mathematically, the hyperbolic discounting function behaves as follows:

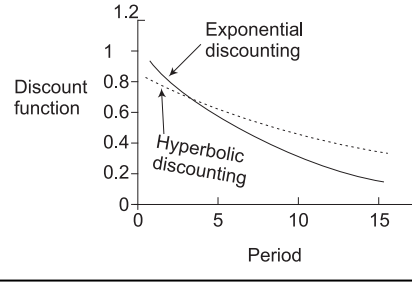
$$\beta, \beta\partial_H, \beta\partial^2{}_H, \beta\partial^2{}_H, \beta\partial^3{}_H \ldots$$

Essentially, the discount function shows a steep decline initially, but then looks very similar to an exponential function.

Exhibit 3.5 displays illustrative exponential and hyperbolic discount functions. For the exponential function, we have set $\partial = 0.909$ and for the hyperbolic discount function, we have set $\beta = 0.80$ and $\partial_H = 0.926$. While hyperbolic discounters display standard preferences when they compare moneys at two different *future* points in time, they seem to have a problem when one of the sums to be compared is immediate. This is a manifestation of the self-control problem.

In the context of savings, people want to start a savings programme next year, not now. A person who likes the idea of saving a rupee a year from now but is not keen to do it now, has a hyperbolic discounting function.

Exhibit 3.5 Hyperbolic vs. Exponential Discount Functions



SUMMARY

- The neoclassical models in economics and finance assume that the typical decision-maker has all the information and unlimited cerebral capacity. He considers all relevant information and comes up with an optimal choice under the circumstances using a process called constrained optimisation.
- In the real world, people make decisions with inadequate and imperfect information and have limited cognitive capacity. They rely on heuristics which can lead to biases.
- For the past several decades, psychologists have studied intensively how the human mind works. They believe that there are two systems in the mind. Psychologists Keith Stanovich and Richard West refer to them as System 1 and System 2. System 1 operates automatically and rapidly. It requires little or no effort and is not amenable to voluntary control. System 2 is effortful, deliberate, and slow.
- When we think of ourselves, we identify ourselves with System 2, and think that we form beliefs and make choices in a conscious, deliberate manner. But in reality System 1, where impressions and feelings originate effortlessly, provides the main inputs for the explicit and deliberate choices of System 2.
- System 1 generates impressions, intuitions, and impulses that serve as suggestions for System 2. If approved by System 2, impressions and intuitions convert into beliefs and impulses that translate into voluntary action. Most of the time, this works well: You believe your impressions and act on your desires.
- Normally, the division of labour between the two systems is highly efficient, as it minimises effort and optimises performance.
- Because System 1 operates automatically and cannot be turned off at will, errors of intuitive thought are often difficult to prevent. Biases cannot always be avoided, because System 2 may have no clue to the error.
- The best we can do is to improve our ability to recognise situations in which such mistakes are likely and try deliberately to avoid such mistakes where the stakes are high. It seems easier to recognise other people's mistakes than our own.
- It is clear that illusions occur when the judgment is based on cognitive ease. As Daniel Kahneman put it, "Anything that makes it easier for the associative machine to run smoothly will also bias beliefs."
- According to a theory of believing and disbelieving developed by Daniel Gilbert, System 1 is gullible and credulous, whereas System 2 is unbelieving and doubting. When System 2 is otherwise preoccupied, we tend to be very credulous.
- The confirmatory bias of System 1 induces uncritical acceptance of suggestions and exaggerates the probability of extreme and unlikely events.

- If you like the policies of the prime minister, you probably like his appearance and voice as well. It is a manifestation of a psychological phenomenon, called 'exaggerated emotional coherence' or 'halo effect.'
- People jump to conclusions on the basis of limited evidence. Kahneman uses a cumbersome abbreviation for it, **WYSIATI,** which stands for what you see is all there is. WYSIATI helps in explaining a long and diverse list of biases of judgment and choice.
- How do we generate intuitive opinions on complex matters? As Kahneman explains, "If a satisfactory answer to a hard question is not found quickly, System 1 will find a related question that is easier and will answer it. I call the operation of answering one question in place of another substitution."
- The **idea of substitution** is the core of the heuristics and biases approach developed by Kahneman and Tversky.
- The likes and dislikes of people determine their beliefs about the world. Paul Slovic refers to this phenomenon as **affect heuristic**.
- It appears that the search for information and arguments is biased in favour of existing beliefs.
- The belief that small samples closely mirror the population from which they are drawn stems from a tendency to exaggerate the consistency and coherence of what one sees.
- We humans are wired to make links between causes and effects. Lewis Wolpert, a renowned biologist, argues that the concept of cause and effect has been a fundamental driver of human evolution. Evolutionarily it is advantageous to understand the cause-effect relationship.
- **Magical thinking** attributes causal relationship between actions and events which seemingly cannot be justified by reason and observation.
- **Wishful thinking** means forming beliefs and deciding on the basis of what might be pleasing to imagine instead of relying on evidence, rationality, or reality.
- We have a predilection for causal thinking and this makes us prone to commit serious mistakes in assessing the randomness of truly random events.
- People are comfortable with things that are familiar to them. The human brain often uses the familiarity shortcut in making choices.
- People have an aversion to ambiguity.
- According to the **diversification heuristic**, when choices are not mutually exclusive, people like to try a little bit of everything.
- This tendency to latch on to a single object in a habitual way is referred to by behaviouralists as **functional fixedness** (sometimes called functional fixation).

- **Status quo bias** implies that people are comfortable with the familiar and would like to keep things the way they have been.
- The **endowment effect** says that people tend to place greater value on what belongs to them relative to the value they would place on the same thing if it belonged to someone else.
- **Representativeness** refers to the tendency to form judgments based on stereotypes.
- People have difficulty with numbers. In his book *Innumeracy: Mathematical Illiteracy and Its Consequences*, John Paulos noted that "some of the blocks to dealing comfortably with numbers and probabilities are due to quite natural psychological responses to uncertainty, to coincidence, or to how a problem is framed. Others can be attributed to anxiety, or to romantic misconceptions about the nature and importance of mathematics".
- An example of probability-related difficulty is that people often have a poor understanding of the difference between simple probabilities (probability of A) and joint probabilities (probability of both A and B).
- Another variant of representativeness is **base rate neglect.**
- As per the Bayes' theorem:

$$P(B/A) = P(A/B)^* [P(B)/P(A)]$$

  Thus, according to the Bayes' theorem, the probability of event B, conditional on event A, is equal to the probability of event A, conditional on event B, multiplied by the ratio of the simple probabilities of event B to event A.
- People tend to judge the frequency of something by the ease with which instances can be recalled. Like other heuristics of judgment, the **availability heuristic** substitutes the harder question (How likely an event is?) with the easier question (Have I seen something like this?)
- While making a quantitative judgment, people are subconsciously anchored to some arbitrary stimulus.
- Gerd Gigerenzer and others look at heuristics more favourably. Heuristics, they argue, help in minimising the time, knowledge, and computation required to make adaptive choices in a rapidly changing real world. They have coined the term **fast and frugal heuristics**. Their approach is akin to the bounded rationality approach developed by Herbert Simon, a Nobel laureate in economics.
- Traditional finance assumes **exponential discounting**. Exponential discounting is a time-consistent model of discounting, implying that a constant discount rate is assumed across time. This means that valuation falls by a constant factor per unit of delay, irrespective of the total length of the delay. Under **hyperbolic discounting**, valuation falls very rapidly for small delay periods, but then falls slowly for longer delay periods.

SOLVED PROBLEMS

1. On a sunny day you go to a horse race between only two horses—Hero and Chetak—and are in the process of deciding on which to bet. You understand that of the previous 20 occasions of race between only these two horses, Chetak had won 8 times and Hero 12 times. You further understand that of the 8 wins of Chetak 6 were on sunny days and it was a sunny day only thrice on any of the days he lost. Determine the probability that Chetak wins on a sunny day.

   Solution

   Probability of it being a sunny day when Chetak wins = 6/8

   Probability of Chetak winning in the absence of any information on the weather = 8/20

   Probability of it being a sunny day on a race day = (6 + 3)/20

   Probability of Chetak winning on a sunny day = $6/8 \times [(8/20)/(9/20)] = 0.67$

2. Jasleen follows exponential discounting. Her discount function which represents her preference for money at various points of time is as follows:

   $$\partial(t) = 1/(1.06)^t \text{ for } t = 0,1,2\ldots\ldots$$

   Sukhbir, on the other hand, follows hyperbolic discounting. His discount function is as follows:

   $$\partial(t) = 1 \text{ for } t = 0$$
   $$= 0.90/(1.05)^{t-1} \text{ for } t = 1,2\ldots.$$

   a. What would Jasleen/Sukhbir prefer: ₹1.00 today or ₹1.14 next year (i.e. at the end of the current year)? Why?

   b. What would Jasleen/Sukhbir prefer: ₹1.00 next year or ₹1.09 the year after that? Explain their preferences.

   Solution

   a. Jasleen will prefer ₹1.14 next year to ₹1 today because ₹1.14/.06 = ₹1.075 which is greater than ₹1.00. Sukhbir will also prefer ₹1.14 next year to ₹1 today because for him ₹1.14 next year has a value of ₹$1.14 \times 0.9/1$ = ₹1.026 which is more than ₹1.00.

   b. Jasleen will prefer ₹1.09 the year after next year (i.e. at the end of the second year) to ₹1.00 next year because present value of ₹1.09 as at the end of the first year = 1.09/1.06 = 1.03 which is more than ₹1.

   For Sukhbir, the present value of ₹1 receivable at the end of the first year

   $$= 1 \times 0.90/1 = ₹0.90$$

   The present value of ₹1.09 receivable at the end of the year after next year

   $$= 1.09 \times 0.90/1.05 = ₹0.93$$

   Sukhbir too will prefer to receive ₹1.09 the year after next year to ₹1.00 next year.

PROBLEMS

1. Shivram is a bright but fun loving person. Three-fourths of the time he gets an A grade in the courses that he takes. Since he loves fun and leisure, he studies seriously only in one-half of the course he takes. However, when he studies seriously he is likely to get an A grade with a probability of 90 per cent. Suppose that he got an A in a course, How likely is it that he studied seriously?
2. Radha follows exponential discounting. Her discount function which represents her preference for money at various points of time is as follows:

$$\partial(t) = 1/(1.08)^t \text{ for } t = 0, 1, 2\ldots$$

Ramesh, on the other hand, follows hyperbolic discounting. His discount function is as follows:

$$\partial(t) = 1 \text{ for } t = 0$$
$$= 0.85 / (1.04)^{t-1} \text{ for } t = 1, 2 \ldots$$

   a. What would Radha/Ramesh prefer: ₹1.00 today or ₹1.12 next year? Why?
   b. What would Radha/Ramesh prefer: ₹1.00 next year or ₹1.06 the year after that? Explain their preferences.

DISCUSSION QUESTIONS

1. Discuss the two systems in the mind, System 1 and System 2.
2. Discuss the interaction of the two systems.
3. Explain the following:
   i. The associative machine
   ii. Cognitive ease
   iii. WYSIATI
   iv. The affect heuristic
4. Discuss the following: the law of small numbers, cause and chance, magical thinking, wishful thinking.
5. Explain the following familiarity-related heuristics: ambiguity aversion, diversification heuristic, functional fixation, status quo bias and endowment effect.
6. What is representativeness?
7. Discuss the following: innumeracy, probability matching, conjunction fallacy, and base rate neglect.
8. Explain the Bayes' theorem.
9. What is availability heuristic, recency bias, and salience bias?
10. What is anchoring? What explains anchoring?
11. What is hyperbolic discounting? How does is differ from exponential discounting?

MINI CASE

Mrs. Gupta was deeply perturbed when the standard mammogram test, that she undergoes every year, showed positive result. Her husband, Dr. Gupta, a mathematics professor, wanted to understand how serious the problem was.

Based on his research he found the following:

- Breast cancer afflicts 1 woman in 200 at any given point of time.
- The standard mammogram tests report false positives about 5 percent of the time. This means that out of 100 disease-free women, the test will show positive in 5 cases.
- The standard mammogram tests report false negative 2 percent of the time. This means that out of 100 women with the disease, the test will show negative in 2 cases, and positive in 98 cases.

Discussion Question

1. What is the probability that Mrs. Gupta has cancer?

APPENDIX 3A

HEURISTICS AND BIASES: EXTENDED DISCUSSION

Extending the discussion of biases and heuristics, this appendix dwells at greater length on the following biases: Availability bias, Ambiguity aversion bias, Endowment bias, Regret aversion bias, and Self-control bias. In addition, it discusses some more biases.

3A.1 ✦ AVAILABILITY BIAS

According to Jason Zweig, "Availability is essentially a mental shortcut, or HEURISTIC, that leads people to judge the frequency or probability of events by how easily an example springs to mind. The vividness of rare events can make them seem more common and likely to recur than they are." Initial public offerings of companies in stock market are a good illustration. As Jason Zweig put it, "The vast majority of initial public offerings (IPOs) fail to outperform the market, but it takes only a few spectacular successes like Google to create the illusion that investing in IPOs is the road to riches."

The availability heuristic prods people to make confident conclusions. In his book *Future Babble: Why Expert Predictions Fail - and Why We Believe Them Anyway,* Dan Gardner wrote: "The availability heuristic is a tool of the unconscious mind. It churns out conclusions automatically, without conscious effort. We experience these conclusions as intuitions. We don't know where they come from and we don't know how they are produced, they just feel right."

• Investment Mistakes

The various categories of availability bias and the investment mistakes associated with them are as follows:

Retrievability Investors tend to choose investments based on information that is available to them (ads, suggestions from friends and advisors, and so on).

Categorisation Investors tend to choose investments based on categories stored in their minds. Other types of investments may be ignored by them.

Narrow range of experience Investors tend to choose investments drawn from their narrow range of life experiences (such as the industry they work in and the region they live in).

Resonance Investors tend to choose investments that resonate with their own personality. For example, thrifty people may not invest in stocks with a high price/ earnings multiple.

3A.2 ✦ AMBIGUITY AVERSION BIAS

Frank Knight, a leading twentieth century economist, made an important distinction between 'risk' and 'uncertainty.' He defined risk as a gamble that has a well-defined distribution of possible outcomes and uncertainty as a gamble that has an unknown distribution of possible outcomes. Knight argued that people dislike uncertainty (ambiguity) more than they dislike risk.

In his classic 1954 book *The Foundations of Statistics*, Leonard Savage developed Subjective Expected Utility Theory (SEUT) as a counterpart of expected utility theory. According to this theory, under certain conditions, an individual's expected utility is obtained by weighting the possible outcomes by his/her subjective probability assessments.

Using SEUT, Daniel Ellsberg performed an experiment to demonstrate **ambiguity aversion**. The details of his experiment are given below.

Subjects were presented with two boxes, referred to here as Box 1 and Box 2. Subjects were told that Box 2 contained a total of 100 balls, 50 white and 50 black. Likewise, Box 1 contained 100 balls, a mix of white and black, but in an unknown proportion.

Subjects were asked to choose one of the following two options, each of which offered a possible payoff of $100, depending on the colour of ball drawn at random from the relevant box.

1A:	Draw a ball from Box 1. The payoff is $100 if the ball is white and $0 if the ball is black.
1B:	Draw a ball from Box 2. The payoff is $100 if the ball is white and $0 if the ball is black. A follow-up scenario was presented and the subjects were again asked to choose between two options.
2A:	Draw a ball from Box 1. The payoff is $0 if the ball is white and $100 if the ball is black.
2B:	Draw a ball from Box 2. The payoff is $0 if the ball is white and $100 if the ball is black.

Subjects typically preferred 1B to 1A, and 2B to 2A. These choices are incongruent with the Subjective Expected Utility Theory. If 1B is preferred to 1A, it means that the subjective probability of

white balls in Box 1 is less than 0.5; if 2B is preferred to 2A, it means that the probability of white balls in Box 1 is more than 0.5.

The experiment suggests that people do not like situations characterised by uncertainty about the probability distribution of outcomes. Put differently, they have aversion to ambiguity.

• Investment Mistakes

Ambiguity aversion can cause investors to make the following mistakes:

- Investors may hold only conservative investments which may yield meagre post-inflation and post-tax returns.
- Investors may restrict their investments to home country stocks.
- Investors may invest in stocks of companies in which they are employed.
- If investors judge themselves to be competent in some area, they may accept more risks than they should. This is referred as **competence effect** and it overrides ambiguity aversion.

3A.3 ✦ ENDOWMENT BIAS

According to standard economic theory, a person's willingness to pay for a good or an object should be equal to his/her willingness to accept dispossession of that good or object (dispossession is quantified in the form of compensation). Psychologists, however, have found that the minimum price at which a person is willing to sell any good or object that he possesses is typically higher than the price at which he/she is willing to buy the same good or object. In effect, ownership of an asset endows the asset with some added value. This phenomenon is called the **endowment bias.**

• Investment Mistakes

Endowment bias causes investors to make the following mistakes:

- Investors hold on to securities or assets they have inherited or purchased, regardless of whether it is worth holding them.
- Investors hold securities or assets they have inherited or purchased because they do not want to incur the transaction costs associated with selling the securities and/or because they are familiar with the characteristics of endowed investments.

3A.4 ✦ REGRET AVERSION BIAS

Under conditions of uncertainty, people fear that their decision will turn out to be wrong in the hindsight. So they display regret aversion and try to minimise future regret. Here is a conspicuous example of this tendency. Harry Markowitz, father of Modern Portfolio Theory, said, "I visualised my grief if the stock market went way up and I wasn't in it, or if it went down and I was completely in it. My intention was to minimise my future regret. So I split my retirement plan contributions fifty-fifty between bonds and equities."

Regret-averse people try to avoid the pain arising from two types of mistakes: (i) errors of commission, and (ii) errors of omission. *Errors* of *commission* arise from misguided action, whereas *errors of omission*

arise from misguided inaction. Regret tends to be more intense when unfavourable outcomes are due to errors of commission rather than errors of omission. Further, regret is more palpable when the outcomes of actions (or inactions) are highly visible or accessible.

• Investment Mistakes

Regret aversion bias can cause the following investment mistakes:

- Investors may become too conservative. After a loss, an investor may shun the market altogether.
- Investors may hold on to a losing position for too long. People do not like to admit that they're wrong.
- Investors tend to follow the herd as buying with the herd assuages potential regret.
- Investors may hold on to a winning stock for too long. People fear that if they sell they may miss out further gains.
- Investors tend to prefer 'good companies' though they may not be 'good investments.' As J.M. Keynes said, "It is better to fail conventionally rather than succeed unconventionally."

3A.5 ✦ SELF-CONTROL BIAS

The human propensity to consume today at the expense of tomorrow is called **self-control bias**. This bias can be best understood in the context of the **life-cycle hypothesis**. Grounded in expected utility theory, the life-cycle hypothesis assumes rational behaviour. According to the life-cycle hypothesis, (i) people prefer a higher standard of living to a lower standard of living, and (ii) people prefer to maintain a relatively stable standard of living throughout their lives. In essence, the life-cycle hypothesis assumes that people will try to maintain the highest smoothest consumption path possible. In reality, however, the behaviour of people is likely to deviate from what the hypothesis suggests, thanks to self-control bias.

• Investment Mistakes

Self-control bias represents the propensity to consume today at the expense of tomorrow. Such behaviour can be hazardous to one's wealth and may cause people to save inadequately for retirement, lose sight of basic financial principles, such as compounding and dollar cost averaging, and display preference for income-producing assets, thanks to a *spend today* mentality.

3A.6 ✦ CONTRAST BIAS

Before we discuss the contrast bias, let us understand what the contrast effect is. The **contrast effect** is a magnification or diminishment of perception as a consequence of previous exposure to something of inferior or superior quality. The contrast effect may be positive or negative. A 'positive contrast effect' occurs when something is perceived as better than it actually is because it is compared to something worse. An example of this would be an English teacher grading papers. She grades a horrible paper with numerous grammatical and spelling mistakes. When the next paper does not have any of these mistakes, she rates it very highly (glossing over some its own shortcomings) because it looks great compared to the preceding paper.

A 'negative contrast effect' occurs when something is perceived to be worse than it actually is because it is compared to something better. To illustrate, suppose a man goes on two blind dates, one on Friday night and the other on Saturday night. The woman on Friday night is exceptionally beautiful. The woman on Saturday night is quite pretty, but compared to the woman on Friday night she doesn't appear to be anything special. Unfortunately, she is judged as less beautiful than she actually is because she is compared to the first woman.

Contrast bias is the tendency to rank something wrongly after making a largely irrelevant comparison.

• An Interesting Application of Contrast Bias

In his book *Predictably Irrational*, Dan Ariely provides an interesting example of how *The Economist* magazine used contrast bias to influence buying decisions. To begin with, *The Economist* presented the following advert:

Economist.com Subscription	$59	(On-line access to all articles for one year)
Print and Web Subscription	$125	(1-year subscription to the printed edition and full on-line access)

In response to this advert, 68 percent of buyers chose the $59 product and 32 percent of buyers chose the $125 product.

Not satisfied with how their advert was performing *The Economist* modified the advert by adding a "decoy."

Economist.com Subscription	$59	(On-line access to all articles for 1 year)
Print Subscription	$125	
Print and Web Subscription	$125	(1-year subscription to the printed edition and full on-line access)

This advert forced the reader to compare the first $125 product with the second $125 product. Clearly the second $125 product appeared a much better product and that comparison trumped the real comparison that readers should have been making, i.e, the one with $59 product. The response of the buyers was as follows:16 percent for the $59 product, 0 percent for the first $125 product (obviously), and 84 percent for the second $125 product. This means that the decoy (the one in the middle) led to a dramatic increase for the $125 product, from 32 percent to 84 percent.

3A.7 ✦ SOME MORE BIASES

Here are some more biases:

Attentional Bias Attentional bias causes people to focus their attention on just one or two possible outcomes when making judgements. They ignore the rest.

Good Looking People Bias In decision-making and reasoning, people tend to place more weight on the views of good looking people than average-looking or ugly people.

Distinction Bias People tend to view two options as more dissimilar when assessing them together than when assessing them separately.

Choice Supportive Bias Choice supportive bias is the tendency of a person to defend his own decision or to rate it better later just because he made it.

Impact Bias People tend to overestimate the duration or the intensity of their future feelings in reaction to either good or bad occurrences.

Moral Credential Bias A person with a history of making fair judgements may think that he has a "free license" in future.

News Media Bias The media has a tendency to run stories that are topical, visually appealing, and commercially viable. Paradoxically, the media's attempt to avoid bias also creates bias.

■ ■

Chapter **4**

Self-Deception

In the slow process of natural selection, our minds adapted to seek the ultimate goal of reproduction in the environment of evolutionary adaptiveness (EEA). Thanks to the conflicts between predator and prey, competition for reproduction, and group living, deception evolved under natural selection, along with the capacity to detect it. Perhaps the easiest way to avoid detection is to lie to ourselves or resort to self-deception. As Martin Sorrell put it, "So, not only do we wish to appear (genetically) fitter than others (this has obvious advantages when it comes to mate selection), but we actually believe that we are." As Bernard Berelson and Gary Steiner put it, "He (man) is a creature who adapts reality to his own ends, who transforms reality into a congenial form, who makes his own reality… In his quest for satisfaction, man is not just a seeker of truth, but of deception, of himself as well as others."

In a similar vein, Jonathan Haidt said, "One of the most universal pieces of advice from across cultures and eras is that we are all hypocrites, and in our condemnation of others' hypocrisy we only compound our own." Machiavelli, the epitome of cunning and amoral use of power, wrote five centuries ago, "the great majority of mankind are satisfied with appearances, as though they were realities, and are often more influenced by the things that seem than by those that are."

Self-deception manifests itself primarily in the form of overconfidence. People tend to be overconfident. Psychologists say that due to overconfidence, people overestimate their knowledge and abilities, underestimate risks, exaggerate their ability to control things, and often display overoptimism.

This chapter discusses various facets of overconfidence and other forms of self-deception. It is divided into five sections as follows:

- Forms of overconfidence
- Causes of overconfidence
- Factors impeding overconfidence
- Other forms of self-deception
- How much do the experts know
- The success equation: untangling skill and luck in business

4.1 ✦ FORMS OF OVERCONFIDENCE

Overconfidence manifests itself in various forms. The common ones being miscalibration, better-than-average effect, and excessive optimism.

• Miscalibration

People tend to overestimate - or miscalibrate - the precision of their knowledge. For example, if people are asked to define (say) 90% confidence interval for some known or knowable magnitude (such as the population of Moscow or the level of Nifty in a month's time), their intervals tend to be too narrow (miscalibrated).

More precisely, if a sufficiently large number (a sufficiently large number of questions reduces the sampling error) of, say, 90% confidence interval[1] questions are asked to an individual then about 90% of his intervals should bracket the right answer, if the individual is properly calibrated. Or, if the same question is asked to a sufficiently large number of respondents, 90% of the respondents should have their confidence intervals encompassing the correct answer, if, on the whole, the group is properly calibrated.

The reality, however, turns out to be different. In the case of an individual, who is asked a sufficiently large number of questions, it is commonplace to find that substantially less than 90% of his intervals bracket the right answer. Similarly, in the case of a group that is asked the same question, it is commonplace to find that the percentage of individuals whose intervals bracket the answer is substantially less than 90%.

What explains this? One explanation is that in assessing how sound their conclusions are, people go by the probability that they are right on only the last step of their reasoning, forgetting that there are other elements in the reasoning where they can be wrong. Another explanation is that people make probability judgements by looking for similarities to other known observations, forgetting that there are many other possible observations. Yet another explanation is that people nurture illusions. For example, an investor may say, "If I buy a stock, it will go up afterwards."

• Better-Than-Average Effect

When people are asked to rate themselves on some positive personal attribute (such as driving skill or teaching ability) relative to others, most tend to rate themselves above average on those attributes. This is called the **better-than-average effect**. For example, in one survey done by O. Svenson, 82% of the respondents rated themselves in the top 30% of their group in term of driving safety. Objectively, however, only 50% of the people in any group can be better-than-average.

One factor that contributes to better-than–average belief is that the definition of excellence or competence is often not exact. Consider driving. Some may see "best" as being most adept

[1] A 90% confidence interval represents an *interval* within which, in the judgment of the estimator, a given magnitude will fall with a probability of 0.9. For example, someone may say that in his judgment the population of the U.S. may be between 320 million and 360 million with a probability of 0.9.

in avoiding accidents; some may see "best" as being most skillful while speeding down the highway; still others may see "best" as providing the smoothest ride. There are motivational and cognitive reasons behind the better-than-average effect. From the motivational point of view, believing that you are better-than-average enhances self-esteem; from the cognitive point of view, the performance criteria that most easily come to one's mind are often those that one is best at.

• Optimistic Bias

One of the most important cognitive biases is optimistic bias. As Kahneman put it, "Most of us view the world as more benign than it really is, our attributes as more favorable than they truly are, and the goals that we adopt as more achievable than they are likely to be."

Optimism appears to be the default state and embedded within System 1 of information processing. Psychologists have found that participants in their experiments display optimism. Recent work of neuroscientists has provided further evidence of the deep-seated nature of our optimism.

Optimism seems to stem from nature as well as nurture. Let us begin with nature. Many of our biases, including optimism, presumably conferred some evolutionary advantage. In his book *Optimism: The Biology of Hope*, Lionel Tiger argued that when early humans left the forests to become hunters many of them suffered injury and death. Since humans tend to abandon tasks that have negative consequences, it was biologically adaptive for humans to develop a sense of optimism. As James Montier put it, "After all, it must have needed a great deal of courage to take on mastodon (a very large prehistoric elephant-like creature); frankly not too many pessimists would even bother."

Nurture, too, generates the generally optimistic view. People are prone to act in ways that support their own interests. *Self-serving bias* is a well-documented psychological phenomenon. As Warren Buffett said, "Asking an investment banker whether a deal should be done is asking an interior decorator whether an expensive Persian rug should be bought."

An optimistic attitude is a blessing. As Kahneman put it, "Optimists are normally cheerful and happy and, therefore, popular; they are resilient in adopting to failures and hardships; their immune system is stronger; they take better care of their health; they feel healthier than others and are likely to live longer." Largely inherited, the optimistic attitude is part of a general disposition for well-being.

Optimists play a significant role in shaping our lives. As Kahneman put it, "Their decisions make a difference: they are the inventors, the entrepreneurs, the political and military leaders—not average people. They go where they are by seeking challenges and risks. They are talented and they have been lucky, almost certainly luckier than they acknowledge."

The blessings of optimism, however, are available only to those who can "accentuate the positive" without losing track of reality.

While optimistic risk takers contribute to the dynamism of a capitalistic society, most risk takers tend to be disappointed.

While optimism is a great life strategy, it isn't a good investment strategy. Aware of the dangers of over-optimism, Benjamin Graham noted, "Observation over many years has taught us that the chief losses to investors come from the purchase of low-quality securities at times

of favorable business conditions. The purchasers view the current good earnings as equivalent to "earning power" and assume that prosperity is synonymous with safety."

To defend ourselves against over-optimism, we must learn to become more critical and skeptical. Rather than asking "Can I believe this?" we should get used to asking "Must I believe this?" Heed to the advice of the philosopher George Santayana who said, "Skepticism is the chastity of the intellect, and it is shameful to surrender it too soon or to the first comer." These words are true for investing as well as life generally.

Overconfidence and Earnings Manipulation

Why do managers manipulate earnings when they know that it is unsustainable and a self-destructive activity? The answer perhaps lies in the cognitive trait of *overconfidence.* Here is a common scenario of how it plays out: The company's sales growth falters or operating costs rise unexpectedly. To achieve their targets, the managers bring forward some revenues from the next quarter to make good the numbers. While they are aware that this ploy (front-loading) will start the next quarter with a deficit, overconfidence persuades them to believe that revenues next quarter will be higher to compensate for front-loading. This rarely happens and small frauds tend to balloon over time. As Ramalinga Raju confessed in his 2009 letter to the board of Satyam Computers: "What started as a marginal gap between actual operating profit and the one reflected in the books of accounts (and publicly reported) continued to grow over the years. It has attained unmanageable proportions."

4.2 ✦ CAUSES OF OVERCONFIDENCE

Overconfidence is caused by several factors such as the illusion of knowledge, the illusion of control, the illusion of understanding, the illusion of validity, and the illusion of skill. Psychologists say that due to overconfidence people overestimate their knowledge, underestimate risks, and exaggerate their ability to control things.

• Illusion of Knowledge

People tend to believe that the more information they have, the more knowledgeable they are, and the more accurate their forecasts are likely to be. However, greater information does not necessarily lead to greater knowledge for the following reasons. First, many people may not have the ability to interpret the information. Second, some information may be irrelevant or misleading. Third, people tend to interpret new information as confirming their prior beliefs.

The investment industry seems to be addicted to information. As James Montier put it, "The whole investment industry is obsessed with learning more and more about less and less, until we know absolutely everything about nothing." In a similar vein, Janiel Boorstein opined, "The greatest obstacle to discovery is not ignorance-it is the illusion of knowledge." What is the implication of this for investors? Investors would be far better off analysing the five things they really need to know about an investment, rather than trying to know absolutely

everything concerning that investment. As Jean-Marie Eveillard said," It's very common to drown in the details or be attracted to complexity, but what's most important to me is to know what three, four, or five major characteristics of the business really matter."

• Illusion of Control

People tend to become more overconfident when they feel that they have control over the outcome. Langer conducted an experiment in which the participants were asked to bet on the outcome of a toss of coin. Some participants were asked to toss a coin and bet on its outcome. Other participants were asked to bet on a coin that was already tossed with the result concealed. Participants in the first group bet more because people have an illusion that they can control randomness.

The factors that cause the illusion of control are choice, information, outcome sequence, and familiarity with task.

Choice Active choice induces a sense of control. When someone chooses his own lottery number, he feels that he has a greater chance of winning than when the number is randomly assigned to him.

Information Greater information induces a greater illusion of control. When they obtain new information, people tend to place a lot of emphasis on how extreme or important it is, without realising that much of the information they receive is really noise and trivial.

Outcome Sequence The sequence in which the outcomes occur has a bearing on the illusion of control. Early positive outcomes induce a greater illusion of control than early negative outcomes. For example, when someone guesses correctly the outcome of the first two tosses of a coin, he feels more confident about predicting the outcome of the next toss.

Familiarity with Task Greater familiarity with a task leads to a greater sense of control of the task.

• Illusion of Understanding

In his book *The Black Swan*, Nassim Taleb introduced the notion of a **narrative fallacy**. A narrative fallacy is a flawed story of the past that shapes our views of the world and our expectations of the future. Narrative fallacies stem from our continuous attempt to make sense of the world. Kahneman described the nature of narrative stories as follows: "The explanatory stories that people find compelling are simple, are concrete rather than abstract, assign a larger role to talent, stupidity and intentions than to luck, and focus on a few striking events that happened rather than on the countless events that failed to happen." We fool ourselves by constructing flimsy stories and nurture the illusion of understanding. As Kahneman put it, "Paradoxically, it is easier to construct a coherent story when you know little, when there are fewer pieces to fit into the puzzle. Our comforting conviction that the world makes sense rests on a secure foundation: Our almost unlimited ability to ignore our ignorance."

• Illusion of Validity

Operating on the WYSIATI principle, System 1 jumps to conclusions with little evidence. The amount of evidence and its quality don't matter much because poor evidence often makes a very good story. As Kahneman put it: "For some of our most important beliefs, we have no evidence at all, except that people we love and trust hold these beliefs. Considering how little we know, the confidence we have in our beliefs is preposterous – and it is also essential." He coined the term the **illusion of validity** to describe this cognitive illusion.

• Illusion of Skill

The illusion of skill is widespread. As Kahneman put it, "The illusion of skill is not only an individual aberration: it is deeply ingrained in the culture of the industry. Facts that challenge such basic assumptions, and thereby threaten people's livelihood and self-esteem, are simply not absorbed."

Billions of shares are traded every day because buyers think the price is too low and likely to rise and sellers think the price is too high and likely to fall. Why do they have different opinions when most of the buyers and sellers have access to the same information? Why do they believe that they know more about what the price should be than the market does? In general, that belief is an illusion of skill.

Terry Odeon studied the trading records of 10,000 brokerage accounts of individual investors over a seven-year period. He identified all instances in which an investor sold some stock and soon after bought another stock. These actions suggested that the investor expected the stock that he bought to do better than the stock that he sold.

To determine whether those expectations were well founded, Odeon compared the returns of the stock sold and the stock bought in its place, over a period of one year after the transaction. The results were damaging: On average stocks sold did better than stocks bought by a margin of 3.2 per cent per year, over and above the costs of executing the two trades.

Since this is a statement about averages, some individuals did much better whereas other did much worse. However, it seems clear that a large majority of individual investors would be better off following a passive strategy rather than an active strategy. Subsequent research by Terry Odeon and Brad Barber reinforced this conclusion. In a paper aptly titled "Trading is Hazardous to Your Health," they showed that, on average, those who traded the most had the poorest results and those who traded the least had the best results.

• What Supports the Illusions of Skill and Validity

Most investors, both amateur and professional, stubbornly believe that they can outperform the market, contrary to an economic theory that most of them accept and also inconsistent with what they could learn by dispassionately evaluating their personal experience. Why? There are two possible explanations. First, when people pick stocks they consult macroeconomic data and forecasts, analyse industry dynamics, understand the competitive advantages of companies, examine financial statements, develop company forecasts, assess the quality of management, and arrive at estimates of value. Apparently, they believe that they are exercising

high level skills and this can induce illusions. Second, a powerful professional culture supports the illusions of validity and skill. As Kahneman put it, "We know that people can maintain an unshakable faith in any proposition, however absurd, when they are sustained by a community of like-minded believers."

Inside each of us, there is a con-artist who cajoles us into an inflated sense of our powers. It appears that the less skilled or experienced a person is, the harder the con man works. It is good up to a point as it boosts our self-esteem, but it becomes dysfunctional thereafter.

4.3 ✦ OTHER FORMS OF SELF-DECEPTION

Along with overconfidence, the other forms of self-deception are avoidance of cognitive dissonance, self-attribution bias, confirmation bias, hindsight bias, naïve realism, and distorted self-perceptions. All of these make people feel better about themselves than they might be if they were bias-free.

• Avoidance of Cognitive Dissonance

When newly acquired information is at variance with pre-existing understanding, people usually experience mental discomfort which is referred to as **cognitive dissonance**. In psychology, cognitions represent attitudes, emotions, beliefs, or values and cognitive dissonance is the imbalance that arises when contradictory cognitions interact.

People abhor cognitive dissonance. So, they often resort to far-reaching rationalisations to synchronise their cognitions and maintain psychological stability. This is reflected in selective perception and selective decision making.

As psychologist Leo Festinger explained in his book *A Theory of Cognitive Dissonance*, "Cognitive dissonance can be seen as an antecedent condition which leads to activity oriented towards dissonance reduction just as hunger leads toward activity oriented toward hunger reduction. It is a very different motivation from what psychologists are used to dealing with but, as we shall see, nonetheless powerful."

To reduce or minimise cognitive dissonance, people resort to three key strategies.

1. Change the conflicting belief so that it is congruent with other beliefs or behaviours.
2. Diminish the importance of the conflicting belief.
3. Emphasise more supportive beliefs that outweigh the dissonant belief or behaviour.

• Self-Attribution Bias

Self-attribution bias means that people tend to ascribe their success to their skill and their failure to their bad luck. Harvard psychologist Langer called this phenomenon as "head I win, tail it's a chance."

The self-attribution bias, also called the self-serving bias, is any cognitive or perceptual process that is distorted in order to maintain and enhance self-esteem. When a person focuses on his strengths and achievements but overlooks his faults and failures, denies the validity of negative feedback, or takes credit for his group's work and downplays the contribution of others, he is essentially protecting his self-esteem.

• Confirmation Bias

People tend to overlook information that is contrary to their views in favour of information that confirms their views. While we think that our beliefs are the result of years of experience and objective analysis, the reality is that all of us are susceptible to **confirmation bias**. As Tim Sanderson put it, "We all ignore information that disputes our expectations. We are more likely to remember (and repeat) stereotype-consistent information and to forget or ignore stereotype-inconsistent information, which is one way stereotypes are maintained even in the face of disconfirming evidence."

Confirmation bias affects how people gather information as well as how they interpret and recall information. When an individual supports or opposes a particular issue, he will not only seek information that confirms his beliefs, but also interpret news stories in a manner that upholds his existing ideas and recall things in a way that it reinforces these ideas.

• Hindsight Bias

People have a tendency to view events as more predictable than they really are. This bias is called the **hindsight bias**. It is often referred to as the "I-knew-it-all-along phenomenon." Hindsight bias is closely related to self-attribution bias. Hindsight bias persuades people to think that "They know it all along." This bias is more pronounced when the focal event has well defined alternative outcomes (such as the ICC World Cup) or when the event in question has emotional or moral overtones.

This phenomenon has been demonstrated in a number of situations, involving stock market, politics, and sports. For example, researchers Martin Bolt and John Brink asked college students to forecast how the U.S. Senate would vote when Clarence Thomas, a Supreme Court nominee was to be confirmed. Before the senate vote, 58 per cent of the participants forecasted that he would be confirmed. When students were polled again after the confirmation of Thomas, 78 per cent of the participants said that they thought Thomas would be confirmed.

• Naïve Realism

People think that they see the world directly, as it really is. They further believe that the facts as they see are there for all to see and hence others should agree with them. This may be called **naïve realism** and it causes a great deal of strife. As Jonathan Haidt put it, "If I could nominate one candidate for 'biggest obstacle to world peace and social harmony,' it would be naïve realism because it is so easily ratcheted up from the individual to the group level... Good and evil do not reside out of our beliefs about them." He added, "We all commit selfish and shortsighted acts, but our inner lawyer ensures that we do not blame ourselves or our allies for them. We are thus convinced of our virtue, but quick to see bias, greed, and duplicity in others."

• Distorted Self-perceptions

It seems easier to spot a cheater when we are looking outward, but harder when we are looking inward. A Nigerian proverb says, "A he-goat doesn't realise that he smells." In a similar vein, a

Japanese proverb says, "Though we see the seven defects of others, we don't see our own ten defects." As Robert Wright observed in his incisive book, *The Moral Animal*, "Human beings are a species splendid in their array of moral equipment, tragic in their propensity to misuse it, and pathetic in their ignorance of the misuse."

Harvard psychologist David Perkins says that in our thinking we generally use the "makes-sense" stopping rule. We typically take a position, look for confirming evidence, and if we find some evidence supporting our position, we stop thinking. As Benjamin Franklin put it, "So convenient a thing it is to be a reasonable creature, since it enables us to find or make a reason for everything one has a mind to do." Indeed it is a consistent finding of psychological research that while we are fairly accurate in our perception of others, our self-perceptions are distorted because we look at ourselves in a rose-coloured mirror.

4.4 ✦ HOW MUCH DO THE EXPERTS KNOW[2]

We have a tendency to construct and believe coherent narratives of the past. Everything seems to make sense in hindsight and this prods us to think that we can forecast the future. As Kahneman put it, "The illusion that we understand the past fosters overconfidence in our ability to predict the future."

• The Illusion of Pundits

In his 2005 book, *Expert Political Judgment: How Good Is It? How Can We Know?*, psychologist Philip Tetlock examined the so-called expert predictions based on a landmark twenty-year study. He interviewed 284 people who made their living by commenting or advising on political and economic trends, both in their fields of specialisation as well as in the fields in which they had less knowledge. He asked the respondents to assess the probabilities that certain events would occur in the not-too-distant future. In every case, they were asked to rate the probabilities of three alternatives: the continuation of the status quo; more of something (economic growth or political freedom); or less of that thing.

The results were unequivocally bad: the experts performed worse than they would have, if they had simply considered each of the three potential outcomes as equiprobable. As Kahneman put it: "In other words, people who spend their time and earn their living, studying a particular topic, produce poorer predictions than dart-throwing monkeys who would have distributed their choices evenly over the options. Even in the region they knew best, experts were not significantly better than non-specialists."

It appears that those who know more predict very slightly better than those who know less, but those who know most are often less reliable. Why? A highly knowledgeable person develops an enhanced illusion of his or her skill and becomes unrealistically overconfident. As Tetlock put it, "We reach the point of diminishing marginal predictive returns for knowledge disconcertingly quickly." He added, "In this age of academic hyper-specialisation, there is no reason for supposing that contributors to top journals—distinguished political scientists, area

[2] This section draws heavily on Daniel Kahneman's book, *Thinking, Fast and Slow*, Allen Lane, 2011.

study specialists, economists, and so on—are any better than journalists or attentive readers of *The New York Times* in 'reading' emerging situation."

It is worth reiterating two lessons. One, since the world we live in is unpredictable, prediction errors are inevitable. Two, a high subjective confidence cannot be trusted as an indicator of accuracy – low confidence may be more informative.

• Why Forecasting Thrives

If forecasts are really unreliable, why do people keep producing them? Perhaps experts don't learn from their experience and ingeniously explain their failure. Financial analysts, for example, commonly say that they should not be evaluated on the basis of just one forecast (the single prediction defence) or something that happened outside of the scope of their model (the ceteris paribus defence).

Another reason is that it is a case of demand creating supply. When investment analysts and their managers are asked why do they engage in the futile exercise of issuing target prices, their last line of defence is always "Because the clients want them."

We explored some reasons why people continue to produce forecasts, even if they are worthless. A bigger question seems to be: Why do people unthinkingly follow such useless forecasts? One view on this issue was articulated by Joe Nocera in an article that appeared in *New York Times* on October1, 2005: "Indeed, I wound up thinking that forecasting is to the market what gravity is to the earth. As much as we like to poke fun at faulty predictions, we can't function without them… Without forecasts, the market would no longer be grounded to anything." I am not sure whether we need forecasts for investing. But Nocera suggests a reason why people keep using forecasts: When we are given a number we tend to cling to it, even without realising it. Cognitive psychologists call this phenomenon *anchoring*.

• Superiority of Formulae, Models, or Algorithms

In a remarkably insightful book, *Clinical vs. Statistical Prediction: A Theoretical Analysis and a Review of Evidence,* psychologist Paul Meehl reviewed twenty studies that analysed whether clinical predictions based on subjective judgments of trained professionals were more accurate than statistical predictions based on combining a few scores or ratings according to a formula. He found that statistical predictions were better than clinical predictions. This book provoked considerable controversy and engendered a stream of research that is still continuing even after more than sixty years of its initial publication. Nearly two hundred such studies done over decades have shown that algorithms are significantly more accurate than humans.

Similar studies have been done in other domains such as medicine, economics, finance, public policy, and sports. Each of these domains is characterised by a high degree of uncertainty and unpredictability. They are referred to as "low-validity environments." Interestingly, in every case, the accuracy of experts has been matched or exceeded by a simple algorithm. As Meehl said with justifiable pride three decades after the publication of his book, "There is no controversy in social science, which shows such a large body of qualitatively diverse studies coming out so uniformly in the same direction as this one."

Why are experts inferior to algorithms? One reason is that experts try to consider complex combinations of features. While complexity may work in an odd case, more often than not it reduces validity. Another reason is that humans are incorrigibly inconsistent in drawing inferences from complex information. In his revolutionary book, *The Limits of Scientific Reasoning*, David Faust wrote: "Human judgment is far more limited than we think. We have a surprisingly restricted capacity to manage or interpret complex information." Studying a wide range of professionals, Faust found that simple quantitative models consistently outperformed human judges.

As James P.O. Shaughnessy put it in his book *What Works on Wall Street*: "Models beat human forecasters because they reliably and consistently apply the same criteria time after time. In almost every instance, it is the total reliability of application of the model that accounts for its superior performance. Models never vary. They are always consistent. They are never moody, never fight with their spouse, are never hung over from a night on the town, and never get bored. They don't favour vivid, interesting stories over reams of statistical data. They never take anything personally. They don't have ego. They're not put out to prove anything. If they were people, they'd be the death of any party".

• Robustness of a Simple Algorithm

Since Meehl's original work, the most important development in the field has been Robyn Dawes' famous article, "The Robust Beauty of Improper Linear Models in Decision Making," published in a 1979 issue of *American Psychologist*. The dominant practice in social sciences is to use an algorithm, called multiple regression analysis, for assigning weights to different predictors (factors). Multiple regression analysis has a sound logic and it determines the optimal formula that puts together a weighted combination of the predictors. However, Dawes observed that a formula in which predictors are equally weighted is likely to be just as reliable in predicting new cases as the multiple regression formula derived from the original sample. More research goes a step further: equal-weighted formulas are superior to multiple regression formulas derived from the original sample, because they are not affected by sampling errors. As Kahneman observed in his seminal work, *Thinking, Fast and Slow*, "The surprising success of equal-weighting schemes has an important practical implication: it is possible to develop useful algorithms without any prior statistical research. Simple equally weighted formulas based on existing statistics or on common sense are often very good predictors of significant outcomes."

In a memorable example, Dawes showed that marital stability can be predicted by a simple formula:

Frequency of lovemaking – Frequency of quarrels

The moral of the story is that a simple, back-of-the envelope algorithm is often as good as an optimally weighted formula and certainly better than expert judgment. This logic is applicable in many domains, ranging from stock selection to choice of medical treatment.

A classic application of this approach is a simple method for assessing the condition of a new-born baby. Developed by Dr. Apgar, this method says examine five variables (heart rate, respiration, reflex, muscle tone, and colour), assign each of them one of the three scores (0, 1, or 2, depending on the robustness of each sign), and rate the infants by this rule one minute

after they are born. A baby with a total score of 8 or above is likely to be in good shape and a baby with a total score of 4 or below needs immediate intervention. The Apgar test has made an important contribution to lowering infant mortality. Atul Gawande's book, *A Checklist Manifesto*, provides many other examples of the benefits of checklists and simple rules. As Atul Gawande said, "In domain after domain, aviation, medicine, construction, and investing where people have properly implemented a checklist, the outcomes have improved without improvement in the underlying skill of the users."

• The Hostility to Algorithms

Clinical psychologists reacted to Meehl's ideas with hostility and disbelief. The statistical evidence of clinical inferiority is incongruent with clinicians' experience of the quality of their judgments. Psychologists who work with patients have many hunches during therapy sessions that are confirmed, suggesting the reality of their clinical skill.

The problem is that the correct judgments relate to short-term predictions (a skill in which therapists may have years of practice). However, they typically fail at tasks that require long-term predictions about the future of patients.

It appears that the debate about the virtues of clinical and statistical prediction has always had a moral dimension. As Meehl wrote, experienced clinicians criticise the statistical method as "mechanical, atomistic, additive, cut and dried, artificial, unreal, arbitrary, incomplete, dead, pedantic, fractionated, trivial, forced, static, superficial, rigid, sterile, academic, pseudoscientific, and blind." On the other hand, the proponents of the clinical method lauded it as "dynamic, global, meaningful, holistic, subtle, sympathetic, configural, patterned, organised, rich, deep, genuine, sensitive, sophisticated, real, living, concrete, natural, true to life, and understanding."

• When Can You Trust Expert Intuition

Kahneman has been the leader of the heuristics and biases approach. This approach is not liked by Gary Klein, the intellectual leader of an association of scholars and practitioners who call themselves students of Naturalistic Decision Making or NDM. They work mostly in organisations where they study how experts work. Gary Klein wrote a book, titled *Sources of Power*, in which he analyses how experienced professionals hone intuitive skills. They are critical of the heuristics and biases approach because they think it is overly concerned with failures and based on artificial experiments rather than the study of real people doing things that really matter. They are skeptical about the use of algorithms in place of human judgement.

Interestingly, the leaders of the two groups, viz., Kahneman and Klein engaged in an "adversarial collaboration" to map the boundary that separates the marvels of intuition from its flaws. After several years of discussions and argumentation they published a joint article, titled "Conditions for Intuitive Expertise: A Failure to Disagree." They concluded that their disagreement was partly due to the fact that they had different experts in mind. Klein spent much time with clinical nurses, fireground commanders, and other professionals who have real expertise. Kahneman had spent more time thinking about clinical psychologists, stock pickers, and political scientists trying to make unsupportable long-term predictions. Understandably, Klein has a lot of trust in expert intuition, whereas Kahneman has skepticism.

To understand when judgments reflect true expertise and when they display the illusion of validity, we should know the conditions for acquiring a skill. It seems that skill can be acquired when the environment is sufficiently regular to be predictable and there is an opportunity to learn these regularities through sustained practice. When both the conditions are fulfilled, intuitions are likely to be skilled. Chess is an excellent example of high validity environment where there is an opportunity to learn through sustained practice. In contrast, stock pickers operate in a zero-validity environment.

4.5 ✦ THE SUCCESS EQUATION: UNTANGLING SKILL AND LUCK IN BUSINESS[3]

A combination of skill and luck influences much of what we experience in life. You earn a windfall if you buy the stock of a company just before it is acquired at a huge premium. A pharmaceutical company develops a drug for cholesterol that turns out to be a blockbuster drug for diabetes.

To understand the performance of a firm, we must learn to untangle the role of skill and luck. In this context, bear in mind the following.

1. While different levels of skill and luck shape our lives, we are not good at distinguishing between the two. This is partly because most of us are not well versed with statistics. More important, psychological factors hinder our ability to distinguish between skill and luck. Our intuitive judgments are often unreliable because we base predictions on how well an event seems to fit a story, rather than consider how reliable the story is, or what happened before in similar situations. (Because humans love stories as they are one of the most powerful ways of communicating.) Once something has happened, we are inclined to come up with a cause to explain the event. As Michael Mauboussin says, "The problem is that we commonly twist, distort, or ignore the role that luck plays in our successes and failures. Thinking explicitly about how luck influences our lives can help offset that cognitive bias."
2. As a first step toward untangling skill and luck, let us define these terms. A dictionary defines luck as "events or circumstances that work for or against an individual." More specifically, luck is a chance occurrence that affects a person or group, favourably or unfavourably, and luck is beyond one's control. It is useful to distinguish between randomness and luck. While randomness operates at the level of a system, luck operates at the level of an individual. The above definition suggests that one should develop an attitude of equanimity toward luck. As Michael Mauboussin says, "If you've benefited from good luck, be happy about it and prepare for the day when your luck runs out. And don't feel affronted when you suffer from bad luck." He adds, "Provided that you have approached the activity in the correct fashion, you want to shrug off the poor results and go about your business in the same fashion in the future."
3. What is skill? According to a dictionary, skill is defined as the "ability to use one's knowledge effectively and readily in execution or performance." It is practically not possible to discuss skill in a particular activity without considering the role of luck.

[3] Adapted from Michael J. Mauboussin, *The Success Equation*, Boston, HBR Press, 2012.

4. Some activities such as playing chess or running a race depend almost wholly on skill. Other activities like betting on a roulette wheel depend almost wholly on luck. In between lie most of the activities which depend on skill and luck in varying proportions.
5. When skill exerts more influence, there is an intimate connection between cause and effect. On the other hand, when lucks exert more influence, there is a loose connection between cause and effect in the short run. An activity may be deemed to involve skill, if you can lose on purpose.
6. Michael Raynor, a Deloitte consultant, defines what he calls the *strategy paradox*. This means "the same behaviors and characteristics that maximize a firm's probability of notable success also maximize its probability of failure." He illustrates this paradox with the story of Sony Betamax and Minidiscs. When these products were launched, Sony was on the top with a long string of winning products such as the transistor radio, the Walkman, and the compact disc (CD) player. However, when it came to Betamax and Minidiscs, argues Raynor, "the company's strategies failed not because they were bad strategies but because they were great strategies."
7. When luck dominates, a large sample is necessary to understand what's going on. But when skill dominates, a small sample is sufficient to figure out what is happening.
8. With improvement in skill, performance becomes more consistent. Hence, luck becomes more important. Mauboussin calls this the *paradox of skill*. When everyone in a certain sphere of activity is uniformly more skillful, the vagaries of luck matter more. As Mauboussin says, "When everyone in business, sports, and investing copies the best practices of others, luck plays a greater role in how well they do." In a somewhat similar vein, Jay Gould says, "Long streaks are, and must be, a matter of extraordinary luck imposed on great skill." The paradox of skill explains why it is hard to consistently beat the market. As Charles Ellis says, "Gifted, determined, ambitious professionals have come into investment management in such large numbers during the past 30 years that it may no longer be feasible for any of them to profit from the errors of all the others sufficiently often and by sufficient magnitude to beat the market averages."
9. When we talk about success, we tend to over-emphasise skill and under-emphasise luck. A closer examination, however, would reveal the substantial role played by luck. As Mauboussin says, "History is written *about* the winners, because we like to see clear cause and effect. Luck is boring as the driving force in a story."
10 Reversion to the mean implies that an outcome that is far from the average will be followed by an outcome that is closer to the average. The position of an activity on the luck-skill continuum determines the *rate* of reversion to the mean. If an activity depends solely on luck, there is complete reversion to the mean. On the other hand, if an activity relies entirely on skill, there is no reversion to the mean.
11. The luck-skill continuum is a simple but powerful concept. It helps us to understand when luck makes the level of skill irrelevant.
12. To place activities on the luck-skill continuum, you have to understand the nature of the activity and the outcomes it produces. In this context, answering some basic

questions is helpful. First, can you easily assign a cause to the effect you see? If yes, the activity is most likely to lie on the skill side of the continuum. Second, what is the rate of reversion to the mean? If the reversion to the mean is slow, skill plays a dominant rote; if it is rapid, luck plays a dominate role. Third, how useful are expert predictions? When the predictions of experts are similar and accurate, skill plays a dominant role. When experts differ widely and predict poorly, luck plays a dominant role.

13. Experts are notoriously fallible in predicting the outcomes of economic, social, and political systems. This is because these systems are complex adaptive systems where the outcomes depend on the interaction of lots of individual agents. Such systems obscure cause and effect. What is surprising is not the poor record of experts, but people's faith in experts.
14. The most common way to understand the determinants of business success is to find successful companies and identify the common practices of these companies. Jim Collin's immensely popular book *Good to Great* exemplifies this approach. Such an approach works if causality were clear. The problem with this approach is that the performance of a company depends on skill as well as luck, implying that a given strategy will succeed only part of the time. So attributing success to a given strategy may be naïve because you're looking at the sample of only the winners. Jerker Denrell refers to this as the *under sampling of failure*. The question that needs to be asked is: How many companies that tried a given strategy succeeded or failed? As Mauboussin says, "Since we draw our sample from the outcome, not the strategy, we observe the successful company and assume that the strategy was good. In other words, we assume that the favourable outcome was the result of a skillful strategy and overlook the influence of luck."
15. A careful study by Andy Henderson, Michael Raynor, and Mumtaz Ahmed examined tens of thousands of companies over a period of four decades, using over 23,000 return on assets (ROA) observations, to distinguish between luck and skill in explaining corporate success. The principal finding of their study is that "the results consistently indicate that there are many more sustained superior performers than we would expect through the occurrence of lucky random walks." The authors however caution that it is fairly easy to confuse superior performance with the results from luck. As they write, "Our results show that it is easy to be fooled by randomness, and we suspect that a number of the firms that are identified as sustained superior performers based on 5-year or 10-year windows may be possessors of exceptional luck."
16. Like athletes, companies tend to follow a lifecycle. As the industry matures, all competitors tend to move toward optimal efficiency and, as a result, excess returns are dissipated. As Bruce Greenwald said, "in the long run everything is a toaster." The toaster symbolises a mature business, with no entry barriers and no excess returns.
17. Based on their research, Robert Wiggins and Timothy Ruefle argue that there is clear evidence of reversion to the mean in the corporate world. Further, returns seem to be converging at a faster rate today than they did in the past.

SUMMARY

- In the slow process of natural selection, our minds adapted to seek the ultimate goal of reproduction in the environment of evolutionary adaptiveness (EEA).
- Self-deception manifests itself primarily in the form of over-confidence. People tend to be overconfident. Psychologists say that due to overconfidence, people overestimate their knowledge and abilities, underestimate risks, exaggerate their ability to control things, and often display over optimism.
- Overconfidence manifests itself in various forms. The common ones being **miscalibration**, better-than-average effect, and excessive optimism.
- People tend to overestimate – or miscalibrate – the precision of their knowledge.
- When people are asked to rate themselves on some positive personal attribute (such as driving skill or teaching ability) relative to others, most tend to rate themselves above average on those attributes. This is called the **better-than-average effect**.
- One of the most important cognitive biases is **optimistic bias**. As Kahneman put it, "Most of us view the world as more benign than it really is, our attributes as more favorable than they truly are, and the goals that we adopt as more achievable than they are likely to be."
- Why do managers manipulate earnings when they know that it is unsustainable and a self-destructive activity? The answer perhaps lies in the cognitive trait of **overconfidence**.
- Overconfidence is caused by several factors such as the illusion of knowledge, the illusion of control, the illusion of understanding, the illusion of validity, and the illusion of skill. Psychologists say that due to overconfidence people overestimate their knowledge, underestimate risks, and exaggerate their ability to control things.
- People tend to believe that the more information they have, the more knowledgeable they are, and the more accurate their forecasts are likely to.
- The factors that cause the illusion of control are choice, information, familiarity with task, and outcome sequence.
- A **narrative fallacy** is a flawed story of the past that shapes our views of the world and our expectations of the future. Narrative fallacies stem from our continuous attempt to make sense of the world.
- The illusion of skill is widespread. As Kahneman put it, "The illusion of skill is not only an individual aberration: it is deeply ingrained in the culture of the industry. Facts that challenge such basic assumptions—and thereby threaten people's livelihood and self-esteem—are simply not absorbed."
- Inside each of us, there is a con-artist who cajoles us into an inflated sense of our powers. It appears that the less skilled or experienced a person is, the harder the

con man works. It is good up to a point as it boost our self-esteem, but it becomes dysfunctional thereafter.

- Along with overconfidence, the other forms of self-deception are avoidance of cognitive dissonance, self-attribution bias, confirmation bias, hindsight bias, naïve realism, and distorted self-perceptions. All of these make people feel better about themselves than they might be if they were bias-free.
- When newly acquired information is at variance with preexisting understanding, people usually experience mental discomfort which is referred to as **cognitive dissonance**.
- **Self-attribution bias** means that people tend to ascribe their success to their skill and their failure to their bad luck. Harvard psychologist Langer called this phenomenon as "head I win, tail it's a chance."
- People tend to overlook information that is contrary to their views in favour of information that confirms their views.
- People have a tendency to view events as more predictable than they really are. This bias is called the **hindsight bias**. It is often referred to as the "I-knew-it-all-along phenomenon."
- People think that they see the world directly, as it really is. They further believe that the facts as they see are there for all to see and hence, others should agree with them. This may be called **naïve realism** and it causes a great deal of strife.
- Why are experts inferior to algorithms? One reason is that experts try to consider complex combinations of features. While complexity may work in an odd case, more often than not it reduces validity. Another reason is that humans are incorrigibly inconsistent in drawing inferences from complex information.
- To understand when judgments reflect true expertise and when they display the illusion of validity, we should know the conditions for acquiring a skill. It seems that skill can be acquired when the environment is sufficiently regular to be predictable and there is an opportunity to learn these regularities through sustained practice.
- A combination of skill and luck influences much of what we experience in life. To understand the performance of a firm, we must learn to untangle the role of skill and luck.

DISCUSSION QUESTIONS

1. What is miscalibration? What explains miscalibration?
2. What is the better-than-average effect? What contributes to it?
3. What is optimistic bias?

4. What factors do cause overconfidence?
5. What factors do cause the illusion of control?
6. Discuss the illusions of validity and skill. What does support them?
7. What is cognitive dissonance? What do people do to reduce cognitive dissonance?
8. Discuss the following: self-attribution bias, confirmation bias, hindsight bias, naïve realism, distorted self-perception.
9. Discuss the illusion of pundits.
10. What is the evidence on superiority of formulas, models, or algorithms?
11. Why do experts tend to be inferior to algorithms?
12. Discuss the robustness of a simple algorithm.
13. Why is there hostility to algorithms?
14. When can you trust expert intuition?
15. Why are we not good at untangling the role of luck and skill?
16. What is luck? What is skill?
17. What is strategy paradox?
18. What is under sampling of failure?

MINI CASE

KINGFISHER AIRLINES

The UB Group of India, headed by Vijay Mallya, launched the Kingfisher Airlines (KFA) in 2005. After having earned the reputation of liquor baron, Vijay Mallya diversified into the totally unrelated business of airlines. He entered the airline industry when the buzzword was 'low cost' and the aviation industry in India was booming. Vijay Mallya, a colourful and flamboyant person, is known for his fondness for "good things in life" such as IPL teams, cars, horses, private jets, yachts, and exotic villas. According to some sources, Vijay Mallya set up KFA in 2005 as a birthday gift for his son, Siddharth Mallya, on his 18^{th} birthday.

The UB Group, under the leadership of Vijay Mallya, built a successful liquor business and Mallya took great pride in building several powerful liquor brands. Fond of good things in life, Vijay Mallya conceived of KFA as a five star airline. He took special interest in building KFA as a premium airlines brand. KFA offered exotic cuisine, provided choice in-flight entertainment, and employed model-like air hostesses. KFA won several awards. Among the more notables of them are: India's Second Buzziest Brand in 2008 by *The Brand Reporter*, Asia Pacific's Top Airline Brand, India's No. 1 Airline in customer satisfaction by *Business World*, Best Airline in India/Central Asia, at the Spytrax World Airline Awards 2010.

The image that it created enabled it to get the KFA brand valued by Grant Thorton at ₹4,100 crore in 2011-12, even though the company was incurring losses. In March, 2016, this valuation was being

probed by the Serious Fraud Investigation Office (SFIO). A Grant Thorton spokesperson said the firm fully stood by its brand valuation report on Kingfisher. He said, "We believe it was appropriate in the context of when it was done and the purpose for which it was done." By the way, RBSA Advisors, a global valuation and transaction advisory firm, carried out two valuation exercises of KFA brand in 2013 and 2015. In 2013, the KFA brand was valued at ₹ 200 crore and in 2015 it was valued at ₹ 100 crore.

To the surprise of many, KFA which prided itself as a provider of premium services, acquired Air Deccan, a low cost carrier in 2007, changed its name to Simplify Deccan and subsequently to Kingfisher Red. Perhaps this acquisition was motivated by a desire to cross the legal hurdles of flying internationally quickly. KFA started its international operations in September 2008. On September 2011, Vijay Mallya announced that KFA would soon stop operations of Kingfisher Red as it did not believe in low-cost operation any longer.

Since its inception KFA never made money. It accumulated losses and debt. Even after two rounds of debt restructuring, it defaulted on its debt and other obligations. In September 2011, KFA made following disclosure to the Bombay Stock Exchange (BSE): "The company has incurred substantial losses and its net worth has been eroded. However, having regard to improvement in the economic sentiment, rationalisation measures adopted by the Company, fleet recovery and the implementation of the debt recast package with the lenders and promoters including conversion of debt into share capital, these interim financial statements have been prepared on the basis that the Company is a going concern and that no adjustments are required to the carrying value of assets and liabilities." KFA lenders later stated that they regarded the company as viable.

On 15 November 2011, KFA released poor financial results indicating that the company was "drowning in high-interest debt and losing money." Mallya suggested that the solution was for the government to reduce fuel and other taxes. In 2012, the Directorate General of Civil Aviation suspended KFA's operator permit and KFA was grounded.

In 2013, lenders began to recall loans. In 2014, KFA loan was treated as an NPA by lenders and United Bank of India declared KFA as a 'willful defaulter.' According to the 2014-15 annual report of the group's holding company, United Breweries Limited, the consortium of bankers had invoked the company's corporate guarantee. In 2015, lenders began the recovery process. In 2016, SBI, the lead banker in a consortium of 17 banks that have loans worth ₹ 9000 crore to KFA, said that they were trying to do everything possible to find a solution.

Discussion Question

1. Discuss the behavioural factors that may have led to the creation and destruction of KFA.

APPENDIX 4A

MINDFUL ECONOMICS: THE PRODUCTION, CONSUMPTION, AND VALUE OF BELIEFS

In earlier economic models, agents relied on simple extrapolation or error-correction rules. Then came the rational-expectations revolution which assumed the agents to be highly sophisticated information processors, who are not prone to systematic errors. The rational-expectations model dominated the field of economics for several decades until the rise of behavioural economics and its emphasis on

"heuristics and biases," which recognises that humans are prone to overconfidence, confirmation bias, distorted probability weights, and several other "wired-in" cognitive mistakes. Since mid-2000s, the pendulum has begun to swing again towards some form of adaptiveness or implicit purposefulness in human cognition. This approach, called the *motivated beliefs and reasoning perspective* recognises that beliefs often serve important psychological and functional needs of an individual. For example, overconfidence and optimism, perhaps the most common manifestations of the motivated beliefs phenomenon make people feel better, compared to despair and uncertainty, and enhance their ability to act successfully and interact productively with others. While excessive overconfidence tends to be dangerous, moderate amounts can be beneficial. Hope and confidence certainly feel better compared to anguish and uncertainty. They enhance a person's ability to act successfully on his behalf and have more productive interactions with others. Puri and Robinson found that more optimistic people work harder, work longer, save more, and are likely to remarry after divorce.

According to Ronald Be'nabou and Jean Tirole, "People thus find themselves motivated (often unconsciously) to achieve positive beliefs and this typically occurs through fundamental asymmetry in the *process* by which beliefs are revised in the face of new evidence: individuals update suitably when facing good news, but fail to properly account for bad news."

Although goal-directed, self-deception can result in a highly inefficient outcome and become a self-trap. When it becomes a *social* phenomenon, the consequences of motivated thinking can *be* even more severe. As Be'nabou and Tirole put it, "Collectively shared belief distortions may amplify each other so that entire firms, institutions, and polities end up locked in denial of unpleasant realities and blind to major risks: unsustainable fiscal imbalances or labour market policies, climate change, collapse of housing or financial markets, and so on."

• Why Do We Have Motivated Beliefs

For a standard economic agent, information, good or bad, is valuable to the extent it improves decision making. But as Schelling aptly described the mind as a "consuming organ," we all know that subjective beliefs can have a direct and powerful affective impact. Perceptions about ourselves (such as self-esteem and self-disappointment) or about the broader environment we face evoke feelings of anxiety, hope, excitement, and so on. Such consumable beliefs may be represented as an element directly entering the preferences of agents.

Subjective beliefs are often instrumental in enhancing self-efficacy. First, self-confidence and optimism provide powerful motivation to undertake and persevere in long-term projects. Second, a person who is convinced of his strength, determination, abilities, and sincerity can convince others better. It appears that this **signaling value** is why humans have evolved the capacity for self-deception, which later may have been deployed for other uses.

Thus, there are two classes of motives that underline departures from objective cognition: **affective motives,** which make oneself or one's future better and **functional motives,** which are helpful in achieving certain goals, internal or external. It appears that religion is the number one form of valued beliefs that typically serve both functions; it provides comfort and it imposes discipline.

• Strategies of Self-Deception and Dissonance Reduction

There are three main strategies of self-deception and dissonance reduction used for protecting valued beliefs: strategic ignorance, reality denial, and self-signaling.

Strategic ignorance means avoiding information sources that may be potentially negative. For instance, many at-risk subjects do not test for Huntington's disease or HIV, even though the test is free, reliable, and can be taken anonymously.

Reality denial is the failure to rationally update beliefs in response to bad news. Warning signals tend to be ignored or processed in a distorted manner.

Self-signaling means that an agent develops diagnostic signals of desired type, by making choices that he subsequently interprets as impartial evidence supporting his abilities, preferences, or perceptions about the world.

• What Differentiates Motivated Beliefs from Bounded Rationality

There are three features that differentiate motivated beliefs and reasoning from failures of inferences on account of bounded rationality or limited attention. These are as follows:

1. Endogenous Directionality Unlike the biases that stem from "System 1" thinking, motivated beliefs are goal-directed, though generally not consciously so.

2. Not a Product of Naiveté or Lack of Attention The concept of bounded rationality implies that individuals who are analytically sophisticated and better educated would be less prone to mistakes and biases. This seems to be true for hyperbolic discounting, endowment effect, loss aversion, and even visual illusions. However, when it comes to confirmation bias, self-enhancement bias, and compartmentalising knowledge, analytically sophisticated, better educated, and more attentive people often display greater propensity towards such behaviour.

3. Heat versus Light In motivated beliefs, *emotion* is also present. As Be'nabou and Tirole put it, "Challenging cherished beliefs directly, like a person's religion, identity, morality, or politics, evokes strong emotional and even physical responses of anger, outrage, and disgust. Such pushback is a clear sign of protected beliefs". This emphasis on the interplay of emotions and information processing is congruent with a similar current trend in psychology and neuroscience, sometimes labeled as the "affective revolution" or "second cognitive revolution."

APPENDIX 4B

MOTIVATED REASONING*

People's preferences can affect their beliefs. As Nicholas Epley and Thomas Gilovich put it, "People generally reason their way to conclusions they favour, with their preferences influencing the way evidence is gathered, arguments are processed, and memories of past experiences are recalled. Each of these processes can be affected in subtle ways by people's motivations, leading to biased beliefs that feel objective." Or as Ziva Kunda put it, "People motivated to arrive at a particular conclusion attempt to

* Adapted from Nicholas Epley and Thomas Gilovich, "The Mechanics of Motivated Reasoning," *The Journal of Economic Perspectives*, Summer 2016, p. 133–140.

be rational and construct a justification of their desired conclusion that would persuade a dispassionate observer. They draw the desired conclusion only if they can muster up the evidence necessary to support it." Thus, motivated reasoning is constrained.

• Motives for Reasoning

The great psychologist and philosopher William James wrote in 1890: "My thinking is first and last, and always for the sake of my doing, and I can do one thing at a time."

One problem in understanding motivated reasoning is that people have multiple goals such as surviving, reproducing, achieving social status, maintaining cooperative relationships, persuading others, having accurate beliefs and expectations, and having consistency in beliefs for effective action. As a result, reasoning directed at one goal may undermine another. A person trying to persuade others about his point may resort to exaggeration, thereby undermining the accuracy of his assessments. A CEO who is obsessed with the bottom line may ignore the ethical implications of actions aimed at advancing short-term profitability.

An important point is that when one goal commandeers attention, the manner in which information is gathered and processed can systematically depart from the accepted standards of rationality. Just the way economists are well aware of crowding-out effects in markets, psychologists recognise that motivated reasoning represents crowding-out effects in attention.

In any given instance, the challenge is to figure out which goals are influencing reasoning. Consider the "above-average" effects in self-evaluation. On almost any desirable human trait, from driving ability to interpersonal skills to trustworthiness, an average person rates himself or herself above average. The above–average effect may reflect egoism (everybody wants to think well of oneself); or it may reflect people's sincere attempt to accurately assess themselves.

• How Motives Influence Beliefs

Reasoning involves two cognitive processes: recruitment of evidence and evaluation of evidence. Goals can cause distortion in both of these cognitive processes.

Recruitment of Evidence Most people do not look at evidence like impartial judges; rather, they recruit evidence like attorneys, looking for evidence that supports a desired position and steering away from evidence that refutes it.

People have a tendency to ask themselves very different questions when they evaluate propositions they favour or oppose. When considering propositions that need to be true, they are likely to ask, "*Can* I believe this?" This standard for evidence is relatively easy to satisfy; after all, even for highly dubious propositions, some evidence can usually be found.

In contrast, when considering propositions that they do not want to be true, they ask "*Must* I believe this?" This standard for evidence is relatively difficult to satisfy; after all, for almost any proposition, some contradictory evidence could be found.

Evaluation of Evidence People with different goals can interpret the very same evidence differently and reach different conclusions. In a telling experiment, participants who were randomly assigned to play the role of a prosecuting attorney regarded the evidence presented in trial to be more consistent

with the defendant's guilt, compared to participants randomly assigned to play the role of the defense attorney.

Any given action can be interpreted in multiple ways. For example, a father lifting a child off the floor may be described as "caring for the child" or "picking the child." Caring for a child is a more benevolent act than just picking the child.

While there is a voluminous literature on the way in which people's goals influence how they evaluate information, psychologists have been especially interested in the distortions meant to achieve consistency. A particularly influential theory is Leon Festinger's theory of cognitive dissonance. People are psychologically uncomfortable if there are inconsistencies between their actions, attitudes, beliefs, or values. So, they have a motivation to resolve these inconsistencies. As Epley and Gilovich put it, "When two beliefs are in conflict, or when an action contradicts a personal value, the individual experiences an unpleasant state of arousal that leads to psychological efforts to dampen or erase the discrepancy, often by changing a belief or attitude."

APPENDIX 4C

TEN COMMANDMENTS FOR ASPIRING SUPER FORECASTERS

Philip Tetlock and Dan Gardner in their book *Superforecasting: The Art and Science of Prediction* (published by rh Books, 2015) offer the following ten commandments for improving forecasting abilities:

1. Triage Focus your questions on areas where your hard work is likely to be rewarded. As he says, "Don't waste time either on easy clocklike questions (where simple rules of thumb can get you close to the right answer), or on impenetrable cloudlike questions. Concentrate on questions in the Goldilocks zone of difficulty, where effort pays off the most."

2. Break seemingly intractable problems into tractable sub-problems A seemingly intractable problem can become manageable if it is broken into tractable sub-problems. As Tetlock and Gardner say, "Decompose the problem into its knowable and unknowable parts. Flush ignorance into the open. Expose and examine your assumptions. Dare to be wrong by making your best guesses. Better to discover errors quickly than to hide them behind vague verbiage." They illustrate this commandment with an example. Peter Backus, a lonely guy in London, guesstimated the potential female partners in his vicinity as follows: Population of London (6 million) × Proportion of women in population (0.5) × Proportion of singles (0.5) × Proportion in the right age (0.2) × Proportion of university graduates (0.26) × Proportion he finds attractive (0.05) × Proportion likely to find him attractive (0.05) × Proportion likely to be compatible with him (0.10) = 20.

Often good estimates arise from a remarkably crude series of assumptions and guesstimates.

3. Strike the right balance between inside and outside views There are two ways to look at a problem, the inside view and the outside view. The inside view makes an estimate based on a plan and a reasonable progression according to the plan. The outside view calls for looking at the outcomes of similar projects or initiatives and using that evidence to inject greater objectivity in the forecasting exercise.

The advantage of the outside view is most pronounced for initiatives which have not been attempted earlier such as entering a new market or building a plant using a new technology. Ironically, the inside view is often preferred in such a case. As Dan Lovallo and Daniel Kahneman put it, "Managers feel that if they don't fully account for the intricacies of the proposed project, they would be derelict in their duties. Indeed, the preference for the inside view over the outside view can feel almost like a moral imperative."

Superforecasters habitually pose the outside-view question: How often do such things happen in situations of this kind? This helps them strike a balance between the inside and outside views.

4. Strike the right balance between under- and overreacting to evidence Skillful updating of beliefs calls for picking up subtle clues before everyone else and avoiding being suckered by misleading clues. Savvy forecasters know how to revise their probability estimates quickly in response to diagnostic signals. As Tetlock and Gardner put it, "Superforecasters are not perfect Bayesian updaters but they are better than most of us. And that is largely because they value this skill and they work hard at cultivating it."

5. Look for the clashing causal forces at work in each problem For every good policy argument, there is often a counterargument that cannot be easily dismissed. Superforecasters are skillful in synthesising divergent views. As Tetlock and Gardner put it, "Synthesis is an art that requires reconciling irreducibly subjective judgments. If you do it well, engaging in this process of synthesising should transform you from a cookie-cutter dove or hawk into an odd hybrid creature, i.e. a dove-hawk, with a nuanced view of when tougher or softer policies are likelier to work."

6. Strive to distinguish as many degrees of doubt as the problem permits but no more Things are rarely certain or impossible, and maybe not very informative. Since nuance matters, you need more than three settings on your uncertainty dial. As Tetlock and Gardner say, "The more degrees of uncertainty you can distinguish, the better a forecaster you are likely to be. As in poker, you have an advantage if you are better than your competitors at separating 60/40 bets from 40/60 or 55/45 from 45/55." It may feel unnatural at first to translate vague verbal hunches into numeric probabilities. But it can be done with patience and practice. We can learn quite quickly to think about uncertainty in a more granular fashion.

7. Strike the right balance between under- and overconfidence, between prudence and decisiveness There is a risk in making a hasty judgment as well as in waffling too long. Aware of these risks, superforecasters strike the right balance between the need to take decisive stands and the need to qualify their stands. As Tetlock and Gardner put it, "It is not enough just to avoid the most recent mistake. They have to find creative ways to tamp down both types of forecasting errors, i.e. misses and false alarms, to the degree a fickle world permits such uncontroversial improvements in accuracy."

8. Look for the errors behind your mistakes but beware of rearview mirror hindsight biases Own your mistakes. Don't try to rationalise them. Conduct objective postmortems of your failures. Remember that while it is common to learn too little from failure, there is also a possibility of learning too much.

Do a postmortem of your successes as well. As Tetlock and Gardner put it, "Not all successes imply that your reasoning was right. You may have just lucked out by making offsetting errors. And if you confidently keep reasoning along the same lines, you are setting yourself up for a nasty surprise."

9. Bring out the best in others and let others bring out the best in you *Inter alia*, skillful team management involves perspective taking (understanding well the arguments of the other side), precision questioning (helping others to clarify their arguments so that there is no scope for misunderstanding), and constructive confrontation (disagreeing without offending). Wise leaders know the subtle difference between making a helpful suggestion and micromanagerial meddling. As Tommy Lasorda put it, "Managing is like holding a dove in your hand. If you hold it too tightly you kill it, but if you hold it too loosely, you lose it."

10. Master the error-balancing cycle As clear from the preceding discussion, implementing each commandment calls for balancing opposing errors. Learning the art of error-balancing requires practice. As Tetlock and Gardner put it, "Just as you can't learn to ride a bicycle by reading a physics textbook, you can't become a super forecaster. Learning requires doing with good feedback that leaves no ambiguity about whether you are succeeding."

11. Don't treat commandments as commandments As no two cases will ever be same, it is not possible to lay down binding rules. In a world where nothing is certain or exactly repeatable, discretion is required in following the guidelines. As Tetlock and Gardner put it, "Superforecasting requires constant mindfulness, even when you are dutifully trying to follow these commandments."

■ ■

Chapter **5**

Prospect Theory and Mental Accounting

According to the expected utility theory, the economic agent is rational and selfish, and has stable tastes. Psychologists, however, challenge this assumption. They believe that people are neither fully rational, nor completely selfish. Further, their tastes tend to change over time. The two disciplines seemed to be studying different species which the renowned behavioural economist Richard Thaler labelled Econs and Humans. As Amos Tversky, a distinguished psychologist famously remarked, "While my colleagues in the economics department study artificial intelligence, we study natural stupidity."

For several years, Daniel Kahneman and Amos Tversky looked at how people make decisions in the face of risk. They established a dozen facts and several of these were inconsistent with expected utility theory. So, they developed a theory that modified expected utility theory just enough to explain the collection of their observations and called it prospect theory in their seminal paper titled "Prospect Theory: An Analysis of Decision under Risk." Fortuitously, the paper was published in *Econometrica* a top ranking quantitatively oriented economics journal where it received a lot of attention from economists and others. The following is the actual abstract of the paper. "This paper presents a critique of expected utility theory as a descriptive model of decision making under risk, and develops an alternative model, called prospect theory. Choices among risky prospects exhibit several pervasive effects that're inconsistent with the basic tenets of utility theory. In particular, people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty. This tendency, called certainty effects, contributes to risk aversion in choices involving sure gains and to risk seeking in choices involving sure losses."

While the prospect theory was closely modelled on utility theory, it departed from the latter in fundamental ways. It is a purely descriptive model which seeks to document and explain systematic violations of the axioms of rationality in choices between gambles. The approach taken by prospect theory was in the spirit of a field of psychology called psychophysics founded by Gustav Fechner, a German psychologist, who was obsessed with how mind and matter are related.

This chapter discusses the essentials of prospect theory along with mental accounting, two cornerstone ideas of behavioural finance. It also discusses SP/A theory and framing effects. It is divided into five sections as follows:

- Errors in Bernoulli's theory
- Prospect theory
- SP/A theory
- Framing
- Mental accounting

5.1 ✦ ERROR IN BERNOULLI'S THEORY

The longevity of the theory of expected utility proposed by Bernoulli is all the more remarkable because it is seriously erroneous. The error in his theory is not in what is states explicitly; rather, it lies in what it ignores or tacitly assumes. To understand this, consider the following scenarios.

Today Ram and Shyam have a wealth of ₹10 million. Yesterday, Ram had ₹5 million and Shyam had ₹15 million.

Is their happiness the same? (Do they have the same utility?)

According to Bernoulli's theory, utility depends on wealth and since Ram and Shyam have the same wealth, they should be equally happy. Your common sense, however, tells you that today Ram will be elated and Shyam despondent. Thus, Bernoulli's theory must be wrong.

The happiness that Ram and Shyam experience is a function of the recent *change* in wealth, in relation to the different states of wealth that define their reference points (₹5 million for Ram and ₹15 million for Shyam). As Kahneman put it, "This reference dependence is ubiquitous in sensation and perception. The same sound will experience as very loud or quite faint, depending on whether it was preceded by a whisper or by a roar."

Here is another example of what Bernoulli's theory misses. Consider Ravi and Geeta:

Ravi's current wealth is ₹2 million.

Geeta's current wealth is ₹5 million.

Both of them are offered a choice between a gamble and a sure thing, in lieu of their current wealth, and they have to opt for one of them.

Gamble It has two equiprobable outcomes: ₹2 million or ₹5 million

OR

Sure Thing ₹3 million for sure

As per Bernoulli's analysis, Ravi and Geeta face the same choice: expected wealth of ₹3.5 million, if they opt for the gamble or a certain wealth of ₹3 million, if they opt for the sure thing. Bernoulli would expect Ravi and Geeta to make the same choice assuming that their utility function is the same. However, this prediction is not correct. Bernoulli's theory fails here as it does not allow for the different *reference points* from which Ravi and Geeta evaluate their options. Imagine yourself to be in Ravi's and Geeta's shoes and you will quickly realise that their current wealth matters a great deal. They are likely to think as follows:

Ravi: "The sure thing of ₹3 million will increase my wealth (which is currently ₹2 million) by 50 per cent with certainty and this is quite attractive. The gamble provides an equal chance of increasing my wealth to ₹5 million or gain nothing."

Geeta: "The sure thing of ₹3 million will decrease my wealth (which is currently ₹5 million) by 40 per cent with certainty, which is awful. The gamble provides an equal chance of not losing anything or losing 60 per cent of my wealth."

Ravi is most likely to choose the "sure thing" whereas Geeta is most likely to choose the "gamble." The "sure thing" makes Ravi happy but Geeta miserable. Why? Ravi is happy with the "sure thing" because it guarantees an increase of 50 per cent whereas the gamble may mean that he has a 50 per cent chance that he will gain nothing. Geeta does not like the "sure" thing because it means that she will suffer 40 per cent erosion of her wealth. The "gamble" appeals to her because it offers a 50 per cent chance that she can protect her wealth. Neither Ravi nor Geeta thinks in terms of states of wealth. Ravi thinks of *gains*, Geeta thinks of *losses*. While the possible states of wealth they face are the same, the psychological outcomes they assess are entirely different.

Since Bernouilli's model lacks the idea of a reference point, expected utility theory ignores the fact that the outcome that appeals to Ravi is not acceptable to Geeta.

Bernouilli's model can explain Ravi's risk aversion but it cannot explain Geeta's preference for a gamble. Her risk-seeking behaviour is similar to what is often observed in entrepreneurs and military generals when all the options they face are bad.

You may be wondering why the Bernouilli model survived for so long despite such flaws. Kahneman offers an explanation: "I can explain it only by a weakness of the scholarly mind that I have often observed in myself. I call it theory-induced blindness: once you have accepted a theory and used it as a tool in your thinking, it is extraordinarily difficult to notice its flaws."

5.2 ✦ PROSPECT THEORY

In the early 1950s, Harry Markowitz, who later got the Nobel prize in economics for his work in finance, proposed a theory in which utilities were assigned to changes of wealth and not to states of wealth. For almost a quarter of a century, this idea did not attract much attention till Daniel Kahneman and Amos Tversky decided that this was the way to go. They developed a theory which defined outcomes as gains and losses, not as states of wealth. As Daniel Kahneman observed, "Knowledge of perception and ignorance about decision theory both contributed to a large step forward in our research."

In their 1979 *Econometrica* paper mentioned earlier, Daniel Kahneman and Amos Tvesky provided a series of simple but compelling demonstrations of how the predictions of expected utility theory, economists' workhorse model of decision making under risk, are systematically violated by people in laboratory settings. They presented a new theory of risk attitudes, called "prospect theory," which elegantly reflected the empirical evidence on risk taking, including the observed violations of expected utility. In 1992, they published a modified version of their theory, called "cumulative prospect theory," which is now typically used. This version will be discussed here.

Key Tenets of Prospect Theory

The key tenets of prospect theory are:

- Reference dependence
- Diminishing sensitivity
- Loss aversion
- Changes in risk attitude
- Decision weights

For discussing the tenets, we will use the notation introduced in Chapter 2. Recall that a prospect P(*pr*, *A*, B) is a gamble whose outcomes are A (with a probability of *pr*) and B (with a probability of (1 – *pr*)). If the second outcome is omitted, as in P (*pr*, *A*), it means that it is zero. Finally, if the probability also is omitted, as in P(A), it means that it is a certain (riskless) prospect.

Reference Dependence The value of a prospect depends on gains and losses relative to a reference point, which is usually the status quo.

Consider the following decision situations:

Decision Situation 1:	Assume that you are richer by ₹3,000 than you are today, and then choose between P1 (₹1,000) and P2 (0.50, ₹2,000)
Decision Situation 2:	Assume that you are richer by ₹5,000 than you are today, and then choose between P3 (–₹1,000) and P4 (0.5, ₹2,000)

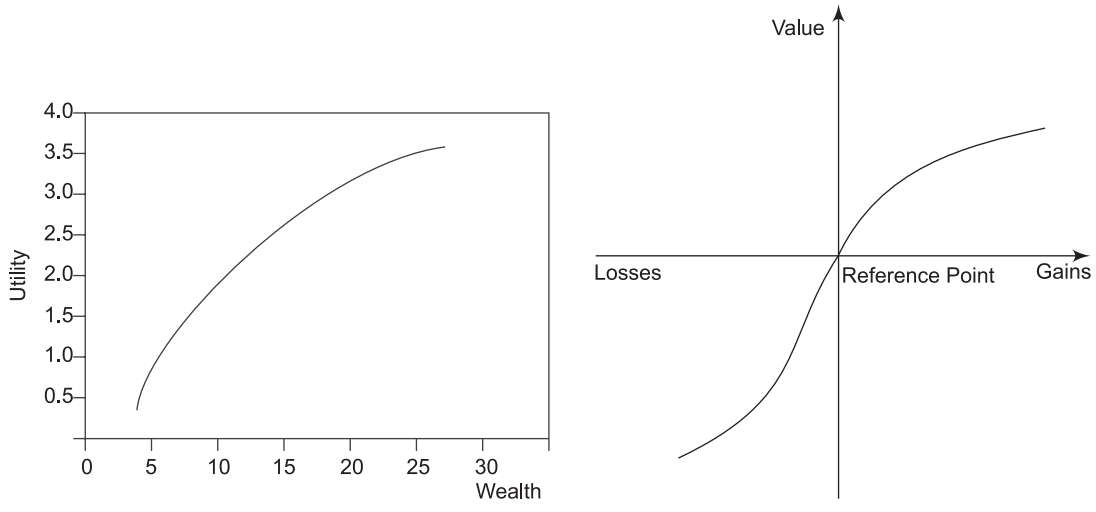
You can see that the two situations are effectively the same. In both of them, the decision is between a certain ₹4,000 and a prospect which has two payoffs, ₹3,000 and ₹5,000, with equal probabilities. Yet, respondents typically choose P1 and P4. This means that in decision situation 1 they shun risk, whereas in decision situation 4, they seek risk. The risk attitude is not the same across gains and losses because what matters to people is not the level of wealth, but the change in wealth. People typically evaluate an outcome in terms of gain or loss, relative to a reference point, which is usually the current wealth. Note that in the above problem, the two decision situations assume different starting wealth position. An important difference between expected utility theory and prospect theory is that the former assumes that people value an outcome based on the final wealth position, regardless of the initial wealth, whereas the latter assumes that people value an outcome in terms of gain or loss relative to a reference point, which is usually the current wealth.

The utility function of a rational person as per expected utility theory is shown in Panel A of Exhibit 5.1. According to this description, higher wealth provides higher satisfaction or "utility," but at a diminishing rate. This results in risk aversion. The increase in utility from a gain of ₹10,000 is less than the decrease in utility from a loss of ₹10,000.

The prospect theory provides an alternative description of preferences. According to prospect theory, utility (referred to as value) depends not on the **level** of wealth as in Panel A of Exhibit 5.1, but on **changes** in wealth from current levels as in Panel B of Exhibit 5.1.

Diminishing Sensitivity How do people value gains/losses? They value gains/losses according to an S-shaped value function as shown in Panel B of Exhibit 5.1. Notice the following features of the value function.

Exhibit 5.1 Expected Utility Theory and Prospect Theory



(A) Utility Function under Expected Utility Theory **(B) Value Function under Prospect Theory**

- The value function is concave for gains. This means that people feel good when they gain, but twice the gain does not make them feel twice as good. The concavity over gains means that people tend to be *risk-averse* over moderate probability gains: they prefer a certain gain of 1000 to a 50 per cent chance of 2000.
- The value function is convex for losses. This means that people experience a pain when they lose, but twice the loss does not mean twice the pain. The convexity (or diminishing sensitivity) over losses means that people tend to be *risk–seeking* over losses: they prefer a 50 per cent chance of losing 2000 to losing 1000 for sure. While the convexity of the value function over losses captures an important facet of preference, it ignores another. A person facing a loss that represents a large fraction of wealth tends to be very sensitive, not insensitive, to further losses.

Put simply, people experience diminishing sensitivity to gains/losses. The diminishing sensitivity to changes away from status quo reflects a basic human trait called the Weber-Fechner Law, one of earliest findings in psychology. According to this law, the just noticeable difference in any variable is directly proportional to the magnitude of that variable. If you gain 100 grams in weight, you won't notice it, but if you are buying gold, the difference, between 100 grams and 200 grams is obvious.

Loss Aversion The value function is steeper for losses than for gains. This means that people feel more strongly about the pain from a loss than the pleasure from an equal gain – about two and half times as strongly, according to Kahneman and Tversky. This phenomenon is referred to as loss aversion. It is quite different from risk aversion.

Kahneman and Tversky infer loss aversion from the fact that most people reject the gamble (–₹1,000, ½; ₹1,100, ½). It is hard to understand this fact in the expected utility framework.

The rupee amounts are so small in relation to typical wealth levels that under expected utility theory, the gamble would be evaluated essentially in a risk-neutral way. Since it has a positive expected value, it is attractive. However, for a loss-averse individual, the gamble lacks appeal: the pain of losing ₹1,000 far exceeds the pleasure of winning ₹1,100.

What explains loss aversion? In the ancient laboratory of evolution sensitivity to losses was perhaps more helpful to survive than appreciation of gains. As psychologist Amos Tversky said, "It would have been wonderful to be a species that was almost insensitive to pain and had an infinite capacity to appreciate pleasure. But you probably wouldn't have survived the evolutionary battle." Over thousands of generations, a "better safe than sorry" reflex has become a deeply ingrained instinct in humans, as it is in other animals.

The concept of loss aversion may be explained from a biological and psychological point of view. As Daniel Kahneman put it, "The brains of humans and other animals contain a mechanism that is designed to give priority to bad news. By shaving a few hundredths of a second from the time needed to detect a predator, this circuit improves the animal's odds of living long enough to reproduce." He further added, "The negative trumps the positive in many ways and loss aversion is one of the many manifestations of the broad negativity dominance."

The brain responds to even symbolic threats. Emotionally loaded bad words (war, crime, disaster) attract attention faster than happy words (love, tranquility, peace). Even if there is no real threat, the mere reminder of a bad event is perceived as threatening.

That we pay more attention to possible losses than gains makes sense. Steven Pinker's book, *How the Mind Works*, quotes social psychologist Timothy Ketelaar as saying, "as things get better, increases in fitness show diminishing returns: more food is better, but only up to a point. But as things get worse, decreases in fitness can take you out of the game; not enough food and you're dead."

Our aversion to pain also encourages a certain human behaviour: to take the most rewarding view of events. We interpret choices and events in ways that make us feel better. We often prefer to hear supporting reasons for our beliefs; think of ourselves as more talented than others; and make the best of bad situations.

The concept of loss aversion is perhaps the most significant contribution of psychology to behavioural economics. Loss aversion is a manifestation of the broad dominance of negativity. As a psychologist put it, "Bad emotions, bad parents, and bad feedback have more impact than good ones, and bad information is processed more thoroughly than good. The self is more motivated to avoid bad self-definitions than to pursue good ones. Bad impressions and bad stereotypes are quicker to form and more resistant to disconfirmation than good ones."

It is worth emphasising that the S-shaped curve captures an enormous amount of wisdom about human nature. The upper portion, which reflects gains, has the same shape as the utility of wealth function (in the standard expected utility theory) capturing the notion of diminishing sensitivity. But notice that the lower portion, which reflects losses, also captures diminishing sensitivity. This means that the difference between losing ₹10,000 and ₹20,000 feels much bigger than the difference between losing ₹100,000 and ₹110,000. This is quite different from the standard model in which starting from a given level of wealth, losses are captured by moving down the utility of wealth line, which is a concave line implying that each loss becomes more painful. If a person cares less and less about increases in wealth, then it means that he cares more and more about decreases in wealth.

Changes in Risk Attitude Depending on the nature of the prospect, people sometimes display risk aversion and sometimes display risk seeking.

To illustrate this aspect of behaviour, imagine that you are presented with the following pair of concurrent decisions situations.

Decision Situation 3 : Choose between P5 (₹2400) and P6 (0.25, ₹10000)

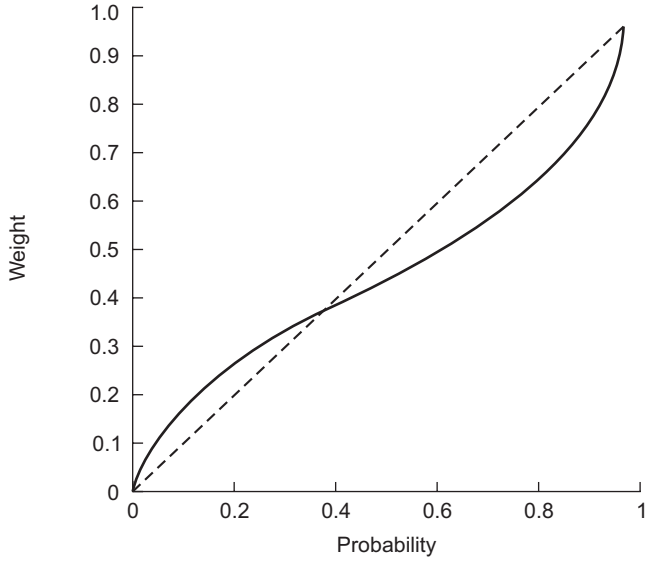
Decision Situation 4: Choose between P7 (–₹7500) and P8 (0.75, –₹10000)

In other words, in the first situation you have to choose between a sure gain of ₹2,400 and a 25% chance of gaining ₹10,000. In the second situation, you have to choose between a sure loss of ₹7,500 and a 75% chance of losing ₹10,000.

When such decision situations are presented to respondents in experiments, the respondents typically choose P5 in decision situation 3, which means that they exhibit risk aversion. However, in decision situation 4, the respondents typically choose P8, which means that they exhibit risk seeking. While expected utility theory does not allow for changes in risk attitude like this, prospect theory allows for variations in risk attitude depending on the nature of the prospect.

Decision Weights In utility theory, people weight outcomes by their objective probabilities p_i, but in prospect theory people weight outcomes by transformed probabilities or decision weights π_i. The decision weights are computed using a weighting function W (.) which is a function of objective probability. In Exhibit 5.2 the solid line is the weighting function proposed by Tversky and Kahneman, whereas the dotted line (a 45 degree line) represents the objective probabilities used in the expected utility theory. A comparison of the two suggests that the weighting function overweights low probabilities and underweights high probabilities.

Exhibit 5.2 Weighting Function



It must be emphasised that in cumulative prospect theory, the weighting function is applied to cumulative probability – for example, to the probability of gaining at least 10,000, or of losing 5000 or more. Note that the weighting function shown in Exhibit 5.2 leads the individual to overweight the *tails* of any distribution. Put differently it overweights unlikely extreme outcomes. Tversky and Kahneman explain this partly from the fact that people like both lotteries and insurance. This means people prefer a 0.001 chance of winning 10,000 to a certain gain of 10, but also a certain loss of 10 to a 0.001 chance of losing 10,000. It is difficult to explain a coexistence of such behaviours with expected utility. In cumulative prospect theory, the unlikely state of the world in which the individual gains or loses 10,000 is overweighted in his mind.

• Hypothetical Value and Weighting Functions

Kahneman and Tversky conducted an extensive experiment in which subjects were asked to provide certainty equivalents for a number of prospects presented to them. On the basis of the results of this experiment, Kahneman and Tversky proposed hypothetical forms for the value and weighting functions and also estimated the relevant parameters.

According to the prospect theory, the value function should reflect concavity for gains and convexity for losses and loss aversion. A **value function** that is consistent with these properties is:

$$v(z) = z^{\alpha} \qquad 0 < \alpha < 1 \qquad \text{if } z \geq 0 \tag{5.1a}$$

$$v(z) = -\lambda(-z)^{\beta} \qquad \lambda > 1,\ 0 < \beta < 1 \qquad \text{if } z < 0 \tag{5.1b}$$

This is a two-part power function. On the basis of their empirical data, Kahneman and Tversky estimated α and β to be approximately 0.88 each and λ to be approximately 2.25. These estimates suggest that losses loom larger than gains in the value function, as shown in Exhibit 5.1, which in fact depicts this particular value function. This may be regarded as the value function of a typical decision maker. The relevant parameters may have higher/lower values for some people.

Based on their estimates, Kahneman and Tversky suggested the following **weighting function**.

$$W(P) = \frac{P^{\delta}}{\left[P^{\delta} - (1-P)^{\delta}\right]^{1/\delta}} \quad \delta > 0; \text{ if } z \geq 0 \tag{5.2a}$$

$$W(P) = \frac{P^{\gamma}}{\left[P^{\gamma} - (1-P)^{\gamma}\right]^{1/\gamma}} \quad \gamma > 0; \text{ if } z < 0 \tag{5.2 b}$$

Exhibit 5.2 depicts this weighting function. They estimated δ and γ as 0.61 and 0.69. Since these magnitudes are close, we may, for simplicity, use the average value (0.65) for gains as well as losses. From the exhibit we find that low-probability outcomes are accorded relatively higher values and certainty is weighted highly compared to near-certainty. This is consistent with evidence.

Thanks to its ability to explain how people make decisions in face of risk, prospect theory has been quite influential and is considered as an important contribution to economics. In 2002, Daniel Kahneman was given the Nobel prize in economics "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty."

• The Four-Fold Pattern of Preferences

According to the expected utility theory developed by John von Neumann and Oscar Morgenstern, a rational decision maker must conform to the expectation principle which says that values are weighted by their probability. They derived the expectation principle from the axioms of rational choice. They proved that any weighting of uncertain outcomes that was not strictly proportional to probability would lead to inconsistencies. Considered as a monumental achievement, the expected utility theory forms the core of the rational agent model in economics and other social sciences.

Maurice Allais, a Nobel Laureate in Economics, constructed puzzles meant to demonstrate to his guests that they were susceptible to certainty effect which violated the expected utility theory and the axioms of rational choice underlying that theory.

A simplified version of the puzzle that Allais constructed is given below.

In problems, X and Y, which would you choose?

X: 62% chance to win ₹480,000 or a 64% chance to win ₹460,000

Y: 98% chance to win ₹480,000 or a 100% chance to win ₹460,000

Most people prefer the left hand option in problem X and the right hand option is problem Y. This means they commit a logical error and violates the rule of rational choice.

What explains such behaviour? Two ideas provide an answer:

- People attach values to gains and losses rather than to actual wealth.
- People assign decision weights to outcomes that are different from probabilities

In combination, the above ideas explain a distinctive pattern of preferences that Amos Tversky and Daniel Kahneman called the four-fold pattern. This is shown in Exhibit 5.3.

Exhibit 5.3 The Four-Fold Pattern of Preference

	Gains	*Losses*
HIGH PROBABILITY Certainty Effect	95% chance to win ₹1,000,000 Fear of disappointment RISK AVERSE Accept unfavourable settlement	95% chance to lose ₹1,000,000 RISK SEEKING Reject favourable settlement
LOW PROBABILITY Possibility Effect	5% chance to win ₹1,000,000 Hope of large gain RISK SEEKING Reject favourable settlement LOTTERY TICKET	5% chance to lose ₹1,000,000 Fear of large loss RISK AVERSE Accept unfavourable settlement INSURANCE

Accustomed to thinking in terms of risk aversion except for the bottom left cell (where lotteries are preferred), Amos Tversky and Daniel Kahneman were surprised by the results of top right cell where people become risk seeking. They identified two reasons for such behaviour.

Value Function Due to diminishing sensitivity, the reaction to a loss of ₹800,000 is more than 80 per cent as intense as the reaction to a loss of ₹1,000,000.

Decision Weights The decisions weights corresponding to a probability of 90 per cent is only about 71 per cent.

The pattern observed in the top row of the above exhibit can be explained by the value function and the decision weights. Commenting on the top right cell, Daniel Kahneman wrote, "Many unfortunate human situations unfold in the top right cell. This is where people who face bad options take desperate gambles, accepting a high probability of making things worse in exchange for a small hope of avoiding a large loss."

It must be emphasised that the transformed probabilities π_i are not erroneous beliefs; rather, they represent decision weights. According to prospect theory, if someone is offered a 0.001 chance of winning 10,000, he knows what it means for something to have a 0.001 probability of occurring. However, in evaluating the gamble, this person weights the 10,000 by more than 0.001.

• Blind Spots of Prospect Theory

We have so far criticised the rational model and expected utility theory and praised the prospect theory. It is time for restoring some balance.

The omission of prospect theory and loss aversion in most introductory texts in economics may seem odd, but it appears that there are good reasons for this. As Daniel Kahneman explains, "The basic concepts of economics are essential intellectual tools, which are not easy to grasp even with simplified and unrealistic assumptions about the nature of the economic agents who interact in markets. Raising questions about these assumptions even as they are introduced would be confusing and perhaps demoralising."

Like the expected utility theory, the prospect theory too has its flaws.

In prospect theory it is assumed that the reference point, usually the status quo, has a value of zero. While reasonable, this assumption can lead to some absurd consequences. To illustrate this, Kahneman presents an interesting choice situation. Consider the following gambles.

A. One chance in a million to win $1 million
B. 90% chance to win $12 and 10% chance to win nothing
C. 90% chance to win $1 million and 10% chance to win nothing

In all the three gambles, winning nothing is a possible outcome, and prospect theory assigns the same value to that outcome in all the cases. Since winning nothing is the reference point, its value is zero. Do you think it to be so? Of course not. In the first two cases, winning nothing is a non-event and assigning it a zero value makes sense. However, in the third case, winning nothing is intensely disappointing. Relative to the high probability of winning a large sum, winning nothing will be experienced as a hugely adverse consequence. But prospect theory does not reckon this reality, because it does not allow the value of an outcome (in this case,

winning nothing) to change when the alternative is very desirable. As Kahneman admits, "In simple words, prospect theory cannot deal with disappointment. Disappointment and the anticipation of disappointment are real, however, and the failure to acknowledge them is as obvious a flaw as the counterexamples that I invoked to criticise Bernoulli's theory."

Further, prospect theory as well as utility theory, ignore the possibility of regret. Both the theories assume that available options in a choice situation are evaluated separately and independently, and the option that has the highest value is chosen. Kahneman argues that this assumption is wrong and gives the following example to demonstrate this:

A. Choose between 90% chance to win $1 million Or $50 with certainty.
B. Choose between 90% chance to win $1 million Or $150,000 with certainty.

While failing to win is disappointing in both the cases, the potential pain is greater in B because if you choose the gamble and lose, you will regret your "greedy" choice by foregoing a sure gain of $150,000.

Several models of decision making have been proposed to reflect the emotions of regret and disappointment, but they have had less influence than prospect theory. Why? Kahneman explains: "The emotions of regret and disappointment are real, and decision makers surely anticipate these emotions when making choices. The problem is that regret theories make few striking predictions that would distinguish them from prospect theory, which has the advantage of being simpler." He further adds: "Prospect theory was accepted by many scholars not because it is 'true' but because the concepts that it added to utility theory, notably the reference point and loss aversion, were worth the trouble, and they yielded new predictions that turned out to be true. We were lucky."

5.3 ✦ SP/A THEORY

SP/A theory, a psychologically based theory of choice among risky alternatives, was proposed by Lola Lopes and further developed by Lopes and Oden. Lopes' 1987 article, "The Psychology of Risk: Between Hope and Fear," captures the idea that the emotions of hope and fear influence the choice among risky alternatives. According to SP/A theory, people evaluate risky alternatives by using an objective function which has three arguments, viz., security (S), potential (P), and aspiration (A).

Let us consider two decision-makers who are faced with an identical risk, or prospect D. However, they experience different degrees of fear. Understandably, the decision maker who experiences more fear will attach greater importance to the probability of unfavourable events, compared to the decision maker who experiences less fear.

In Lopes' framework, the h-function for a person who experiences neither fear nor hope is simply the identity function $h(D) = D$.

For a person who experiences only fear, and no hope, the h-function is strictly convex in D. It is flat in the neighborhood of 0 and steep in the neighborhood of 1. It may be represented as:

$$h_s(D) = D^q,\ q > 1 \tag{5.3}$$

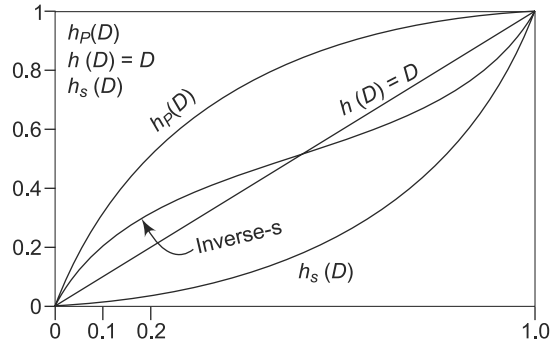
For a person who experiences only hope, the h-function is strictly concave in D. It may be represented as a power function.

$$h_p(D) = 1 - (1 - D)^p,\ p > 1 \tag{5.4}$$

For a person who experiences both fear and hope, the *h*-function has an inverse-S shape. Formally, Lopes uses a convex combination of the power functions h_s and h_p to represent this case.

Graphically, the four *h*-functions are shown in Exhibit 5.4.

Exhibit 5.4 h-functions



5.4 ✦ FRAMING

There can be different ways of presenting a decision problem and it appears that people's decisions are influenced by the manner of presentation. A decision frame represents how a decision maker views the problem and its possible consequences.

To demonstrate frame dependence, Tversky and Kahneman posed simple problems like the following to their students.

The government estimates that 600 people will die due to a deadly outbreak of Asian flu, if nothing is done. To tackle this problem, the government is considering two alternative programmes.

Programme A: Develop a vaccine which can save 200 lives.

Programme B: Develop a vaccine which will stop anyone from dying provided it works. The probability that it will work is one-third. If it doesn't work no one will be cured.

When students were asked to choose one of the two programmes, 75% of them chose programme A. The risk of seeing all 600 victims die was considered too much to be compensated by the hope that all would be saved.

Kahneman and Tversky reformulated the question and posed it to a different group of students. To tackle the same health problem, two choices were offered:

Programme C: Accept that 400 victims of the flu will die.

Programme D: Cure all the 600 victims of the flu with a probability of one-third.

When students were asked to choose between these two options, two-thirds of the students chose programme D. The statement '400 would die' scared most students, even though it is actually the same outcome as that of programme A above, but expressed in more dire terms. It is evident that what matters it is not just what you ask, but also how you ask.

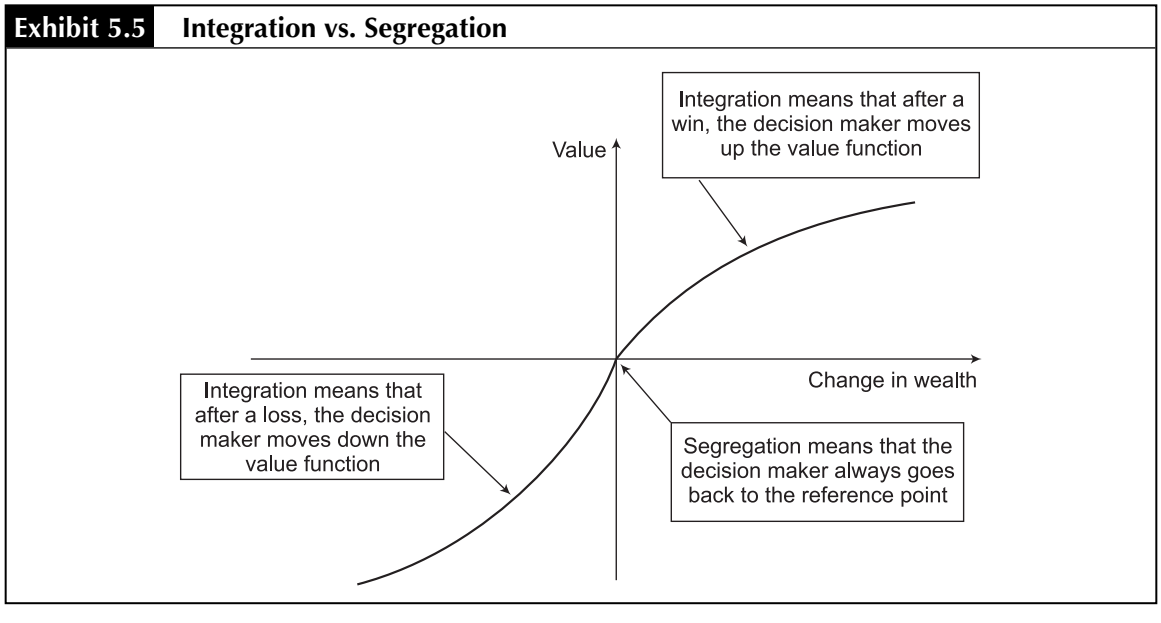
• Integration vs. Segregation

In the examples given above, the questions were posed to suggest a particular reference point (e.g. lives saved or lives lost). However, in many cases, the decision maker himself chooses the reference point, and whether an outcome is considered as positive or negative will depend on the reference point selected by the decision maker. To illustrate, suppose that Mohan has lost ₹ 4,500 on the horse track today. He is looking at the possibility of betting another ₹ 500 in the last race of the day on a horse, with 10:1 odds. If his horse wins, his payoff will be ₹ 5,000, but if his horse loses, he will lose another ₹ 500. The reference point that he chooses is very relevant. If he considers the previous losses of ₹ 4,500, the bet of ₹ 500 will enable him to break even if the horse wins, or result in a cumulative loss of ₹ 5,000, if the horse loses. Should he ignore the previous losses of ₹ 4,500 and consider the last race as a fresh bet, the outcome would be either a gain of ₹ 4,500 (₹ 5,000 – ₹ 500) or a loss of ₹ 500. According to prospect theory, if Mohan takes the first reference point, he is *integrating* the outcomes of all the bets of the day. Since he is in the domain of losses (of ₹ 4,500) and the last bet provides an opportunity to break even, he will tend to take the risk.

If Mohan takes the second reference point, he is *segregating* the outcomes of different bets. In this case, he will tend to shun the risk, because the gamble crosses over between a loss and gain and loss aversion bothers him.

Exhibit 5.5 depicts the difference between integration and segregation. Integration means that the positions are lumped together and segregation means that the positions are viewed separately.

Exhibit 5.5 Integration vs. Segregation



The less knowledgeable a person is about an issue, the more easily he is influenced about how it is framed. The British philosopher Herbert Spencer said "How often misused words

generate misleading thoughts." Our preferences are influenced by how a choice is presented. You are likely to choose a product that is presented as "95% fat free" rather than "5% fat." Likewise, you are likely to choose a surgical procedure that has a 40% chance of success than one that has a 60% chance of failure. In general, our response depends on whether something is presented in terms of gains or in terms of losses.

• Money Illusion

An important theme of behavioural finance is frame dependence which holds that differences in form may also be substantive. An example of frame dependence is **money illusion**. To understand money illusion, let us look at the following questions from a 1997 study by Eldar Shafir, Peter Diamond, and Amos Tversky.

Consider two girls Ann and Barbara, who passed out from the same college a year apart and took up similar jobs. Ann started with a yearly salary of $30,000. After one year; during which there was no inflation, Ann got a 2 per cent ($600) raise in salary. Barbara too started with a yearly salary of $30000. After one year, during which there was 4 per cent inflation, Barbara got a 5 per cent ($1500) raise in salary.

As they entered the second year on the job (a) Who was better off economically? (b) Who do you think was happier? and (c) Who do you think was more likely to leave her present job for another job?

Most people think that Ann is better off economically, Barbara is happier, and Ann is more likely to leave her present job for another job. This is somewhat puzzling. Why is Ann less happy and more likely to look for another position, if she is better off economically? According to Shafir, Diamond, and Tversky, although people know how to adjust for inflation it is natural for them to think in term of nominal terms. Hence, people's emotional reaction is guided by nominal values, and those seem to be better for Barbara than they do for Ann.

5.5 ✦ MENTAL ACCOUNTING

Traditional finance holds that wealth in general and money in particular must be regarded as "fungible" and every financial decision should be based on a rational calculation of its effects on overall wealth position. In reality, however, people do not have the computational skills and will power to evaluate decisions in terms of their impact on overall wealth. It is intellectually difficult and emotionally burdensome to figure out how every short-term decision (like buying a new phone or throwing a party) will bear on what will happen to the wealth position in the long run.

So, as a practical expedient, people separate their money into various mental accounts and treat a rupee in one account differently from a rupee in another because each account has a different significance to them. The concept of **mental accounting** was proposed by Richard Thaler, one of the brightest stars of behavioural finance.

Businesses, governments, and other establishments use accounting systems to track, separate, and categorise various financial transactions. People, on the other hand, use a system of mental accounting. The human brain is similar to a file cabinet in which there is a separate

folder (account) for each decision, which contains the costs and benefits associated with that decision.

Once an outcome is assigned to a mental account, it is difficult to view it in any other way. Mental accounting can influence a person's decisions in unexpected ways as the following example suggests.

> Mr. and Mrs. Sharma have saved ₹10 lakhs for their daughter's wedding that may take place 3 years from now. The money earns interest at the rate of 9% in a bank fixed deposit account. They just bought a new car for ₹6 lakhs on which they have taken a 3 year car loan at 12%.

The above example suggests that people often have money in a fixed deposit account (earmarked for a certain purpose) that earns a low rate of interest and yet they borrow money at a high rate of interest for some other purpose.

While money does not come with labels, the human mind puts labels on it. Mr. and Mrs. Sharma labelled their fixed deposit as "daughter's wedding provision" in a separate mental account and did not want to draw on it to finance a car even though it made sense to do that.

• Mental Budgeting

Just the way people use financial budgets to monitor and control their spending, the brain uses mental budgets to reflect the psychological benefits and costs in each mental account.

A pay-as-you-go payment system is usually preferred because of the tight match between costs and benefits of the purchase.

When the pay-as-you-go system is not available, things get more complicated. In a study, respondents were asked to choose between the following payment options for a hypothetical purchase of a clothes washer and dryer costing $1200:

A. Six monthly payments of $200 each before the arrival of the washer and dryer.
B. Six monthly payments of $200 each during the six months beginning after the arrival of the washer and dryer.

Eighty-four per cent of the respondents chose postponed payment option B. Since the benefits of the washer and dryer is derived over a long period (hopefully years) after their purchase, the choice of option B is consistent with the cost/benefit matching of mental budgeting. Further, option B is consistent with traditional economics, because it allows borrowing at 0% interest rate.

In the same study, the respondents were asked two further questions. In the second question they were asked to choose between the following payment options for a hypothetical one-week vacation to the Caribbean costing $1200.

A. Monthly payments of $200 each during the six months prior to the vacation.
B. Monthly payments of $200 each in the six months period beginning after the vacation.

Sixty per cent of the respondents chose option A, the prepaid option, an option that is inconsistent with traditional economics. People seem to find a prepaid vacation more pleasurable than one that must be paid for subsequently. If the payment is made earlier, the

pain associated with payment is over and hence, the vacation is more pleasurable. If the payment is to be made later, the pleasure of the vacation diminishes by wondering, "How much is this pleasure going to cost?"

In the third question, the respondents were asked how they would like to be paid for doing few weeks of work on the weekends in the next six months—before doing the work or after? Surprisingly, 73 per cent of the respondents said that they would like to be paid after doing the work instead of before. Again, this is not consistent with traditional economics as it violates the wealth-maximising principle.

The above examples suggest that people are willing to incur monetary costs to facilitate their mental budgeting process. They are willing to accelerate payments and delay income to **match better the emotional costs and benefits**, ignoring the time value of money principles.

• Sunk Cost Effect

Traditional economics assumes that while making a decision, people ignore past costs and consider only the present and future costs and benefits associated with that decision. In reality, however, people routinely consider historical costs when making decisions about the future. Such behaviour is called the **sunk-cost effect**. It may be viewed as a tendency to continue an endeavour, once an investment of money, time, or effort has been made.

There are two dimensions of sunk costs, viz., size and timing. To understand the **size** dimension consider the following scenario:

You have a ticket to attend a live musical concert by your favourite rockstar. The ticket is worth ₹2,000. On the day of the concert there is a big thunderstorm. While you can still attend the concert, the thunderstorm will cause considerable inconvenience. Are you likely to go to the concert if you had purchased the ticket for ₹2,000 or if you had received the ticket for free?

If you had purchased the ticket for ₹2,000, you are likely to go to the concert, but if you had received the ticket for free, you are not likely to go to the concert. Why? When you purchase the ticket for ₹2,000, you open a mental account with a ₹2,000 cost attached to it. If you do not attend the concert, you have to close the mental account without the benefit of enjoying the concert, resulting in a perceived loss. To avoid the emotional pain of this loss, you are likely to attend the concert. On the other hand, if you receive the ticket for free, you can close the mental account without a benefit or a cost.

To understand the **timing dimension** of the sunk cost, consider the following scenario.

You have long anticipated going to the musical concert by your favourite rockstar. On the day of the concert, there is a thunderstorm. Are you likely to go to the concert if you had purchased the ticket for ₹2,000 yesterday or one year ago?

The purchase price of ₹2,000 is a sunk cost in both cases, but the timing of the sunk cost seems to matter. You are more likely to go to the concert if you had purchased the ticket yesterday than if you had purchased the ticket last year. As Nofsinger put it, "The pain of closing a mental account without a benefit decreases over time. In other words, the negative impact of a sunk cost declines over time."

Mental Accounting and Investing

Mental accounting adversely affects your wealth in two ways. First, it accentuates the disposition effect, which is reflected in the tendency on the part of an investor to sell the winners and ride the losers. You have an aversion to sell a stock because doing so closes the mental account and causes regret. Mental accounting compounds this aversion. With the passage of time, the purchase of the stock becomes a sunk cost. The emotional pain associated with wasting some of the sunk cost on a loser decreases over time. So, you are likely to sell the losing stock later as opposed to earlier. Second, mental accounting affects how we view our investment portfolios. Thanks to mental accounting, we segregate our portfolio into different mental accounts.

SUMMARY

- According to the expected utility theory, the economic agent is rational and selfish, and has stable tastes. Psychologists, however, challenge this. They believe that people are neither fully rational, nor completely selfish.
- While the prospect theory was closely modelled on utility theory, it departed from the latter in fundamental ways. It is a purely descriptive model which seeks to document and explain systematic violations of the axioms of rationality in choices between gambles.
- The longevity of the theory of expected utility proposed by Bernoulli is all the more remarkable because it is seriously erroneous. The error in his theory is not in what is states explicitly; rather, it lies in what it ignores or tacitly assumes.
- In 1979, Daniel Kahneman and Amos Tversky published a paper titled "Prospect Theory: An Analysis of Decision under Risk," in the journal *Econometrica*. This article provided a series of simple but compelling demonstrations of how the predictions of expected utility theory, economists' workhorse model of decision making under risk, are systematically violated by people in laboratory settings. They presented a new theory of risk attitudes called "**prospect theory**," which elegantly reflected the empirical evidence on risk taking, including the observed violations of expected utility.
- The key tenets of prospect theory are:
  - Changes in risk attitude
  - Reference dependence
  - Diminishing sensitivity
  - Loss aversion
  - Decision weights
- What explains loss aversion? In the ancient laboratory of evolution sensitivity to losses was perhaps more helpful to survive than appreciation of gains.

- The omission of prospect theory and loss aversion in most introductory texts in economics may seem odd, but it appears that there are good reasons for this.
- According to SP/A theory, people evaluate risky alternatives by using an objective function which has three arguments, viz., security (S), potential (P), and aspiration (A).
- A common concept underlying the various contradictions of expected utility is the idea that each decision is structured within an ordered 'mental frames' and manipulation of such frames can change a person's decision.
- To address this shortcoming of expected utility theory, Kahneman and Tversky suggest that investor evaluate prospects in two consecutive steps:

  1. *Editing – framing stage*: The gamble is initially structured for detailed consideration.
  2. *Evaluation stage*: The gambled is evaluated in detail.
- Traditional finance holds that wealth in general and money in particular must be regarded as "fungible" and every financial decision should be based on a rational calculation of its effects on overall wealth position. In reality, however, people do not have the computational skills and will power to evaluate decisions in terms of their impact on overall wealth.
- So, as a practical expedient, people separate their money into various mental accounts and treat a rupee in one account differently from a rupee in another because each account has a different significance to them. The concept of **mental accounting** was proposed by Richard Thaler, one of the brightest stars of behavioural finance.
- Just the way people use financial budgets to monitor and control their spending, the brain uses mental budgets to reflect the psychological benefits and costs in each mental account.
- Traditional economics assumes that while making a decision people should ignore past costs and consider only the present and future costs and benefits associated with that decision. In reality, however, people routinely consider historical costs when making decisions about the future. Such behaviour is called the **sunk-cost effect**. It may be viewed as a tendency to continue an endeavour, once an investment of money, time, or effort has been made.
- Mental accounting adversely affects your wealth in two ways. First, it accentuates the disposition effect. Second, mental accounting affects how you view your investment portfolios.

SOLVED PROBLEMS

1. Dilip has the following value function under prospect theory:

$$v(w) = w^{0.8} \quad \text{if } w \geq 0$$
$$= -2\,(-w)^{0.5} \quad \text{if } w < 0$$

a. Is Dilip loss averse? Explain.

b. Assume that Dilip weights values by probabilities. Which of the following prospects would he prefer?

P1 (0.6, 8000, –5000)
P2 (0.7, 6000, –2000)

Solution

a. To examine whether Dilip is loss averse let us look at $v(w)$ for $w = 1000$ and $w = -1000$.

$$v(1000) = 1000^{0.8} = 251.19$$
$$v(-1000) = -2(1000)^{0.5} = -63.25$$

This means that the value function is steeper for gains than for losses. Hence Dilip is not loss-averse.

b. (i) The two possible outcomes of P1 are 8000 and –5000 with probabilities of 0.6 and 0.4.

$$v(8000) = 8000^{0.8} = 1325.78$$
$$v(-5000) = -2(5000)^{0.5} = -141.42$$

Expected value of P1 with probabilities serving as weights is: $0.6 \times 1325.78 - 0.4 \times 141.42 = 738.9$

(ii) The two possible outcomes of P2 are 6000 and –2000 with probabilities of 0.7 and 0.3.

$$v(6000) = 6000^{0.8} = 1053.22$$
$$v(-2000) = -3(2000)^{0.5} = -134.16$$

The expected value of P2 when probabilities serve as weights is:

$$0.7 \times 1053.22 - 0.3 \times 134.16 = 697$$

P1 is to be preferred over P2.

2. Felix has the following value function as per prospect theory:

$$v(w) = w^{0.6} \quad \text{if } w \geq 0$$
$$= -1.8\,(-w)^{0.5} \quad \text{if } w < 0$$

a. Is Felix loss averse? Explain.

b. Felix's weighting function is as follows for gains as well as losses:

$$W(P) = \frac{P^{\delta}}{[P^{\delta} - (1-P)^{\delta}]^{1/\delta}}$$

where $\delta = 0.5$

Which of the following prospects should Felix prefer?

P3(.02, –10,000) P4(–70)

Solution

a. To examine whether Felix is loss averse, let us look at $v(w)$ for $w = 100$ and $w = -100$

$$v(w) = 100^{0.6} = 15.85$$
$$v(w) = -1.8(100)^{0.5} = -18$$

This means that the value function is steeper for losses than for gains. Hence Felix is loss averse.

b. The value corresponding to –10,000 is

$v(-10{,}000) = -1.8(10{,}000)^{0.6} = -452.14$

The value corresponding to –70 is:

$v(-70) = -1.8\ (70)^{0.5} = -15.06$

The weights corresponding to the probability of 0.02 is as follows:

$$W(P) = \frac{0.02^{0.5}}{(.02^{0.5} + (1-.02)^{0.5})^{1/0.5}}$$

$$= \frac{0.1414}{(0.144 + 0.99)^{1/0.5}} = 0.11$$

The value of the two prospects, P3 and P4, are as follows:

$v(P3) = 0.11 \times -452.14 = -49.74$

$v(P4) = 1.0 \times -15.06 = -15.06$

Since $v(P4) > v(P3)$, Felix would choose P4.

PROBLEMS

1. Consider the following:
   a. Prospect A (0.80, ₹5,000, ₹0) and Prospect B (0.40, ₹10,000, ₹0)
      Which one would you choose, Prospect A or B?
   b. Prospect C (0.00002, ₹50,000,000) Prospect D (0.00001, ₹100,000,000)
      Which one would you choose, Prospect C or D?
   c. Are your choices congruent with expected utility theory? Explain.
2. Vimala has the following value functions under prospect theory:

$$v(w) = w^{0.4} \quad \text{if } w \geq 0$$

$$= -3\ (-w)^{0.4} \quad \text{if } w < 0$$

   a. Is Vimala loss averse? Explain.
   b. Assume that Vimala weights values by probabilities. Which of the following prospects would she prefer?
      P1 (0.7, 5000, –2000)
      P2 (0.6, 6000, –1500)

3. Ravi has the following value function as per prospect theory:

$$v(w) = w^{0.8} \quad \text{if } w \geq 0$$
$$= -2.5\,(-w)^{0.8} \quad \text{if } w < 0$$

   a. Is Ravi loss averse? Explain.

   b. Ravi's weighting function is as follows for gains as well as losses:

$$W(P) = \frac{P^{\delta}}{\left[P^{\delta} - (1-P)^{\delta}\right]^{1/\delta}}$$

   where $\delta = 0.6$

   Which of the following prospects should Ravi prefer?

   P3 (0.6, 6000, –1000)

   P4 (0.5, 8000, –2000)

DISCUSSION QUESTIONS

1. What is the error in Bernoulli's theory?
2. List the key tenets of prospect theory.
3. Discuss the following: reference dependence, diminishing sensitivity, loss aversion, and decision weights.
4. What explains loss aversion?
5. Discuss the hypothetical value and weighting functions suggested by Kahneman and Tversky.
6. Discuss the four-fold pattern of preferences.
7. What are the blind spots of prospect theory.
8. Discuss the SP/A theory proposed by Lopes?
9. Discuss frame dependence.
10. What is mental accounting?
11. Discuss mental budgeting.
12. What is sunk cost effect?

APPENDIX 5A

EVERYTHING IS RELATIVE

Everything seems to be assessed in relative terms. As Daniel Ariely wrote in his fascinating book *Predictably Irrational*, "Everything is relative when it shouldn't be. Humans rarely choose in 'absolute terms.' We

don't have an internal meter that tells us how much things are worth. Rather, we focus on the relative advantage of one thing over another, and estimate value accordingly."

Philosophers, economists, and others have expressed this thought in different ways. Here is a sampling of their views:

> Aristotle: "Envy is pain at the good fortune of others. We envy those who are near us in time, place, age, or reputation."
>
> Arthur Schopenhauer: "As Hobbes observed, all mental pleasure consists in being able to compare oneself with others to one's advantage."
>
> Mark Twain: "Man will do many things to get himself loved; he will do all things to get himself envied."
>
> Charles P. Kindeberger: "There is nothing so disturbing to one's well-being and judgment as to see a friend get rich."

■ ■

Chapter **6**

Challenges to Efficient Markets Hypothesis

The efficient markets hypothesis (EMH) has been the central idea in finance since the mid-1960s. Eugene Fama who proposed this idea defined an efficient financial market as one in which security prices fully reflect the available information. He argued that the U.S. bond or stock market are efficient according to this definition. This statement has profound implications. As Fama said, the EMH 'rules out the possibility of trading systems based only on currently available information that have expected profits or returns in excess of equilibrium profit or return.' Put simply, it means 'an average investor—whether an individual, a pension fund, or a mutual fund—cannot hope to consistently beat the market, and the vast resources that such investors dedicate to analysing, picking, and trading securities are wasted.'

The EMH has provided fundamental insights, spawned extensive theoretical work and empirical studies, and generated considerable controversy. The EMH is clearly one of the most hotly contested propositions in all the social sciences. Disarmingly simple, it has far-reaching consequences for academic theories and business and investment practice. Yet it seems to defy empirical proof or refutation. As Andrew Lo put it, "Even after several decades of research and literally thousands of published studies, economists have not yet reached a consensus about whether markets—particularly financial markets—are, in fact, efficient".

The EMH was developed independently by Paul Samuelson and Eugene Fama in the 1960s. Interestingly, they arrived at the notion of market efficiency from two rather different research agendas. Samuelson's seminal paper "Proof that Properly Anticipated Prices Fluctuate Randomly," argues that in an informationally efficient market (meaning that prices fully reflect the information and expectations of all market participants), price changes must be non-forecastable or random. Samuelson hit upon the idea of efficient markets through his exploration of temporal pricing models of storable commodities that are harvested and liable to decay.

In contrast, Fama came to the idea of efficient markets on the basis of his interest in measuring the statistical properties of stock prices and in resolving the debate between technical analysis and fundamental analysis. Fama's deep interest in empirical analysis led him and his

students along a path very different from that of Samuelson—a path that led to significant methodological and empirical contributions like the event study, various econometric tests of single- and multi-factor linear asset-pricing models, and a wide range of empirical regularities and anomalies in stock, bond, currency, and commodity markets.

While the EMH has a counter-intuitive flavour, an efficient market is in fact the direct outcome of many market participants competing actively to profit from their information. Such a compelling motivation for randomness is similar to the role of uncertainty in quantum mechanics. As Andrew Lo put it, "Just as Heisenberg's uncertainty principle places a limit on what we can know about an electron's position and momentum if quantum mechanics holds, this version of the EMH places a limit on what we can know about future if the forces of economic self-interest hold."

In the first decade after it was conceived in the 1960s, the EMH turned out to be a monumental theoretical and empirical success. Powerful theoretical reasoning was developed in support of the EMH. More importantly, a vast array of empirical studies substantiated the EMH. The EMH indeed became the central proposition of academic finance. The University of Chicago, the birthplace of the EMH, became world leader of academic finance. Michael Jensen, a Chicago graduate and one of the pioneers of the EMH, declared in 1978 that 'there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis.'

Such strong claims often portend reversals, and the EMH seems to be no exception. Since the early 1980s, the theoretical foundations as well as the empirical evidence in support of the EMH have been questioned and behavioural finance has emerged as an alternative view of financial markets. In this view, economic theory does not result in market efficiency. Rather, systematic and significant departures from market efficiency are expected to persist for extended periods of time. Empirically, behavioural finance offers explanation for observations that appear anomalies from the EMH perspective and generates new predictions that are supported by data.

This chapter discusses the foundations of the EMH and the behavioural challenge to the EMH. It is organised into six sections as follows:

- Theoretical foundations of the EMH
- Empirical support for the EMH
- Theoretical challenge to the EMH
- Empirical challenge to the EMH
- Keynes' beauty contest and guess-a-number game
- An assessment of EMH

6.1 ✦ THEORETICAL FOUNDATIONS OF THE EMH

According to Andrei Shleifer, any one of the following three conditions will lead to market efficiency: (i) investor rationality, (ii) independent deviation from rationality, and (iii) effective arbitrage.

• Investor Rationality

Rational investors value each security at its fundamental value, the net present value of future cash flows discounted at the risk-adjusted rate of return. When such investors learn something that has a bearing on fundamental values of securities, they quickly respond to such information by bidding up the prices when the news is favourable and bidding down the prices when the news is adverse. As a result, security prices reflect fundamental values. The EMH is thus a consequence of equilibrium in competitive markets thronged by rational investors.

• Independent Deviation from Rationality

Remarkably, investor rationality is not a necessary condition for the EMH. The markets can be efficient even if the investors are not rational. In a commonly considered scenario, the irrational investors in the market trade in a random fashion. Suppose Dr. Reddy's Laboratories announces an acquisition that is not understood by most investors. As a result, some may react in an overly optimistic manner while others may react in an overly pessimistic manner. As long as the deviations from rationality are independent and uncorrelated, errors tend to cancel out and the market price will still be an unbiased estimate of intrinsic value. This argument rests on the assumption that the trading strategies of the irrational traders are uncorrelated. So, its validity may be quite limited.

• Effective Arbitrage

Even if the trading strategies of the irrational traders are correlated, a case can be made for the EMH. This case, as argued by Milton Friedman and Eugene Fama, is based on arbitrage, which is clearly one of the most intuitively appealing and plausible arguments in economics. William Sharpe and Gordon Alexander define arbitrage as 'the simultaneous purchase and sale of the same, or essentially similar, security in two different markets at advantageously different prices.' Suppose that a security becomes overpriced in relation to its fundamental value because of correlated purchases by irrational investors. Realising that it is overpriced, smart investors, or arbitrageurs, would sell or even short sell this security and simultaneously purchase other 'essentially similar' securities which are relatively cheaper, to hedge their position. Their actions will bring the price of the security to the level of its fundamental value. In fact, if arbitrage is swift and effective, because substitute securities are available and keen competition exists between arbitrageurs, the price of a security cannot deviate much from its fundamental value.

A similar argument applies to an underpriced security. In such a case, the arbitrageurs will buy the underpriced security and sell essentially similar but relatively overpriced securities to hedge their position. Their actions will bring about a parity between the price and the fundamental value of the security.

Arbitrage has another implication. As irrational investors buy overpriced securities and sell underpriced securities, they earn inferior returns compared to arbitrageurs or even passive investors. Irrational investors lose money relative to their peers. As Milton Friedman

pointed out, since irrational investors cannot lose money forever they eventually disappear from the market. Thus, in the long run, arbitrage and competitive selection ensure market efficiency.

6.2 ✦ EMPIRICAL SUPPORT FOR THE EMH

Powerful as the theoretical arguments for the EMH may seem, the empirical evidence that appeared in the 1960s and 1970s was even more impressive.

The empirical evidence on the EMH may be divided into two broad categories. First, when news about the value of a security arrives in the market, the price should reflect this news quickly and correctly. Second, since the price of a security equals its value, the price should not move without any news about the value of the security.

• Quick and Accurate Reaction to Information

The 'quick' part means that belated information cannot be a source of profit. The 'accurate' part means that, on average, prices adjust correctly in response to the news. Prices neither overreact nor underreact to news announcements. After the initial impact of the news, there should be no price trends or price reversals.

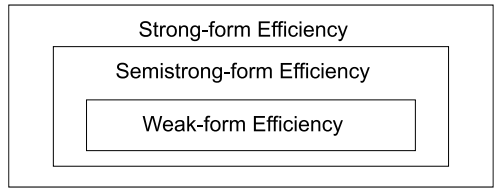
The quick and accurate reaction to news implies that 'stale information' is of no value in 'making money.' Defining 'stale' information is fairly straightforward, but defining 'making money,' as we shall see, is quite controversial.

Fama distinguishes between three types of stale information, which result in three forms of the EMH: the weak form efficiency, the semi-strong form efficiency, and the strong from efficiency. In the weak form efficiency, past prices, returns, trading volumes, and other market-related information represent the stale information. According to the weak form EMH, it is impossible to earn superior risk-adjusted returns on the basis of past prices, returns, trading volumes, and other market-related information. If risk-neutrality is assumed, this version of the EMH reduces to the random walk hypothesis, which implies that past returns cannot be used to predict future returns.

In the semi-strong form EMH, all publicly available information represents stale information. This means that no sooner some information becomes public, it is immediately reflected into prices. Hence, an investor cannot use publicly available information to predict future returns. The semi-strong form EMH subsumes the weak form EMH, since the past market-related information is a subset of the publicly available information about a security.

In the strong form EMH, all available information, public as well as private, represents stale information. This means that even private information, sometimes described as inside information, cannot be used for earning superior risk-adjusted returns because such information quickly leaks out and gets reflected into prices. The strong-form EMH subsumes both the weak-form EMH and the semi-strong form EMH as shown in Exhibit 6.1.

Exhibit 6.1 Three Levels of Market Efficiency



'Making money' in finance means earning superior risk-adjusted returns. Just because a particular strategy produces positive returns by using stale information does not mean that it is evidence of market inefficiency. To earn this return, the investor may have borne more risk and the return may just be a fair compensation for bearing risk. The problem arises because there is no universally accepted model of a fair relationship between risk and return. The capital asset pricing model is a widely accepted model, but it is not the only possibility. As Fama suggested, a test of market efficiency is really a **joint test** of market efficiency and a risk-return model. Whenever researchers found a money-making strategy based on stale information, critics have suggested a model of risk that would reduce the returns to a fair compensation for risk taking.

When researchers set out to test these predictions, they found evidence that broadly supported the EMH. With respect to the weak form EMH, Fama found that stock prices followed closely random walks and there was no systematic evidence of 'technical' trading strategies (such as buying stocks when their prices went up or selling stocks when their prices fell down) being profitable. Even complicated trading strategies failed to be profitable.

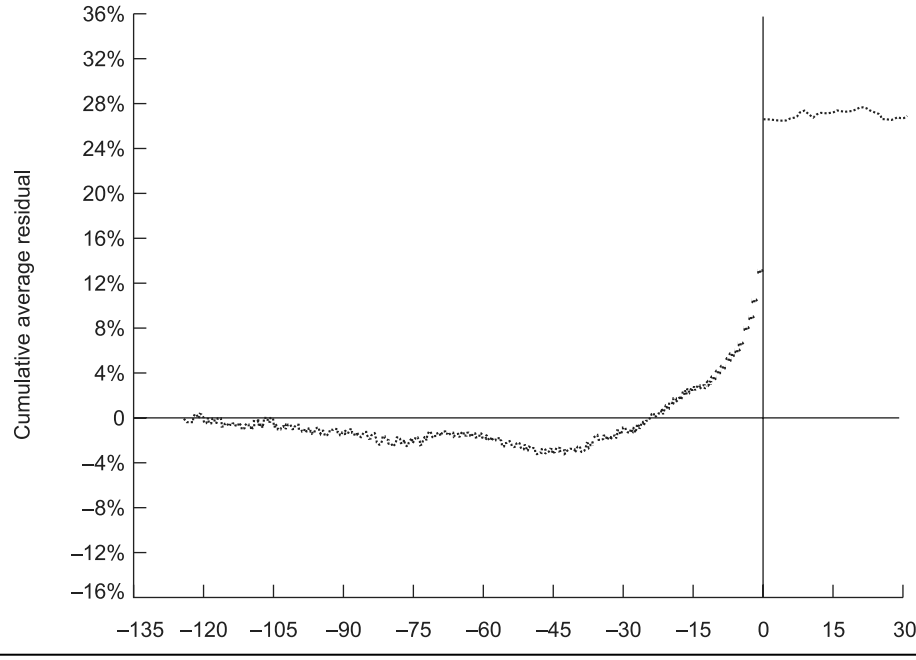
To test the semi-strong form EMH, empirical studies have been conducted that have examined the following questions:

- Is it possible to earn superior risk-adjusted returns by trading on information events like earnings announcements, stock splits, bonus issues, or acquisition announcements? A scheme based on an information event is usually tested with an **event study.** An event study examines the market's reaction to and the excess market returns around a specific information event.
- Is it possible to earn superior risk adjusted returns by trading on an observable characteristic of a firm like the price-earnings ratio, the price-book value ratio, or the dividend yield? A scheme based upon trading on an observable characteristic is usually tested using a **portfolio study**. A portfolio study typically examines whether the investment performance of stocks having certain characteristics (such as low price-earnings ratio) is superior to that of stocks having opposite characteristics (such as high price-earnings ratio).

By and large most of the event studies supported the semi-strong form EMH. As an illustration, consider the study by Arthur Keown and John Pinkerton published in 1981 in which they examined the returns to shareholders of targets of takeover bids around the

announcement of the bid. Exhibit 6.2 shows the results for returns of an average target, adjusted for market movements. This exhibit shows that share prices of targets begin to rise in anticipation of the possible bid, and then jump on the date of announcement to reflect the takeover premium offered. Thereafter, there is no further movement, suggesting that the prices adjust instantaneously to the announced bid, consistent with the semi-strong form EMH.

Exhibit 6.2 **Cumulative Average Residual Returns to Shareholders of Targets of Takeover Attempts Around the Announcement Date**



Prices Do Not React to Non-information

The second implication of the EMH is that prices do not react to non-information. In the major early empirical study of this proposition, Myron Sholes (1972) evaluated share price reactions to sales of large blocks of shares in individual companies by substantial stockholders, using the event study methodology. Sholes' work is particularly significant as it is directly concerned with the availability of close substitutes for individual securities. Sholes' argument, which he calls **substitution hypothesis**, is essentially the same as the arbitrage argument for market efficiency. When large blocks are sold, particularly by uninformed sellers, there should be no impact on the stock price because the price is determined not by supply but by the stock's value relative to that of its close substitutes.

In his study, Scholes found relatively small share price reactions to block sales. Scholes believes that these reactions may have been due to small, adverse news revealed by the decisions of large block holders to dispose their shares. Sholes interprets this results to be

consistent with the substitution hypothesis and the second prediction of the EMH that stock prices do not react to non-information. Perhaps even more important, the non-reaction of prices to non-information reflects arbitrage in action. This means that investors are willing to adjust their portfolios to absorb more shares without any material influence on the price.

As things stood at the end of the 1970s, the EMH was indeed regarded as one of the great triumphs of twentieth century economics. Standard economic theory, particularly the theory of arbitrage, predicted market efficiency and empirical evidence overwhelmingly confirmed the predictions of the theory. This persuaded Michael Jensen to declare in 1978 that the EMH has more solid empirical evidence supporting it than any other proposition in economics.

Profound Impact of a Simple Idea

Eugene Fama introduced the notion of efficient capital market in 1964. This simple idea has had a profound impact in several ways.

1. The evidence on market efficiency helped in establishing a receptive climate for three seminal developments in financial theory: (a) Modigliani-Miller theories of corporate financial policy, (b) the Capital Asset Pricing Model, (c) the Black-Scholes Option Pricing Model. Each of them influenced the practice of finance in important ways.
2. Important practical developments like indexing, asset securitisation, performance measurement, and disclosure of different earnings numbers are based on the notion of well-functioning security markets.
3. Empirical evidence on market efficiency coincided with the growing respect for free markets that began in the 1970s, initially among economists and then among politicians. As Ray Ball put it: "Indeed, the market efficiency literature has helped pave the way for what has proved to be a worldwide 'liberalisation' of financial and other markets… In a surprisingly short time, academic attitudes toward stock markets had shifted from one extreme to the other, from suspicion to almost reverence."

6.3 ✦ THEORETICAL CHALLENGES TO THE EMH

Shortly after Jensen's claim, the EMH was challenged, theoretically as well empirically. Although initially the primary challenge was empirical, we will begin with the theoretical challenges to the EMH and then turn to the empirical evidence.

The EMH has been challenged theoretically on three grounds:

- Investor irrationality
- Correlated investor behaviour
- Limits to arbitrage

Investor Irrationality

People in general and investors in particular are not fully rational. Investors often trade on noise rather than information. As Andrei Shleifer put it, "Investors follow the advice of financial gurus, fail to diversify, actively trade stocks and churn their portfolio, sell winning stocks and hold on to losing stocks, .. buy and sell actively and expensively managed mutual funds, follow stock price patterns and other popular models." Put briefly, investors scarcely pursue the passive strategies that is expected of uninformed market participants according to the efficient markets hypothesis.

The above description of what investors actually do is only the tip of the iceberg. As summarised by Kahneman and Riepe, people deviate from the standard decision making model in economics in three fundamental ways.

Attitude Toward Risk People do not assess risky gambles according to the precepts of von Neumann-Morgenstern rationality. While assessing risky gambles, people don't look at the level of final wealth they attain (as suggested by von Neumann-Morgenstern), but look at gains and losses relative to some reference point, which may vary from situation to situation. Further, they display loss aversion – the loss function is much steeper than the gain function. Such preferences are described and modeled in 'Prospect Theory,' a cornerstone of behavioural finance, developed by Daniel Kahneman and Amos Tversky.

Non-Bayesian Formation of Expectations People systematically violate Bayes' rule and other maxims of probability theory while predicting uncertain outcomes. For example, people often extrapolate recent trends in predicting future events, without realising that the recent history is generated by chance, not by the model they have constructed.

Sensitivity of Decision Making to How the Problems are Framed People make different choices depending on how a given problem is presented to them. Put differently, framing influences decision-making. For example, investors allocate a higher proportion of their wealth to stock when they see the impressive long-term stock returns relative to bond returns. However, they allocate less of their wealth to stocks, if they only see the volatile short-term returns.

Correlated Investor Behaviour

Recall that investor rationality is not a necessary condition for market efficiency. A market thronged by irrational investors can still be efficient – as long as these investors trade randomly, their trades cancel each other out. The evidence, however, shows that people do not deviate from rationality randomly. Rather they employ similar strategies, as they suffer from similar judgmental biases while processing information. For example:

- They tend to be overconfident and hence assume more risk.
- They tend to extrapolate past time series and hence *chase* trends.
- They tend to put lesser weight on base rates and more weight on new information and hence overreact to news.
- They follow market gurus and forecasts and act in a similar fashion.

Given the correlated behaviour of noise traders, their actions lead to aggregate shifts in demand.

• Limits to Arbitrage

One can expect the irrationality of 'noise traders' to be countered by the rationality of 'arbitrageurs' as the latter are supposed to be guided by fundamentals and immune to sentiments. However, arbitrage in the real world is limited by two types of risk.

The first risk is fundamental. Buying 'undervalued' securities tends to be risky because the market may fall further and inflict losses. The fear of such a loss may restrain arbitrageurs from taking large enough long positions that will push price to fully conform to fundamentals.

The second risk is resale price risk and it arises mainly from the fact that arbitrageurs have finite horizons. Why? There are two principal reasons:

1. Arbitrageurs usually borrow money or securities to implement their trades and, therefore, have to pay fees periodically. So, they can ill-afford to keep an open position over a long horizon.
2. Portfolio managers are evaluated every few months. This limits their horizon of arbitrage.

Arbitrageurs are not always there when we need them. One of the best examples is what happened to Long-Term Capital Management (LTCM) in the late 1990s. Reporting the plight of LTCM, Donald MacKinsey notes: "As 'spreads' widened [between off-the-run and on-the-run bonds], and thus, arbitrage opportunities grew more attractive, arbitrageurs did not move into the market, narrowing spreads and restoring 'normality'. Instead, potential arbitrageurs continued to flee, widening the spreads and intensifying the problems of those who remained, such as LTCM. "

• Price Behaviour

Given the substantial presence of noise traders whose behaviour is correlated and the limits to arbitrage, investor sentiment does influence prices. In such a market, prices often vary more than what is warranted by changes in fundamentals.

Indeed, arbitrageurs may also contribute to price volatility as they try to take advantage of the mood swings of noise traders. For example, when some investors follow a positive feedback strategy that says "buy when the price increases and sell when the price decreases," it is no longer optimal for arbitrageurs to counter the actions of noise traders all the time. Instead, they may profit by jumping on the bandwagon themselves for a while. It pays them to buy stocks which excite feedback traders, stimulate price increases, fuel the purchase of other investors, and sell near the top and collect their profits. Likewise, it is profitable for them to sell stocks that positive feedback traders dislike, trigger price decreases, induce sales by other investors, and buy them back near the nadir. Of course, finally their action would align prices to fundamentals. As Andrei Scheifer and Lawrence Summers said: "The effect of arbitrageurs is to stimulate the interest of other investors and so to contribute to the movement of prices away from fundamentals. Although eventually arbitrageurs sell out and help prices return to fundamentals, in the short run they feed the bubble rather than help it to dissolve."

Given such actions of noise traders and arbitrageurs, one would expect the following: (a) returns over horizons of few weeks or months would be positively correlated because of

positive feedback trading, and (b) returns over horizons of few years would be negatively correlated because arbitrageurs eventually help prices to return to fundamentals. This implies that returns tend to be mean reverting.

Several empirical studies have documented these predictions. David Cutler, James Poterba, and Lawrence Summers (1990) found evidence of positive correlations of returns over horizons of few weeks or months and negative correlations of returns over horizons of few years in several markets for stocks, bonds, foreign exchange, and gold. Werner Debondt and Richard Thaler (1985) found that stocks that have appreciated in the past tend to perform poorly in future and vice versa.

Summers' Model

Lawrence Summers (1986) proposed the following model as a plausible alternative to the efficient market hypothesis:

$$P_t = P_t^* + u_t$$

$$u_t = au_{t-1} + v_t$$

where P_t = price at time t

P_t^* = fundamental value at time t

u_t, v_t = random shocks

In the above model a is presumed to lie between 0 and 1.

Essentially, Summers' model says that errors in security prices persist but they to tend to fade away. This model is consistent with overreactions, 'fads', and speculative bubbles.

6.4 ✦ EMPIRICAL CHALLENGES TO THE EMH

Chronologically, the EMH was challenged empirically before it was criticised theoretically. An important early challenge came from Robert Shiller's (1981) work on stock market volatility. Shiller showed that stock market prices fluctuate far more than could be justified by a simple model in which prices are equated with the net present value of dividends. Shiller made some specific assumptions about the dividend process and computed the net present value of dividends using a constant discount rate. Though his work was criticised for mis-specifying the fundamental value (Merton 1987), he showed the way for a whole new area of research.

• Criticism of the Weak Form Efficiency

The proposition that past price information cannot be used to earn excess returns was challenged by Werner DeBondt and Richard Thaler (1985). They formed portfolios of the best and the worst performing stocks over the previous three years, for each year since 1933. They then computed the returns on these portfolios over the following five years. They found that

loser portfolios delivered relatively high average post-formation returns and winner portfolios delivered relatively low average post-formation returns.

Researchers have identified some more ways to use past returns to predict future returns. An important study by N. Jegadeesh and S. Titman (1993) looked at the momentum factor and found that short-term trends (over a period of six months to one year) in the movements in individual stock prices tend to predict future movements in the same direction. Thus, unlike long-term trends which tend to reverse themselves, relatively short-term trends tend to persist. In the wake of such evidence, even Fama admitted that stock returns can be predicted from past returns, and this represents a departure from the conclusions reached earlier.

• Challenge to the Semi-strong Form EMH

The evidence against the semi-strong form efficiency seems to be even greater. Here are some of the important pieces of such evidence.

- **Post-Earnings Announcement Drift** In general, empirical studies have found that the market adjusts gradually, not rapidly, to announcement of unanticipated changes in quarterly earnings. A typical example of such evidence is a study conducted by Bernard and Thomas (1989).
- **Size Effect** In the U.S., historically small stocks have earned higher returns than large stocks. For example, between 1926 and 1996, the compounded annual return on the smallest decile of the New York Stock Exchange Stocks was 13.83 per cent, compared to 9.84 per cent on the largest decile of stocks. Moreover, the superior return on small stocks was concentrated in the month of January each year.
- **Price-Earnings Ratios** In a pioneering study, Sanjay Basu (1977) examined the investment performance of common stocks in relation to their P/E ratios. He found that low P/E stocks outperformed high P/E stocks, even after adjustment for risk. Subsequent studies found similar evidence.
- **Book Value–Market Value (BV/MV) Ratios** In a seminal work, Eugene Fama and Kenneth French (1993) evaluated the joint effects of market beta, size, earnings-price ratio, leverage, and BV/ MV ratio on a cross-section of average returns. They found that the BV/MV ratio and size dominated other ratios.

On the face of it, the above evidence, in particular the size and market to book evidence, poses a serious challenge to the EMH. How can stale information be used to generate superior returns that cannot be attributed to higher risk as conventionally measured? Fama and French, however, have ingeniously interpreted both a company's market capitalisation and its market to book ratio as measures of risk in their three-factor model. According to this model, stocks of smaller firms are fundamentally more risky than stocks of larger firms and stocks of the firms with low market to book ratio are fundamentally more risky than stocks of firms with high market to book ratio. Fama and French argue that perhaps small size and low market to book ratio serve as a proxy for different aspects of the 'distress risk.' Behavioural economists, however, are skeptical of such interpretation. As Shleifer put it, "It is not entirely obvious from the Fama and French analysis how either size or the market to book ratio, whose economic interpretations are rather dubious in the first place, have emerged as heretofore unnoticed but critical indicators of fundamental risk, more important than the market risk itself."

• Stock Price Reaction to Non-information

According to the EMH, stock prices should not react to non-information. But there is evidence that stock prices do react to non-information. Shiller's pioneering work sparked a debate regarding the volatility of stock prices. He has presented evidence that stock prices jump around much more than what is justified by variations in corporate dividends and cash flow.

The Crash of 1987 The stock market crash of October 19, 1987, when Dow Jones Industrial Average fell by 23 per cent in one day, provides the most dramatic evidence in support of Shiller's hypothesis. There was obviously no new fundamental information to justify such a dramatic decline in stock prices. As Shleifer put it, "Although the event caused an aggressive search for the news that may have caused it, no persuasive culprit could be identified. In fact, many sharp moves in stock prices do not appear to accompany significant news." Hence, the idea that the market prices reflects intrinsic value, appears less appealing. Were the prices irrationally high before the Black Monday or irrationally low afterward?

The events of 1987 suggest how difficult it is to value equity stocks. To illustrate the problem, suppose that an equity stock is expected to pay a dividend of ₹3 a year hence and the dividend would grow at a constant rate every year. Investors require a return of 16 per cent on this stock and the market price of the stock is ₹100. Applying the constant growth dividend discount model we can figure out the expected growth in dividends:

$$P_0 = D_1/(r - g)$$

$$100 = ₹3/(0.16 - g) \rightarrow g = 0.13 \text{ or } 13 \text{ per cent}$$

Now suppose that investors revise their growth expectation downward by 1 per cent (from 13 per cent to 12 per cent). As a result, the stock price falls to ₹75.

$$P_0 = ₹3/(0.16 - 0.12) = ₹75$$

An identical fall would occur, if the investors revise their required return upward by 1 per cent to 17 per cent, holding their growth expectation constant.

Thus we find that 1 per cent decline in the expected growth rate or 1 per cent increase in the investors' required return leads to a fall of 25 per cent in the stock price.

The difficulty in valuing equity stocks has two implications. First, investors typically price an equity stock in relative terms – relative to its price yesterday or relative to the price of comparable securities. They assume yesterday's price as correct and adjust it upward or downward based on today's information. Thus, when investors lose faith in the benchmark of yesterday's price, there may be a substantial revision in prices before a new benchmark is determined.

Second, it is almost impossible to test the hypothesis that stock price is equal to intrinsic value, as it is very difficult to establish intrinsic value without any reference to price. Though the crash has not conclusively disproved the EMH, it has undermined the faith of many people in efficient markets hypothesis.

Even though the crash may cast shadow over market efficiency with respect to absolute prices it may not weaken the case for market efficiency with respect to relative prices. Put differently, while we may not be sure whether prices of two stocks, viz., *A* and *B* are fairly

established in any absolute sense, we may be reasonably confident the prices of *A* and *B* are fairly established relative to each other.

Inclusion in an Index Another evidence is that prices react to uninformed shifts in demand when stocks are included in an index. When a company is included in an index like the S&P 500 Index in the U.S. or the S&P CNX Nifty Index in India, a significant number of its shares are acquired by index funds and other funds which keep close to the index. Thus, such inclusion stimulates a substantial uninformed demand for the shares of the company, leading to a price increase. Put differently, demand shifts move security prices and arbitrage does not eliminate the impact of these shifts on stock prices because securities do not have good substitutes.

Many of the studies described above have been challenged on various grounds such as data mining, sample selection bias, transaction costs, and improper adjustment for risk. Nonetheless, the thrust of the evidence, particularly from the 1980s, seems to be much less favourable to the EMH. Why did researchers fail to report much evidence challenging the EMH until 1980? Shleifer offers two possible explanations. First, the professional dominance of the EMH proponents till the late 1970s may have made it difficult to publish rejections of the EMH in academic journals. This explanation, however, is not very convincing because there are many journals in economics and finance willing to publish novel findings. Second, and scientifically more convincing, is the argument of Summers. He says that many tests of market efficiency are not powerful enough to discriminate against plausible forms of inefficiency. Empirically, it is often difficult to tell whether some time series such as a stock index conforms to a random walk or a mean-reverting process arising from a persistent fad. It takes considerable data and perhaps a better theoretical framework, before researchers can find satisfactory evidence. As Shleifer put it: "Whatever the reason why it took so long in practice, the cumulative impact of both the theory and the evidence has been to undermine the hegemony of the EMH and to create a new area of research – behavioural finance."

6.5 ✦ KEYNES' BEAUTY CONTEST AND GUESS-A-NUMBER GAME

John Maynard Keynes considered professional investment to be analogous to a beauty contest. As he put it:

> "Professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole: so that each competitor has to pick, not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view. It is not a case of choosing those which, to the best of one's judgment, are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be, and there are some, I believe, who practice the fourth, fifth, and higher degrees."

The Keynes' beauty contest analogy is an apt description of how financial markets work and the key role played by behavioural factors, though it may be a little difficult to get it. To understand this analogy and its subtlety consider the following contest.

> Guess a number from 0 to 100. Your goal should be to make your guess as close as possible to two-thirds of the average guess of all those who are participating in this contest.

To illustrate this puzzle, suppose there are three participants in this contest who, guessed 20, 30, and 40 respectively. In this case, the average guess is 30, two-thirds of which is 20, so the person who guessed 20 would be the winner.

Let us look at how people at different levels of thinking would play this game:

> A zero-level thinker: "I have no clue. This is a math problem and I don't like math. Let me just pick a number between 0 and 100 at random."
> A first-level thinker: "Since most of the people don't like to think, they will randomly pick a number between 0 and 100, averaging 50. So, my guess should be 33, two-thirds of 50."
> A second-level thinker: "Most participants will be first-level thinkers, but think that other participants are zero-level thinkers, and so they will guess 33. Therefore, my guess should be 22."
> A third-level thinker: "Most participants will be second-level thinkers and guess 22. So, I should guess 15."

Clearly, there is no end to this train of thinking. Would you like to change your guess?

Here is another question you may answer. What is the Nash equilibrium for this game? Named after John Nash, a Nobel laureate in economics, the Nash equilibrium is a number that if everyone guessed it, no one would like to change their number.

The Nash equilibrium for this game is 0. You can see why. Suppose everyone guessed 10. Then the average guess would be 10 and you would like to guess two-thirds of that, or 6.67. But if everyone guessed 6.67, you would like to guess 4.44, and so on. If and only if everyone guessed zero would no one like to change his or her guess.

The guess-the-number game is similar to Keynes' beauty contest. Participants in this game have to guess what other people are thinking that other people are thinking, just as in Keynes' beauty contest. Hence, in economics, the "number guessing game" is popularly referred to as the "beauty contest."

In 1997, Richard Thaler conducted a large-scale "guess-the-number" game with the support of the *Financial Times* newspaper. The newspaper announced that the winner of the contest would get two British Airways round trip "Club Class" between London and either New York or Chicago. Readers were asked to select an integer between 0 and 100. The winning entry would be the one closest to two-thirds of the average entry.

If everyone thought deeper and deeper, along the lines explained earlier, the winning entry would be 1 (when the participants are asked to choose an integer, the Nash equilibrium value is 1 not 0). In the *Financial Times* contest, however, the winning choice was 13, implying that most people made mistakes. This "guess-a-number" experiment illustrates two important themes in behavioural finance: (a) People are prone to commit errors in the course of decision

making. (b) The errors committed by people cause security prices to be different from what they would have been in an error-free environment.

6.6 ✦ AN ASSESSMENT OF EMH

As a **normative** benchmark of how the world should be, the EMH has been very useful. In a rational world, the EMH would be true. Without the rational model as a starting point, it would not have been possible to do research in behavioural finance. As Richard Thaler put it, "Without the rational framework, there would be no anomalies from which we can detect misbehavior. We need some starting point to organize our thoughts on any topic, and the EMH remains the best one we have."

As a **descriptive** model of asset markets, the report card on the EMH is mixed. The "no-free-lunch" component of the EMH is mostly true because mutual funds and professional investors, in general, have not been able to outperform, or even match, the performance of the relevant benchmark indices.

The "price is right" component of the EMH, however, is perhaps not true—and for many important questions, this is the more relevant component. In a very provocative article, titled "Noise," which appeared in the July 1986 issue of *Journal of Finance*, the eminent financial economist Fisher Black opined that, "we might define an efficient market as one in which price is within a factor of 2 of value, i.e., the price is more than half of value and less than twice value. The factor of 2 is arbitrary, of course. Intuitively, though, it seems reasonable to me, in the light of sources of uncertainty about value and the strength of the forces tending to cause price to return to value. By this definition, I think all markets are efficient almost all of the time. 'Almost all' means at least 90%."

It is hard to say whether "90% of the time" is a satisfactory definition of "almost all" of the time, but more significantly, a factor of 2 appears to be a very wide margin to call a market efficient. Richard Thaler seriously challenges the "price is right" component. He says: "My conclusion: the price is often wrong, and sometimes very wrong. Furthermore, when prices diverge from fundamental value by such wide margins, the misallocation of resources can be quite big."

• Contributions of Nobel Laureates

2013 Nobel prize in economics was shared by Eugene Fama, Robert Shiller, and Hansen primarily for their contribution to the debate on the efficient markets hypothesis. According to Fama's efficient market hypothesis, investors cannot expect to beat the market because financial markets aggregate publicly available information efficiently. The idea reflects the broader notion of rational expectations that says that market prices at times correctly reflect available information.

Shiller's major contribution has been to point out that asset prices were far too volatile for markets to be efficient and feature rational expectations. To analyse excessive volatility in markets, Shiller developed theories that involved what may be called 'efficiency bounds,' within which security prices would move, if markets were truly efficient. Shiller found evidence that stock price movements and interest rates were not constrained by these 'efficiency bounds.'

Hansen's major contribution was to develop statistical and theoretical tools that brought greater rigour to the study of asset prices over time.

Karl Popper's View of Knowledge

The eminent philosopher of science Karl Popper said that most theories or assumptions about the world should be considered as temporary or conditional hypotheses until they are refuted. Likewise, in the world of investments, we would be better off if we view most things as a conditional hypothesis or conjecture until something refutes or disproves it.

SUMMARY

- The efficient markets hypothesis (EMH) has been the central idea in finance since the mid-1960s. Eugene Fama who proposed this idea defined an efficient financial market as one in which security prices fully reflect the available information.
- The efficient markets hypothesis has provided fundamental insights, spawned extensive theoretical work and empirical studies, and generated considerable controversy.
- The efficient markets hypothesis was developed independently by Paul Samuelson and Eugene Fama in the 1960s. Interestingly, they arrived at the notion of market efficiency from two rather different research agendas.
- In the first decade after it was conceived in the 1960s, the EMH turned out to be a monumental theoretical and empirical success. Powerful theoretical reasoning was developed in support of the EMH.
- Since the early 1980s, the theoretical foundations as well as the empirical evidence in support of the EMH have been questioned and behavioural finance has emerged as an alternative view of financial markets. In this view, economic theory does not result in market efficiency.
- According to Andrei Shleifer, any one of the following three conditions will lead to market efficiency: (i) investor rationality, (ii) independent deviation from rationality, and (iii) effective arbitrage.
- Powerful as the theoretical arguments for the EMH may seem, the empirical evidence that appeared in the 1960s and 1970s was even more impressive. The empirical evidence on the EMH may be divided into two broad categories. First, when news about the value of a security arrives in the market, the price should reflect this news quickly and correctly. Second, since the price of a security equals its value, the price should not move without any news about the value of the security.

- Fama distinguishes between three types of stale information, which result in three forms of the EMH: the weak from efficiency, the semi-strong form efficiency, and the strong from efficiency. As things stood at the end of the 1970s, the EMH was indeed regarded as one of the great triumphs of twentieth century economics. Standard economic theory, particularly the theory of arbitrage, predicted market efficiency and empirical evidence overwhelmingly confirmed the predictions of the theory. This persuaded Michael Jensen to declare in 1978 that the EMH has more solid empirical evidence supporting it than any other proposition in economics.
- The EMH has been challenged theoretically on three grounds:
  - Investor irrationality
  - Correlated investor behaviour
  - Limits to arbitrage
- One can expect the irrationality of **noise traders** to be countered by the rationality of **arbitrageurs** as the latter are supposed to be guided by fundamentals and immune to sentiments. However, arbitrage in the real world is limited by two types of risk. The first risk is fundamental. Buying undervalued securities tends to be risky because the market may fall further and inflict losses. The second risk is resale price risk and it arises mainly from the fact that arbitrageurs have finite time horizons.
- Chronologically, the EMH was challenged empirically before it was criticised theoretically. An important early challenge came from Shiller's work on stock market volatility. Shiller showed that stock market prices fluctuate far more than could be justified by a simple model in which prices are equated with the net present value of dividends.
- According to the EMH, stock prices should not react to non-information. But there is evidence that stock prices do react to non-information Robert Shiller's pioneering work sparked a debate regarding the volatility of stock prices. He has presented evidence that stock prices jump around much more than what is justified by variations in corporate dividends and cash flow.
- Many of the studies described above have been challenged on various grounds such as data mining, sample selection bias, transaction costs, and improper adjustment for risk. Nonetheless, the thrust of the evidence, particularly from the 1980s, seems to be much less favourable to the EMH.
- The Keynes' beauty contest analogy is an apt description of how financial markets work and the key role played by behavioural factors. The guess-a-number game is a good tool for understanding the Keynes' analogy.
- As a normative benchmark of how the world should be, the EMH has been very useful. As a descriptive model of asset markets, the report card on the EMH is mixed.

DISCUSSION QUESTIONS

1. Discuss the following three conditions which lead to market efficiency: investor rationality, independent deviation from rationality, and effective arbitrage.
2. What is meant by quick and accurate reaction to information?
3. Discuss the three levels of market efficiency.
4. What is an event study? What is a portfolio study?
5. What contributes to investor irrationality, according to Kahneman and Riepe?
6. Why is investor behaviour often correlated?
7. How is arbitrage in the real world limited?
8. Discuss the empirical challenges to the EMH.
9. Describe the Keynes' beauty contest and the guess-a-number game.
10. Assess the EMH as a normative model and as a descriptive model.

MINI CASE

3COM AND PALM

3Com's main business was in networking computers using Ethernet technology. In the late 1990s, it also acquired Palm – as a sequel to a merger. Palm made Palm pilot which at that time was regarded as a very spiffy and fashionable handheld computer. In the summer of 1999, when stocks of respectable Silicon Valley companies were soaring, 3Com's stock was languishing. To boost its share price, 3Com management adopted a plan to divest itself of its interest in Palm. On March 2, 2000, 3Com sold a small fraction of its stake in Palm to outsiders, in what is called an equity carve-out transaction. 3Com sold 1 per cent of its stake in Palm to a consortium of firms and sold about 4 per cent through an initial public offering, while retaining 95 per cent ownership of Palm.

Efficient market votaries would consider such an action irrelevant. Whether Palm is located within 3Com or out on its own should not make any difference. If prices are "right" splitting up a company should not alter its value, unless the parent company (3Com) was stifling the operations of its division (Palm). The 3Com management, of course, did not claim that they wanted Palm to be released from the yoke of their management. Instead, they believed that as a separate company Palm would enjoy fancy valuation like eBay, AOL, Amazon, and other sexy technology companies at that time. An efficient market votary would view such a move with skepticism. In a market dominated by rational investors, the value of 3Com should be equal to the value of Palm plus the value of the rest of 3Com. Splitting 3Com into two parts should have no bearing on the total value of enterprise.

But stock prices of technology firms in the late 1990s were clearly not driven by rational investors. Surprising as it may appear, carving out Palm worked. 3Com was selling for about $ 40 a share when the plan to separate Palm from the rest of the company was announced on December 13, 1999. By the

time the initial public offering for the Palm shares was done, on March 1, 2000, the 3Com share price crossed $ 100. The more interesting part of the story was yet to unfold.

After selling 5 per cent of Palm to outside investors, 3Com planned to distribute, the remaining shares of Palm to its 3Com shareholders, with a time lag of 3 months. For each 3Com share, they would get 1.5 shares of Palm. So a single share of 3Com was equivalent to 1.5 shares of Palm plus an interest in the remaining business of 3Com, or what is referred to in finance as the "stub value" of 3Com. In a rational market, the price of a 3Com share would be equal to: 1.5 x Price of Palm share + Value of the stub.

The investment bankers who marketed the shares to be offered in the initial public offering set a price of $ 38 per share, but when Palm shares started trading the price soared and ended the day a shade over $ 95. Clearly, investors seemed wildly enthusiastic about the prospect of an independent Palm company.

Given this investor enthusiasm for Palm, the price per share of 3Com ought to have been at least $ 143 (1.5 × $ 95), and probably quite a bit more as the remaining parts of 3Com were a profitable business. Surprisingly, the price of 3Com fell that day, closing at $ 82. This means that the market was imputing a price of minus $ 61 per share for the stub value of 3Com. At an aggregate level, it meant that the remaining 3Com business, a profitable operation, had a value of minus $ 23 billion.

This was a gross violation of the law of one price. It was so preposterous that it was widely published. Yet, the value of the 3Com stub remained negative for quite some time.

It must be noted that apart from the law of one price, one more first principle of finance was violated. A fundamental principle of finance is that a stock price can never be negative, thanks to the limited liability principle. This principle, which is even more fundamental than the law of one price, was violated because the value of the 3Com stub remained negative.

Discussion Question

1. How could the law of one price be violated?

APPENDIX 6A

MICRO EFFICIENCY AND MACRO INEFFICIENCY[1]

Paul Samuelson has argued that modern markets show considerable micro efficiency because the minority that spots deviations from micro efficiency can make money by exploiting those deviations and in doing so, they eliminate persisting inefficiencies. In contrast, Paul Samuelson hypothesised that markets display considerable macro inefficiency in the sense that aggregate indexes of security prices remain below or above various definitions of fundamental values for long periods of time. There seems to be substantial evidence in support of Samuelson's dictum where inefficiency is defined as predictability of future (excess) returns.

Samuelson's dictum is plausible because much more information is available about future changes in fundamentals of individual firms than about future changes in the fundamentals of the aggregate stock

[1] This note draws heavily on "Samuelson's Dictum and the Stock Market," by Jeman Jung and Robert J. Shiller (Cowles Foundation Paper No. 1183)

market. Activities and prospects of individual firms are highly diverse. Some firms may be poised to grow rapidly in profitable segments because of major technological breakthroughs or favourable market developments; other firms may be experiencing declining fortunes.

The wide variations in the prospects of individual firms have an overwhelming effect on price, compared to the influence of shifting market psychology over time. Hence, the efficient markets model works fairly well for individual firms.

In contrast, the market has lesser clarity about changes in aggregate dividend or earnings flow. It is harder for investing public to understand the changes in aggregate dividends and earnings as they are influenced by factors like overall economic growth, fiscal and monetary policies, profitability margins, and the like. Given this difficulty in predicting aggregate dividends, we might expect that factors like market psychology would dominate the effect of information about aggregate future dividends in determining prices. Hence the efficient markets model may be a bad approximation for the aggregate stock market.

APPENDIX 6B

VALUE LINE INDEX MISPRICING

In the early 1980s, the renowned financial economist Fisher Black, a co-developer of the famous Black-Scholes option pricing model, presented to his finance class at MIT the Value Line Index mispricing anomaly. The Value Line Index futures contract had been trading at the Kansas City Exchange since 1982 at the wrong price. The Value Line Index futures contract was traded on the basis of the arithmetic average of futures contracts of individual stocks constituting the Value Line Index. The Value Line Index, however, was a geometric average, not an arithmetic average. Since a geometric average is always less than an arithmetic average, the futures contract was always overpriced.

When Fisher Black moved from MIT to Goldman Sachs, the firm put together a large matched book position which was long on all the stocks in the Value Line index and short on the Value Line Index futures. This strategy produced a $20 million risk-free profit and Fisher Black was made a partner at Goldman Sachs in 1986. It also opened a new line of business in basket trading—wherein a package, or basket, of 5 to 50 stocks is sold as a portfolio and another basket is purchased—that offered arbitrage opportunities.

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Chapter 7

Emotional Factors and Social Forces

Neoclassical economics assumes that the "economic man" is a rational, self-centered decision maker. We have discussed at length what it means in finance to be a rational decision maker and presented evidence that suggests that real life human beings are irrational in many ways. As eminent behavioural economist Dan Ariely put it, in his fascinating book *Predictably Irrational*, "My further observation is that we are not only irrational, but *predictably irrational*–that our irrationality happens the same way, again and again."

Recent research has shed light on another quality of the economic man, which is concerned with self-interested behaviour. Human behaviour is not entirely dictated by material self-interest. It is also influenced by social forces and other-regarding preferences such as fairness and reciprocity.

This chapter reviews some of the psychological findings on emotion to help us in exploring the role of emotions in financial decisions. It also discusses the social forces and other regarding preferences that have a bearing on how people behave. It is organised into nine sections as follows:

- Substance of emotion
- Theories of emotion
- Evolutionary perspective on emotions
- Types and dimensions of emotions
- Emotions and investing
- Fairness, reciprocity, and trust
- Conformity
- Psychology of influence
- Social influence and investing

7.1 ✦ SUBSTANCE OF EMOTION

Mental states such as happiness, sadness, pride, greed, fear, regret, anger, contempt, surprise, and disgust are commonly understood as emotions. But, what exactly is an emotion. Sandra Hockenbury describes an emotion as "a complex physiological state that involves three distinct

components: a subjective experience, a physiological response, and an expressive response." John Elster argues that an emotion has six observable features:

1. *Cognitive antecedents* Generally, an emotional response is triggered by a belief. For example, you become angry when someone jumps the queue, gets ahead of you, and buys all the remaining tickets for a movie show, and thereby deprives you of a ticket.
2. *Intentional objects* Emotions relate to something like a person or situation. For example, you are angry with the person who jumped the queue. Often, the object of emotion is closely linked to the belief that prompted the emotion. You get angry with the person who jumped the queue because you consider him unfair. It is important to distinguish between an emotion and a mood. While an emotion relates to something specific, a mood is a general feeling not focused on anything in particular.
3. *Physiological arousal* Emotions are accompanied by changes in the hormonal and nervous system. When a person is enraged, his blood pressure tends to increase.
4. *Physiological expressions* Emotions are often characterised by observable expressions associated with how a person functions. When you get angered by the person who jumps the queue, you may raise your voice or clench your fist. Anger may perhaps consistently be associated with these physiological expressions. But these physiological expressions may not be necessarily unique to anger and can stem from very different emotions. For example, a person may raise his voice and clench his fists at a time of celebration or joy.
5. *Valence* Valence, a psychological term, is used to rate feelings of pleasure and pain. Emotions are typically rated on a scale with a neutral point in the centre and negative and positive feelings at the two end points.
6. *Action tendencies* Emotions tend to produce action. A person who experiences an emotion often feels the urge, sometimes a compulsion, to act in a certain way. You may feel the urge to give the person who jumps the queue a piece of your mind. Or you may simply restrain your urge and walk away. You may regulate your action tendency in a conscious or unconscious manner.

The above six features define what an emotion is and how it may be differentiated from other mental states.

Emotion may be differentiated from similar constructs like feelings, moods, and affect, in the field of affective neuroscience. *Feelings* are subjective representation of emotions. *Moods* are diffused affective states that last much longer and are usually less intense than emotions. *Affect* is a wider term that encompasses emotion, feelings, and moods, even though it is commonly used interchangeably with emotion.

Emotions may be negative or positive. Negative emotions are anger, fear, stress, sadness, disgust, guilt, hatred, shame, contempt, embarrassment, and so on. Positive emotions are gratitude, hope, joy, tranquility, enthusiasm, interest, inspiration, awe, amusement, love, and so on. Historically, psychologists have focused primarily on negative emotions and neglected positive emotions. Such a focus may have been motivated by a desire to alleviate suffering. From mid-1990s, a band of psychologists such as Martin Seligman, C. Mihalyi, Barbara Fredrickson, and others have turned their attention on positive emotions and have founded a branch of psychology called positive psychology. Positive psychology promises to improve the quality of life by promoting positive growth in people and society.

7.2 ✦ THEORIES OF EMOTION

Philosophers, researchers, and psychologists have proposed different theories to explain the what, why, and how behind human emotions. The major theories of emotions may be grouped into two main categories: physiological, and cognitive.

• Physiological Theories

Physiological theories suggest that responses within the body cause emotions. One of the best-known examples of a physiological theory of emotions is the James–Lange theory, independently proposed by psychologist William James and physiologist Carl Lange.

According to this theory, an external stimulus leads to a physiological response which, in turn, leads to an emotional reaction, depending on how the person interprets the physiological response. For example, suppose you see a snake in your backyard and you begin to tremble and conclude that you're frightened ("I am trembling, so I am afraid").

Another well-known physiological theory of emotions is the Cannon–Bard theory of emotions. According to this theory, we feel emotions and physiological reactions (such as trembling and sweating) simultaneously. More specifically, this theory says that both the emotion and physiological reaction occur when the thalamus sends a message to the brain in response to a stimulus.

Yet another physiological theory is the **facial feedback theory**. According to this theory, facial expressions are not only the results of our emotions but are also capable of influencing our emotions. For example, when we smile, we experience pleasure or happiness. Likewise, when we frown, we experience sadness. As Beppe Micallef-Trigona put it, "It is the change in our facial muscles that cue our brains and provide the basis of our emotions. Just as there are an unlimited number of muscle configurations in our face, so too are there a seemingly unlimited number of emotions."

• Cognitive Theories

Cognitive theories argue that thoughts and other mental activities have an important bearing on the formation of emotions. The Schachter–Singer theory, also known as the two-factor theory of emotion, is an example of a cognitive theory of emotion. According to this theory, there are two key components of an emotion: physical arousal and cognitive label. This theory says that a mere physical arousal is not enough; the person must also identify the arousal in order to feel the emotion.

According to the two-factor theory, when you see a cobra snake in your backyard, the sequence that follows would be much like this.

1. I see a cobra snake in my backyard.
2. My heart races.
3. My rapid heart rate is caused by fear.
4. I am frightened.

With the two-factor theory recognising the importance of cognition, several theories emphasised that cognitive activity in the form of thought, judgments, or evaluations are

essential for an emotion to occur. Richard Lazarus, an important proponent of this view, argued that emotions must have some cognitive intentionality. According to this theory, emotion is a disturbance that occurs in the following order:

1. Cognitive appraisal – The individual assesses the event cognitively which motivates the emotion.
2. Physiological changes – The cognitive reaction induces biological changes such as increased heart rate or pituitary adrenal response.
3. Action – The individual feels the emotion and decides how to react.

7.3 ✦ EVOLUTIONARY PERSPECTIVE ON EMOTIONS

When we discussed prospect theory, we learnt that it has an evolutionary aspect to it. Emotions seem to be no different. In recent years, some psychologists have drawn on the seminal contributions Charles Darwin made in the latter half of nineteenth century. In his theory of evolution and natural selection, Charles Darwin argued that the traits that contribute to the survival of a species become the innate characteristics of the species in the long run. Darwin believed that this applied to physical traits as well as emotions.

Based on Darwin's theory of evolution and natural selection, evolutionary theorists argue that our basic emotions have evolved to serve the needs of survival. At times, a situation demands an immediate response, without much deliberation.

According to the evolutionary perspective, the mind is a crowded zoo of evolved, domain-specific programmes, each functionally specialised to solve a different adaptive problem that arose during hominid evolutionary history, such as heart rate regulation, predator vigilance, sleep management, foraging, mate choice, or face recognition. However, the existence of numerous micro-programmes itself creates an adaptive problem.

As Leda Cosmides and John Toby put it, "Programmes that are individually designed to solve specific adaptive problems could, if simultaneously activated, deliver outputs that conflict with one another, interfering with or nullifying each other's functional products. For example, sleep and flight from a predator require mutually inconsistent actions, computations, and physiological states."

To avoid such consequences, the mind needs super ordinate programmes that coordinate these individual programmes snapping each into the right configuration at the right time. Emotions are such super ordinate programmes. As Leda Consmides and John Toby put it, "To behave functionally according to evolutionary standards, the mind's many sub-programme need to be orchestrated so that their joint product at any given time is functionally coordinated, rather than cacophonous and self-defeating. This coordination is accomplished by a set of super ordinate programmes – the emotions."

7.4 ✦ TYPES AND DIMENSIONS OF EMOTIONS

• Plutchik's Wheel of Emotions

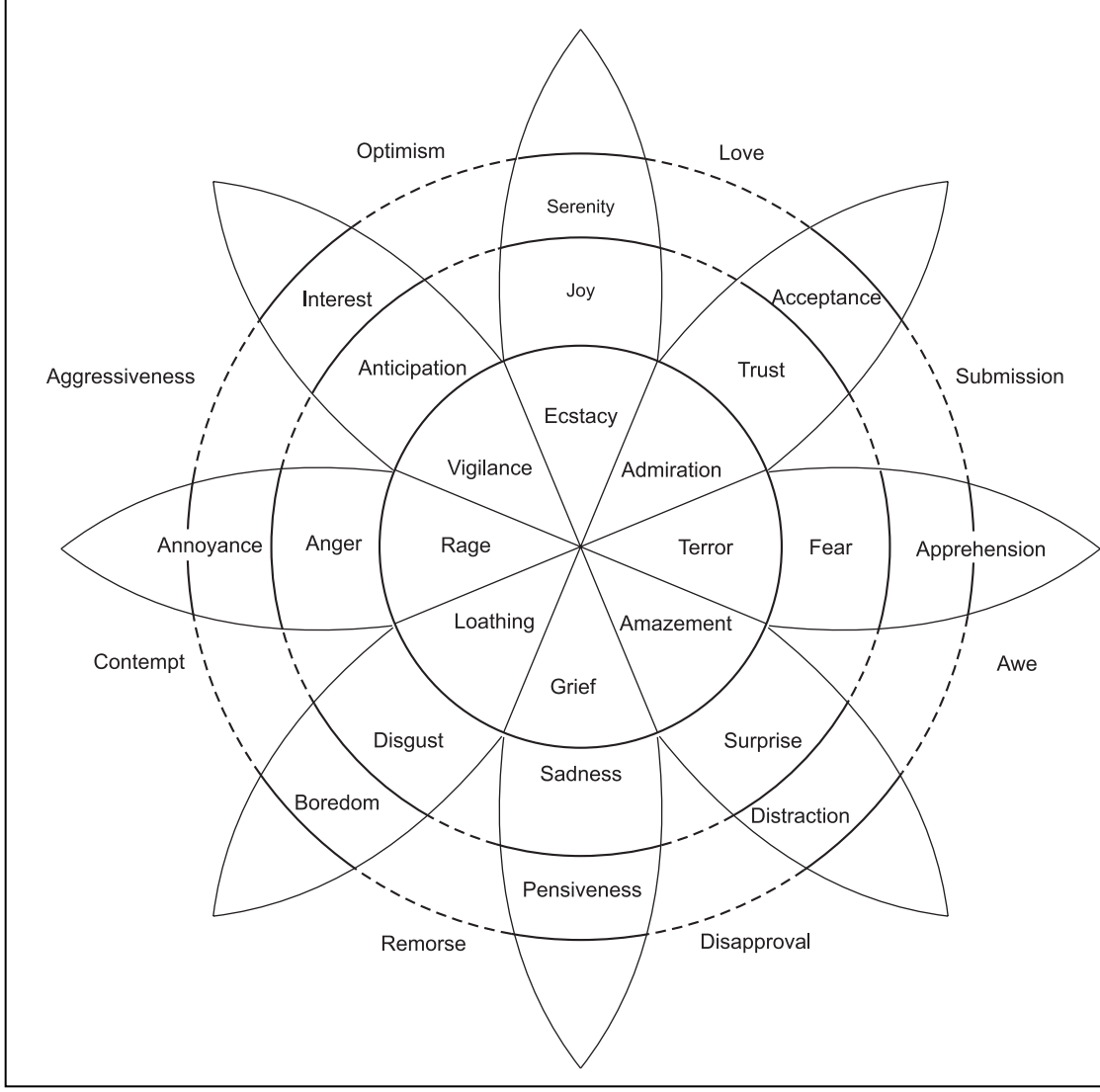
Emotions have been classified into various types or categories. According to Robert Plutchik, a psychologist who developed a psycho evolutionary theory of emotions, there are eight basic

or primary emotions: joy, trust, fear, surprise, sadness, anticipation, anger, and disgust. Each emotion has a polar opposite as shown below.

Joy–Sadness
Fear–Anger
Anticipation–Surprise
Disgust–Trust

Plutchik proposed the wheel of emotions, shown in Exhibit 7.1, in order to illustrate the relationships among emotions. In this wheel, the intensity of emotion increases as one moves toward the centre of the wheel and decreases as one moves outward.

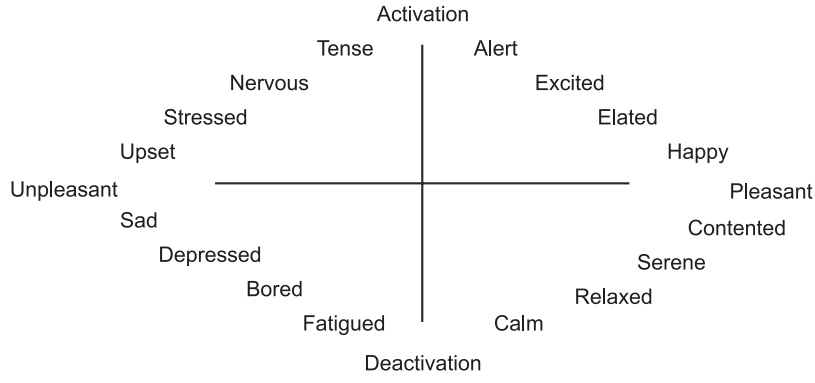
Exhibit 7.1 Plutchik's Wheel of Emotions



Two Dimensions of Emotions

Emotional experiences may be measured along two dimensions, viz., **valence** (how negative or positive the experience feels) and **arousal** (how energising or enervating the experience feels). Exhibit 7.2 depicts a two-dimensional coordinate map.

Exhibit 7.2 Two Dimensions of Emotion



Emotions and Affective Feelings

According to Jan Pankeep, a neuroscientist, there are seven primal emotions and affective feelings associated with them. They are as follows:

Primal Emotions	*Affective Feelings*
Seeking	Enthusiastic
Rage	Angered
Fear	Anxious
Lust	Arousal
Care	Tender and loving
Panic	Lonely and sad
Play	Joyous

7.5 ✦ EMOTIONAL STYLE

According to neuroscientist Richard J. Davidson, each person has a unique emotional profile. As he put it, "Just as each person has a unique fingerprint and a unique face, each of us has a unique emotional profile, one that is so much a part of who we are and those who know us well can often predict how we will respond to an emotional challenge."

Based on his research, Davidson identified six dimensions of Emotional Style in his classic work *The Emotional Life of Your Brain* written with Sharon Begley. According to him, 'Each of the six dimensions has a specific, identifiable neural signature—a good indication that they are real and not merely a theoretical construct."

The six dimensions of Emotional Style are as follows:

Resilience Style Does a person respond to a setback with determination or does he simply surrender helplessly? People at one end of this dimension recover quickly from adversity whereas people at the other end of this dimension recover very slowly.

Outlook Style Does a person have a sunny disposition and look at the brighter side of things or does he tend to be cynical or pessimistic? People at one end of the outlook spectrum may be characterised as Positive types; those at the other, as Negative types.

Social Intuition Style Can a person read other people's body language and voice tone and figure out whether they want to talk or be alone whether they are stressed or relaxed. Or is a person puzzled by the outward manifestations of other people's mental and emotional states? Socially Intuitive types are at one end of this spectrum; Socially Puzzled types are at the other end.

Self-Awareness Style Is a person aware of his own thoughts and feelings and attuned to the messages of his body? Or does he act and react without knowing why he does what he does because his inner self is opaque to his conscious mind? Self-aware people lie at one end of his spectrum; Self-opaque people lie at the other end.

Sensitivity to Context Style Does a person follow conventional rules of interaction so that he does not tell his boss the same dirty jokes he shares with his friends or engage in a date at a funeral service? Or is he baffled when someone points out that his behaviour is inappropriate? Tuned in people are at one end of the spectrum of the Sensitivity to Context Style; Tuned out people are at the other end.

Attention Style Can a person filter out emotional or other distractions and stay focused? Is he so absorbed in the TV show that he does not notice the whining of his dog? Or do his thoughts flit from what he is doing to the quarrel he had with his colleague in the morning or the anxiety about an upcoming presentation? Focused people are at one end of the Attention spectrum; Unfocused people are at the other end.

Emotionally a person is the product of different amounts of each of these six components. Since there are numerous ways to combine the six dimensions, there are countless Emotional Styles. Indeed, everyone is unique. As Davidson put it, "….each of us is a color-wheel combination of the Resilience, Outlook, Social Intuition, Self-Awareness, Context, and Attention dimensions of Emotional Style, a unique blend that describes how you perceive the world and react to it, how you engage with others, and how you navigate the obstacle course of life." An illustrative emotional style is given below:

Resilience

1 2 10

FAST TO RECOVER SLOW TO RECOVER

Outlook

1 8 10

NEGATIVE POSITIVE

Social Intuition

1 8 10

PUZZLED SOCIALLY INTUITIVE

Self-Awareness

1 6 10

SELF-OPAQUE SELF-AWARE

Sensitivity to Context

1 6 10

TUNED-OUT TUNED-IN

Attention

1 8 10

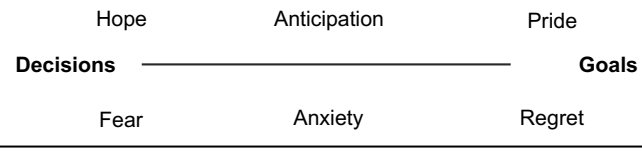
UNFOCUSED FOCUSED

7.6 ✦ EMOTIONS AND INVESTING

Emotions have a bearing on risk tolerance, and risk tolerance influences portfolio selection. Investors experience a variety of emotions as they consider alternatives, decide how much risk to take, watch their decisions play out, assess whether the initial strategy needs modification, and finally learn how far they have succeeded in achieving their financial objectives.

The emotions experienced by a person with respect to investment may be expressed along an emotional time line as shown in Exhibit 7.3. Investment decisions lie at the left end of the time line and investment goals at the right end. According to psychologist Lola Lopes, investors experience a variety of emotions, positive and negative. Positive emotions are shown above

Exhibit 7.3 Emotional Time Line



the time line and negative emotions below the time line. On the positive side, hope becomes anticipation which finally converts into pride. On the negative side, fear turns into anxiety which finally transforms into regret.

Hope and fear have a bearing on how investors evaluate alternatives. Fear induces investors to look at the downside of things, whereas hope causes them to look at the upside. The downside perspective emphasises security; the upside perspective focuses on potential gains. According to Lopes, these two perspectives reside in everyone, as polar opposites. However, they are often not equally matched, as one pole tends to dominate the other. The relative importance of these conflicting emotions determines the tolerance for risk.

The Five Year Rule Wall Street's conventional wisdom is that you should put money into stocks only when you are more than five years from your goal. What is the logic of this rule? The "five year rule" is scarcely a mean-variance strategy. It is driven by emotional considerations. Think about a situation where an investor has sufficient resources to achieve a major goal that is less than five years away by investing in safe fixed instruments. However, the investor allocates a substantial proportion of these resources to equities, only to discover that at the end of five years his equity investment has eroded in value and his goal has moved out of reach.

The dominant emotion in this case would be regret. Hence, the five-year rule seems to be essentially a regret-minimisation rule as historically very rarely have equities delivered a negative return over a five-year holding period.

Emotional Intelligence

Psychologist Daniel Goleman, author of the path-breaking book *Emotional Intelligence*, is an expert on the subject. He defines emotional intelligence as "the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships." According to him there are five basic competencies for emotional intelligence:

- *Self-awareness* The ability to understand how emotions affect oneself and other people.
- *Self-regulation* The ability to control one's impulsive decisions.
- *Internal motivation* The passion for what one is doing along with a curiosity for learning.
- *Empathy* The ability to understand the emotional make-up of others.
- *Social skills* The ability of handle relationships.

7.7 ✦ FAIRNESS, RECIPROCITY, AND TRUST

While most people accept that fairness is valued in our society, the notion of fairness has been largely overlooked in traditional finance which assumes that economic agents are driven by self-interest. In recent years, however, some researchers have recognised the importance of fairness, reciprocity, and trust in the conduct of business transactions. Trust is a prerequisite for an efficiently functioning economy. The costs of business and personal transactions are

significantly reduced if people trust each other and treat each other fairly. Empirical evidence suggests that a large number of people trust and treat others fairly, even when they are not likely to deal with them in future. Tipping servers in restaurants is a commonplace example of fairness and trust. People normally tip the servers, as long as the service is above a threshold level. Although tipping is not required, people often do it out of a sense of fairness.

To understand fairness, reciprocity, and trust, psychologists have designed various games or experiments. The important ones are:

- Ultimatum game
- Dictator game
- Trust game

Ultimatum Game

The participants in this game are divided equally into two groups put in two different Rooms, A and B. Each participant in Room A is randomly paired with someone in Room B. Neither of them know each other's identity. Each participant in Room A (proposer) is given ₹1000 and asked to send any portion of that amount to the randomly paired participant (responder) in Room B. Proposers can send any amount – ₹10, ₹100, ₹500, ₹900, or whatever. The respondent in Room B can choose to accept or reject the amount sent. If the respondent accepts the amount, the division proposed by the participant in Room A is final; if the respondent rejects the amount, neither the proposer nor the respondent receives anything.

If you are a proposer in Room A, how much would you send to your counterpart in Room B? Remember that if you send ₹X and the respondent accepts it, you keep ₹1000 – ₹X; if the respondent rejects it, both receive nothing.

Amount sent to Room B_____.

This game is called the **ultimatum game**. According to the traditional economic theory, a self-interested respondent will accept any positive amount—something is better than nothing. Realising this, a proposer would make the smallest possible offer, ₹1 in our example.

When people play the ultimatum game in experimental settings, on average, proposers send more than the minimum possible offer. Perhaps they realise that respondents will reject offers they perceive to be unfair. Typically half the time respondents reject offers that are less than 20% of the proposer's endowment.

The results of the ultimatum game appear to be incongruent with pure self-interest in two ways. First, responders reject positive offers, which means that they do not maximise their self-interest. Second, proposers send more than the minimum offer, on average, suggesting that they want to be fair. However, you can argue that proposers behave strategically to avoid retaliation of the respondents.

Dictator Game

To separate the effects of fairness and strategy, another game has been proposed. This game is similar to the ultimatum game except that the division proposed by the participants in Room A is final. This game is called the **dictator game** because the participants in Room B have no decision to make.

In the ultimatum game, all proposers make positive offers. This is understandable because the proposers are concerned with retaliation. What happens in the dictator game? Roughly two-thirds of the proposers in the dictator game make positive offers, even though there is no opportunity for retaliation or reputation building. This may be because people value fairness.

• The Trust Game

While the dictator game seems to measure altruism, there is another game, called the **trust game**, that measures trust and reciprocity. It is described below.

As in the previous games, one-half of the participants are in Room A and the other half in Room B. Each participant (now called investor) in Room A is randomly paired with someone in Room B (now called trustee).

The rules of the game change from here on. Participants in both the rooms are given ₹1000 each. Investors in Room A can send any amount from their endowment (₹1000) to the trustees in Room B. Each rupee sent to Room B is multiplied three times. For example, if an investor in Room A sends ₹500 to a randomly assigned trustee in Room B, the amount will be increased to ₹1500. The trustee in Room B can decide how much of this to keep and how much of this to send back to Room A.

This game is called the trust game because it measures how much the investors in Room A trust their counterparts (trustees) in Room B. It is also called as the investment game because the participants in Room A are "investing" ₹X in participants in Room B.

In theory, the trustees in Room B, as purely self-interested persons, should not return anything. Anticipating such behaviour of trustees in Room B, the investors in Room A should not send anything to trustees.

With no trust, the investor in Room A would not send anything to his trustee in Room B and each participant ends up keeping the endowment amount of ₹1000. So, the total gain is ₹2000. With complete trust, the total gain is ₹4000 (3 × ₹1000 + ₹1000). So, if there is trust, all participants can benefit potentially.

In experiments, investors typically send about half of their endowment to trustees, though there is a wide variation across people. Trustees typically return less than one-half of what they receive, implying that the reciprocity ratio is less than 50 per cent most of the time. In fact, many trustees send less than one-third of what they receive, implying that trust does not pay for investors.

• Altruism

Adam Smith, father of economics, recognised the importance of markets and behaviour motivated by self-interest. However, he also realised that people aren't entirely guided by narrow self-interest. They are also concerned about others.

In his book *Theory of Moral Sentiments,* Smith wrote: "How selfish so ever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary for him, though he derives nothing from him, except the pleasure of seeing it. It is this concern for others that contributes to making

the economy more effective and efficient. If you show some concern for the well-being of your employees, they'll be more productive, and the size of the economic pie—the wealth of nations-will increase."

When you engage in altruistic behaviour, you feel better. It increases your overall well-being. It produces what American economist James Andreoni calls a *warm glow effect* that more than compensates for the opportunity cost of altruistic behaviour.

• Social Behaviour and Emotion

Emotions and social interactions are linked, as evidenced by research using fMRI (functional magnetic resonance imaging). Much of this research falls under a discipline called social neuroscience, which explores the "social brain," or the neural circuitry that is activated when people interact with one another. For example, fMRI technology was employed to examine the cognitive and emotional processes of participants during the ultimatum game. fMRI scans of participants showed that unfair offers triggered activity in the forebrain as well as the limbic system. The rational thought in the forebrain says "Let me accept this offer as it benefits me financially"; the emotion in the limbic system says, "By rejecting this offer, I can get even with the guy, even though it will mean some monetary loss." Heightened activity was observed in the limbic system of participants who rejected the offer, indicating which part of the brain won the argument.

Cornell economist Robert Frank's 1987 book *Passions within Reason* analysed some of the things that people do that are not consistent with economic models of pure self-interest. These include tipping in restaurants when far from home, seeking expensive retaliation, and staying loyal to friends and spouses even when better opportunities arise. According to Frank, these behaviours reflect moral emotions (such as love, vengeance, guilt, or shame) and these moral emotions appear to be the products of evolution. As moral psychologist Jonathan Haidt put it, "Evolution seems to have made us 'strategically irrational' and at times for our own good, for example, a person who gets angry when cheated, and who will pursue vengeance regardless of cost, earns a reputation that discourages would-be-cheaters."

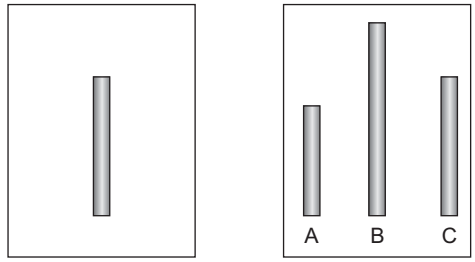
• Social Behaviour and Evolution

Why do human beings cooperate? Why are many people fair, when they don't have to be? It seems that evolution has favoured those who were cooperative and fair in exchanges. Groups that are pro-social seem to outperform groups that are not. This may be the reason why we are "hardwired" to behave socially.

7.8 ✦ CONFORMITY

Psychological studies of conformity suggest that people tend to conform to social pressure, real or imaginary. In a classic experiment, researcher Solomon Asch asked students to consider the lines in Exhibit 7.4 and decide which of the lines A, B or C is identical in length to the first line.

Exhibit 7.4 Asch Test



The obvious answer seems to be line C. Is it not? However, if you are in a room with eight other university students who all said it was line A, you may not necessarily plump for C. Asch found that students who participated in the experiment conformed to the wrong majority roughly one-third of the time. Nearly 75 per cent of the students conformed at least once. Psychologists who have replicated Asch's experiments have found that, in general, conformity changes over time, reflecting social norms and culture.

• Groupthink

Groupthink, wherein the members of a group think alike, is an extreme form of conformity. Groupthink may dominate a small group which is insulated from outside influence. Groupthink occurs because a desire for conformity leads to collective confirmation bias and group members are reluctant to share information or challenge proposals made by others.

7.9 ✦ SOCIAL INFLUENCE

In a fascinating book titled *Social Influence*, renowned sociologist Robert Cialdini discusses a variety of social and other factors that influence the behaviour of people. In particular, he looked at the following factors: reciprocation, social proof, liking, obedience to authority, and scarcity.

• Reciprocation

The reciprocation principle says that a person tries to (or should try to) repay, in kind, what another person has given him. As Cialdini put it, "We are human because our ancestors learned to share their food and their skills in an honored network of obligations." This is a unique adaptive mechanism of human beings facilitating the division of labour. Invoking this principle, free gifts and free samples are given to secure some reciprocal favour.

• Social Proof

To decide what to do, people look at what others are doing. Put differently, they look at social proof. That is why evangelical preachers seed their audience with "ringers," who are

instructed to come forward to give witness and donation; companies claim that their product is the "fastest growing" or "largest selling"; and bartenders often "salt" their tip jar. As Cialdini said, "… we can see that social proof is most powerful for those who feel unfamiliar or unsure in a specific situation and who, consequently, must look outside of themselves for evidence of how best to behave there."

Paradoxically, when people have freedom to do as they please, they tend to imitate each other. In *True Believer*, American philosopher Eric Hoffer said, "When people are free to do as they please, they usually imitate each other." As Michael Mauboussin put it, "Fashions, fads, and tradition are all the result of imitation. And since investing is inherently a social activity, there is every reason to believe that imitation plays a prime part in markets as well." Peter Bevelin put it differently, "We want to be socially accepted and not disliked or rejected. We have a strong desire for avoiding social disapproval, exclusion, humiliation, public shame and losing status. This contributes to conformity."

- **Liking**

As a rule, people prefer to say yes to the requests of someone they know and like. This simple rule is used in many ways by people to persuade others to comply with their requests. Here are some examples:

- The Tupperware Home Parties Corporation arranges for its customers to buy from a friend rather than from an unknown salesperson. To enable this, they incentivise the hostess of Tupperware parties with a percentage of the take.
- Actor McLean Stevenson once mentioned how his wife tricked him into marriage by saying that she liked him. As Cialdini put it, "The information that someone fancies us can be a bewitchingly effective device for producing return liking and willing compliance."
- Joe Girard, the world's "greatest car salesman," sent a holiday greeting card each month to more than 13,000 former customers with a personal message. While the greeting card changed from month to month (Happy Christmas, Happy New Year, and so on), the message was invariably "I like you."

- **Obedience to Authority**

People tend to respect authority. Authority may stem from a position of power or an advanced qualification that takes years of work and achievement or even something like superior clothing.

- **Scarcity**

An opportunity appears more valuable when its availability is limited. The thought of losing something seems to motivate people more than the thought of gaining something of equal value. As G.K. Chesterton put it, "The way to have anything was to realise that it might be lost." Compliance practitioners use scarcity as a weapon for influencing behaviour.

Psychologist Jack Brehm developed a theory called **psychological reactance** theory. The core idea of this theory is that people hate to lose the freedom they already have. As Cialdini explained, "So when increasing scarcity – or anything else – interferes with our prior access to some item, we will *react against* the interference by wanting and trying to possess the item more than before."

This theory explains impressive amounts of human behaviour. When something is restricted, censored, or banned, people crave more of it. As Cialdini put it, "The feeling of being in competition for scarce resources has powerfully motivating properties. The ardor of an indifferent lover surges with the appearance of a rival." He added, "Shoppers at big close-out or bargain sales report being caught up emotionally in the event. Charged by the crush of competitors, they swarm and struggle to claim merchandise they could otherwise disdain."

7.10 ✦ SOCIAL INFLUENCE ON INVESTMENT AND CONSUMPTION

Investing has become an integral part of social life. Not only do we invest, but we also like to talk about them. People discuss investments with their friends, coworkers, neighbours, family members, or even strangers through the web. This has created an interesting paradox. While you want to invest independently, you also want to go by the consensus view. Indeed the popular consensus acts like social pressure.

• Herd Instincts and Overreaction

There is a natural desire on the part of human beings to be part of a group. So people tend to herd together. Moving with the herd, however, magnifies the psychological biases. It induces one to decide on the "feel" of the herd rather than on rigorous independent analysis. This tendency is accentuated in the case of decisions involving high uncertainty.

The heightened sensitivity to what others are doing squares well with a recent theory about fads, trends, and crowd behaviour. In a 1992 paper in the *Journal of Political Economy,* Sushil Bikhchandani, David Hirshleifer, and Ivo Welsh referred to a phenomenon called **information cascade**. Essentially, their theory says that large trends or fads begin when individuals ignore their private information, but take cues from the actions of others. Imagine a traffic jam on a highway and you find that the driver ahead of you suddenly takes a little used exit. Even if you are not sure whether it will save you time, you are likely to follow him. A few others follow you and this, in turn, leads to more people imitating that behaviour.

What is interesting about this story is that a small bit of new information can cause a rapid and wholesale change in behaviour. As Bikchandani *et al*. wrote, "If even a little new information arrives, suggesting that a different course of action is optimal, or if people even suspect that underlying circumstances have changed (whether or not they really have), the social equilibrium may radically shift".

This observation appears very apt for financial markets which are constantly bombarded by new information. In such markets information cascades lead investors to overreact to both good and bad news. That's how a stock market bubble—and, in the opposite direction, a stock

market crash—get started. Eventually, however, the market corrects itself, but it also reminds us that the market is often wrong.

The herd mentality means that financial assets are unlike other goods. The demand for them tends to increase when price rises. As an *Economist* article put it, "To the extent that investors worry about valuation, they tend to be extremely flexible; expectations of future profits are adjusted higher until the price can be justified. Or 'alternative' valuation measures are dreamed up (during the internet era, there was 'price-to-click') that make the price look reasonable."

Conversely, when confidence falters and prices decline, there are many sellers and few buyers, pushing prices downwards.

• Conspicuous Consumption

There is another kind of irrationality induced by a desire to impress others. In his recent book *Luxury Fever*, Frank analysed the vigour with which people pursue goals that are incongruent with their happiness. Frank referred to the pursuit of conspicuous consumption—consumption of things that are considered as markers of a person's relative success. Conspicuous consumption tends to be a zero-sum game.

Inconspicuous consumption, on the other hand, refers to goods and activities that are inherently valuable, that are not bought to show off or achieve status, and that are consumed more privately.

The message of Frank's book is that happiness depends on inconspicuous consumption, not conspicuous consumption. Endorsing this view moral psychologist Jonathan Haidt writes in his insightful book *Happiness Hypothesis*, "Stop trying to keep up with the Joneses. Stop wasting your money on conspicuous consumption. As a first step work less, earn less, accumulate less, and 'consume' more family time, vacations, and other enjoyable activities." A Chinese sage advised people to make their own choices rather than pursue the material objects everyone was pursuing. As he put it, "Racing and hunting madden the mind. Precious things lead one astray. Therefore the sage is guided by what he feels and not what he sees. He lets go of that and chooses this."

Importance of Institutions

Nobel laureate Herbert Simon, who developed the concepts of bounded rationality and satisficing, emphasised the importance of getting our assumptions right about social norms, culture, and the law. In 1979, Simon wrote:

"The principle forerunner of a behavioral theory of the firm is the tradition usually called Institutionalism. It is not clear that all of the writings, European and American, usually lumped under this rubric have much in common, or that their authors would agree with each other's views. At best, they share a conviction that economic theory must be reformulated to take account of the social and legal structures amidst which market transactions are carried out. The social and legal environment provides the incentive structure within which decisions are made. In many instances, without an understanding of this environment, we can't truly understand why, how, and what decisions are made, even if we get our psychological assumptions right."

SUMMARY

- Mental states such as happiness, sadness, pride, greed, fear, regret, anger, contempt, surprise, and disgust are commonly understood as emotions.
- Emotions may be negative or positive. Negative emotions are anger, fear, stress, sadness, disgust, guilt, hatred, shame, contempt, embarrassment, and so on. Positive emotions are gratitude, hope, joy, tranquility, enthusiasm, interest, inspiration, awe, amusement, love, and so on.
- Emotion may be differentiated from similar constructs like feelings, moods, and affect, within the field of affective neuroscience. *Feelings* are subjective representation of emotions. *Moods* are diffuse affective states that last much longer and are usually less intense than emotions. *Affect* is a wider term that encompasses emotion, feelings, and moods, even though it is commonly used interchangeably with emotion.
- According to the James–Langer theory, an external stimulus leads to a physiological response which in turn leads to an emotional reaction depending on how the person interprets the physiological response.
- Cognitive theories argue that thoughts and other mental activities have an important bearing on the formation of emotions.
- In his theory of evolution and natural selection, Charles Darwin argued that the traits that contribute to the survival of a species become the innate characteristics of the species in the long run. Darwin believed that this applied to physical traits as well as emotions.
- Based on Darwin's theory of evolution and natural selection, evolutionary theorists argue that our basic emotions have evolved to serve the needs of survival.
- Each emotion has a polar opposite as shown below.

  Joy – Sadness

  Fear – Anger

  Anticipation – Surprise

  Disgust – Trust
- Emotional experiences may be measured along two dimensions viz., **valence** (how negative or positive the experience feels) and **arousal** (how energising or enervating the experience feels).
- Emotions have a bearing on risk tolerance, and risk tolerance influences portfolio selection.
- Neuroscientist Richard Davidson identified six dimensions of Emotional Style: Resilience Style, Outlook Style, Social Intuition Style, Self-Awareness Style, Sensitivity to Context Style, and Attention Style.

- According to psychologist Daniel Goleman, there are five basic competencies for emotional intelligence: self-awareness, self-regulation, motivation, empathy, and social skills.
- Hope and fear have a bearing on how investors evaluate alternatives. Fear induces investors to look at the downside of things, whereas hope causes them to look at the upside.
- While most people accept that fairness is valued in our society, the notion of fairness has been largely overlooked in traditional finance which assumes that economic agents are driven by self-interest.
- Emotions and social interactions are linked, as evidenced by research using fMRI. Much of this research falls under a discipline called social neuroscience, which explores the "social brain," or the neural circuitry that is activated when people interact with one another.
- It seems that evolution has favoured those who were cooperative and fair in exchanges. Groups that are pro-social seem to outperform groups that are not. This may be the reason why we are "hardwired" to behave socially.
- Psychological studies of conformity suggest that people tend to conform to social pressure, real or imaginary.
- In a fascinating book titled *Social Influence,* renowned sociologist Robert Cialdini discusses a variety of social and other factors that influence the behavior of people. In particular, he looked at the following factors: reciprocation, social proof, liking, obedience to authority, and scarcity.
- Investing has become an integral part of social life. Not only do we invest, but we also like to talk about them. People discuss investments with their friends, coworkers, neighbours, family members, or even strangers through the web. This has created an interesting paradox. While you want to invest independently, you also want to go by the consensus view. Indeed the popular consensus acts like social pressure.
- In his recent book *Luxury Fever*, Frank analysed the vigour with which people pursue goals that are incongruent with their happiness. Frank referred to the pursuit of conspicuous consumption—consumption of things that are considered as markers of a person's relative success. Conspicuous consumption tends to be a zero-sum game.
- Inconspicuous consumption, on the other hand, refers to goods and activities that are inherently valuable, that are not bought to show off or achieve status, and that are consumed more privately.
- The message of Frank's book is that happiness depends on inconspicuous consumption, not conspicuous consumption.

DISCUSSION QUESTIONS

1. Discuss the six observable features of emotion, as suggested by John Elster.
2. Discuss the physiological and cognitive theories of emotion.
3. What is the role of emotions according to the evolutionary perspective?
4. Describe the Plutchik's wheel of emotions.
5. Depict a two-dimensional coordinate map of emotion.
6. What, according to Jan Pankeep, are the seven primal emotions and affective feelings associated with them?
7. Discuss the six dimensions of Emotional Style identified by Richard Davidson.
8. What are the five basic competencies for emotional intelligence, according to Daniel Goleman?
9. Discuss the emotional timeline.
10. Explain the Ultimatum Game and the Dictator Game.
11. Explain the Trust Game.
12. Discuss the experiment of Solomon Asch.
13. Discuss the following: reciprocation, social proof, liking, obedience to authority, and scarcity.
14. Explain the phenomenon of information cascade.
15. What is the message of Robert Frank's book *Passions within Reason*?
16. What is the message of Robert Frank's book *Luxury Fever*?

APPENDIX 7A

NATURE OF MAN

To understand how organisations function, you must understand human behaviour. According to Michael Jensen and William Meckling,[1] here are five models of human behaviour that are often used, albeit implicitly usually, in social science literature and public discussion.

- The resourceful, evaluative, maximising model (or REMM)
- The economic (or money-maximising) model
- The sociological (or social victim) model
- The psychological (or hierarchy of needs) model
- The political (or perfect agent) model

1. Michael C. Jensen and William H. Meckling, "The Nature of Man," *Journal of Applied Corporate Finance*, Vol 7, No.1

The Resourceful, Evaluative, Maximising Model (REMM) According to the REMM:

- An individual cares about a lot of things like wealth, status, peer approval, knowledge, independence, honour, music, the environment, the weather, the plight of others, art, and so on.
- An individual evaluates the possibilities of trade-offs. He is always willing to exchange some sufficiently small amount of any particular good for some sufficiently large amount of other goods.
- An individual cannot be satiated. He always wants more, be they tangible goods like property, jewellery, cars, work of arts or intangible goods like fame, love, power, respect, companionship, solitude, and immortality.
- An individual is constrained by wealth, time, laws, and information. Given these constraints, he seeks to enjoy the highest level of value possible.
- An individual is capable of learning about new opportunities and is resourceful and creative to expand his opportunities in various ways.

The Economic Model The economic model is a reduced version of REMM. According to this model, the individual has only one want: money. He cares only about money and is not interested in things like love, respect, integrity, or art.

The economic model is not a very realistic model. People are not concerned exclusively about money. They care about other things as well.

The Sociological Model According to the sociological model, an individual is a product of his cultural environment. His behaviour is determined by the customs, traditions, mores, and taboos of the society in which he is raised. He is not an evaluator, any more than ants, bees, or termites are evaluators.

While social customs and traditions have an influence on human behaviour they do not 'completely' determine individual behaviour. Individuals do depart from social norms when, in their evaluation, benefits exceed cost. This, indeed, drives social change.

The Psychological Model The psychological model assumes that individual wants are absolute and they are largely independent of one another. Maslow's theory of hierarchy of needs is perhaps the best-known formulation of the psychological model. In a seminal contribution in 1943, Maslow wrote: "Human needs arrange themselves in hierarchies of prepotency. That is to say, the appearance of one need usually rests on the prior satisfaction of another more prepotent need." According to Maslow, human needs, in order of their "prepotency" are physiological (food, water), safety, love, and self-actualisation.

While the psychological model is an improvement over the sociological model, there is ample evidence that the human behaviour often does not conform to the Maslow's hierarchy of needs model. Astronauts, for example, trade safety for wealth, fame, and thrill. Philosophers may forego material comforts to devote themselves to contemplation and enquiry—they seem to be concerned more about self-actualisation than physiological goods.

The Political Model The political model or the good citizen model posits that an individual has a strong desire to do a good job and he works wholeheartedly to promote the interest of the organisation. In this model there is no conflict between the interest of the individual and the interest of the organisation. Hence there is no need for incentive compensation.

The political model is unrealistic because individuals are not perfect agents. They tend to pursue their self-interest which may be at variance with the interest of the organisation. Hence, it is necessary to incentivise them to promote organisational interest.

Which Model is the Best? In terms of the explanatory power, the resourceful, evaluative, maximising model (REMM) dominates all the other models. While each of the other models captures an important aspect of behaviour, REMM seems to incorporate the best of each of these models.

From the economic model, REMM borrows the idea that individuals are resourceful, self-interested maximisers, but rejects the notion that they care only about money. From the psychological model, REMM takes the assumption that individuals are interested in a number of things, but rejects the notion that there is a strictly ordered hierarchy of needs. From the sociological model, REMM takes the assumption that social customs and traditions influence individual behaviour; however, REMM also assumes that individuals will depart from social customs if they find it worthwhile to do so. From the political model, REMM takes the notion that people are capable of altruistic behaviour; however, REMM rejects the notion that people are perfect agents.

Michael Jensen and William Meckling defend REMM eloquently in the following words:

> "For all its diversity, this growing body of research has one common message: Whether they are politicians, managers, academics, professionals, philanthropists, or factory workers, individuals are resourceful, evaluative maximisers. They respond creatively to the opportunities the environment presents to them, and they work to loosen constraints that prevent them from doing what they wish to do. They care about not only money, but almost everything—respect, honour, power, love, and the welfare of others. The challenge for our society, and for all organisations in it, is to establish rules of the game and educational procedures that tap and direct the creative energy of REMMs in ways that increase the effective use of our scarce resources. REMMs are everywhere."

■ ■

Chapter **8**

Neuroscientific and Evolutionary Perspective

There seems to be a deep divide between the theory and practice of investing as the following table suggests:

In Theory	*In Practice*
• Investors have well-defined goals.	• Investors are not sure about their goals.
• Investors carefully weigh the odds of success and failure.	• Investors often act impulsively.
• Investors know how much risk they are comfortable with.	• The risk tolerance of investors varies with the market conditions.
• The smarter an investor is, the more money he will make.	• Many smart people commit dumb investment mistakes. For example, Sir Isaac Newton was financially wiped out in a stock market crash in 1720.
• People who monitor their investments closely tend to make more money.	• People who pay almost no attention to their investments tend to do better.
• Greater effort leads to superior performance.	• On average, professional investors do not outperform amateur investors.

What causes this divide? Neuroeconomics, a new-born discipline, helps in explaining this divide. A hybrid of neuroscience, economics, and psychology, neuroeconomics seeks to understand what drives investment behaviour, not only at a theoretical and practical level, but also at a biological level. It provides an understanding of the important neurophysiological foundations underlying a variety of cognitive processes and behaviours. Neuroeconomics seeks to model what goes on inside an individual's mind just as organisational economics models what goes on inside a firm.

The last decade or so has witnessed an impressive progress in our understanding of the neurobiology of decision making, thanks to the individual and collaborative endeavour of scholars from a variety of intersecting disciplines.

The textbook model of economic decision-making assumes that people behave as if they maximise utility. The emerging evidence supports a neural maximisation (NM) hypothesis.

This means that an individual chooses the alternative that produces the highest level of activity within certain brain structures during the process of deliberation.

This chapter presents some of the important insights and findings of neuroeconomics in a very condensed fashion. It is divided into four sections:

- Brain basics
- Important insights
- Adaptive markets hypothesis
- Financial crises and limbic system

8.1 ✦ BRAIN BASICS

A product of millions of years of evolution, the human brain is designed to efficiently and effectively interpret information, compete in a social hierarchy, and direct activity toward achieving goals. Our brains, however, evolved in a stone-age world which was characterised by dangers and opportunities that were largely immediate and physical and social interactions that were limited. It is clear that our stone-age brain is not designed optimally for the complexities of the modern, globally interconnected, fast-paced world where physical dangers have been largely eliminated.

An understanding of the brain is helpful in our study of emotions. Neuroscientists have devoted a great deal of attention to map the brain and understand the functions of various parts of the brain. Modern technology has been very helpful in this endeavour, in particular tools like PET (position emission tomography) and fMRI (functional magnetic resonance imaging). PET scans use harmless radioactive substances for mapping brain activity. The radioactive substances tend to accumulate in the areas of the brain that are active, thus providing coloured maps of brain activity. fMRI does not require injection of any substances, so it is much less invasive. fMRI enables scientists to monitor blood and oxygen flow in the brain and identify active areas.

The heightened attention paid by neuroscientists and the availability of technologically advanced tools of research have led to a veritable explosion of knowledge about the human brain. However, given the enormous complexity of the human brain—it has 100 billion neurons with each neuron connected with thousands of other neurons through synaptic connections—many believe that our understanding of it is somewhat limited and we will learn a lot more in the years to come.

• Structure and Functions of the Brain

The structure represents what the brain is made up of (the anatomy of the brain) and the function represents what the brain does (the physiology of the brain). We can only give an approximate characterisation of the functions of different parts of the brain as long as we recognise that they don't act in isolation, but act with other parts of the brain. As one neuroscientist puts it vividly, the brain is "globally local" and "locally global". The real thinking, feeling, and intelligence of the brain occurs at the level of neural networks. With this caveat, here is a highly succinct description of the structure and functions of the brain. The thrust of this discussion is to get an elementary understanding of those structures and functions of the brain that have relevance to financial decision making.

- The brain may be conceptualised as having three anatomical divisions: the brain stem, the limbic system, and the cerebrum. The key structures of the brain stem and forebrain are shown in Exhibit 8.1. The key structures of the limbic system are shown in Exhibit 8.2.

Exhibit 8.1 Cerebrum and Brain Stem

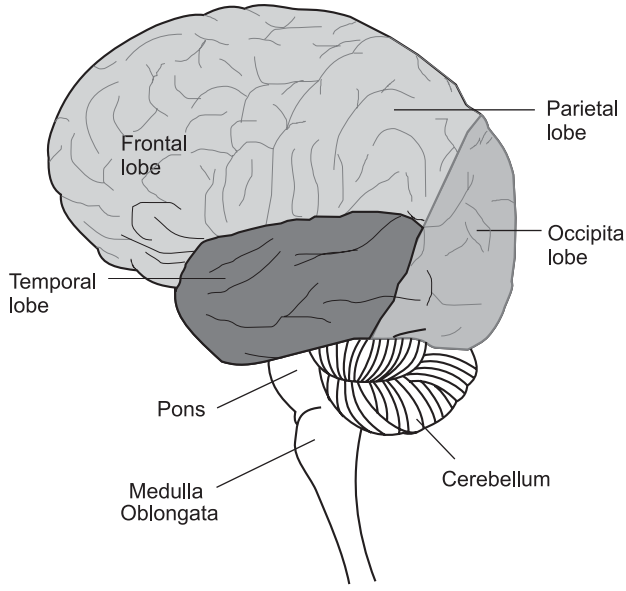
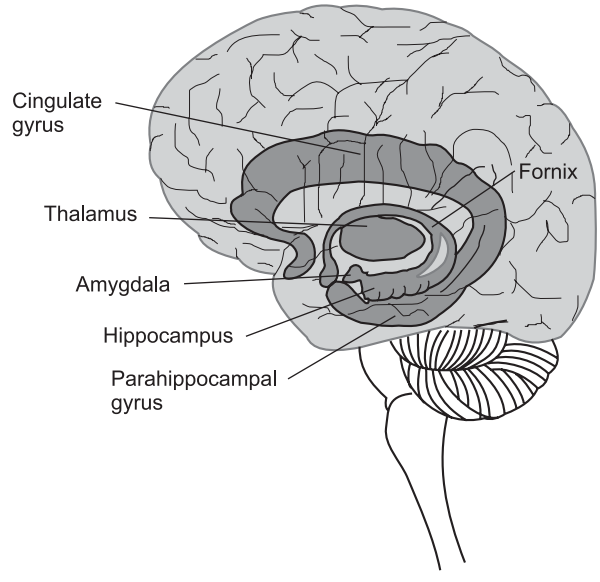


Exhibit 8.2 Limbic System



- The brain stem which lies at the base of the brain sits on the top of the spinal cord. Something that we share with reptiles and other mammals, the brain stem keep us alive by governing vital functions. The brain stem consists of three individual structures: medulla oblongata, pons, and cerebellum. The **medulla oblongata** connects the spinal cord to the rest of the brain and regulates basic things such as breathing, circulation, digestion, and blood pressure—these functions, happen unconsciously. The **pons** regulates eye movements, sleep, and dreaming whereas the **cerebellum** coordinates our movements and ensures physical balance.
- The **limbic system** consists of a group of structures surrounding the top of the brain stem. The limbic system is the seat of emotions and motivation. Scientists sometimes refer to it as the seat of four Fs, i.e. feeding, fighting, fear, and sexual behaviour. It is also referred to as the emotional brain or **reflexive brain**. The limbic system lies deep inside the brain and its boundaries are somewhat fuzzy. While the experts don't seem to agree on what structures make up the entire limbic system, the following structures are generally considered to be part of the limbic system or integrally linked to the limbic system: thalamus, amygdala, hippocampus, and hypothalamus. The **thalamus** sits right on the top of the brain stem. It functions like a router, sorting data and determining where it needs to go. Below the thalamus is a small structure called **hypothalamus.** Although it is a very small structure, it plays an incredible role in regulating a number of bodily functions. It regulates the autonomous nervous system (fight or flee). It is responsible for homeostasis which means that it maintains body temperature, osmo-layerity, circadian rythms, and so on. The hypothalamus is connected to a gland called pituitary gland which sends hormones (like epinephrine, norepinephrine, and adrenaline) into the blood stream, which is another way by which the brain communicates with the body. A little below the hypothalamus is a small gland hanging out and one-half of that gland called **posterior pituitary** is technically part of the brain—through nerves that flow through it, it sends hormones like oxytocin. The **amygdala** (right and left) is sometimes called the aggression centre. Stimulation of the amygdala can produce anger and violence as well as fear and anxiety. Curving around the thalamus is a green structure called the **hippocampus**. It plays a key role in forming new memories and converting a short-term memory into a long-term memory.
- The **cerebrum** (Latin for brain) consists of the cerebral cortex, along with the underlying white matter and the basal ganglia. The cerebrum has two hemispheres, the right and the left, which are connected in the middle by corpus callosum, a collection of nerves between the two hemispheres. The right (left) hemisphere controls and processes signals from the left (right) side of the body. Each hemisphere is divided into four lobes: the frontal, parietal, temporal, and occipital lobes. The **frontal lobe**, the largest lobe lies at the front of the brain. Concerned with the executive function, it is like the boss of the brain that controls the emotions. It is concerned with motor abilities, memory, judgment, decision making, and planning. The **parietal lobe** lies behind the frontal lobe. It is concerned basically with sensation because it deals with a lot of sensory inputs. The **temporal lobe** lies on the side of the brain. Its functions include language, hearing, and memory. The **occipital lobe** lies at the back of the brain and is primarily concerned with vision.

- Very broadly, the mode of thinking in the left sphere of the brain seems to be linear and the mode of thinking in the right sphere of the brain seems to be holistic. The left sphere is primarily concerned with language, writing, mathematics, logic, scientific skills, lists, and so on. The right sphere is primarily concerned with spatial awareness, music, creativity, Gestalt, imagination, emotional expression, and so on.
- The cerebral cortex (which accounts for about 80 per cent of the brain) is the folded outer surface of the brain. The development of the cerebral cortex is a complex and finely tuned process determined by the influence of genes and heredity. It is a kind of skin to the cerebrum which is 2-4 millimetres thick with about six layers. It is the brain's logistical centre. The part of the cerebral cortex which lies beneath the forehead is called the **prefrontal cortex**. It is involved in learning, abstract thinking, planning, decision making, directing attention, exercising self-control and so on. The prefrontal cortex has several regions that deal with different aspects of emotion management. In particular, the **orbitofrontal cortex** (OFC) integrates reason and emotion, the **anterior cingulated cortex** (ACC) resolves decisional conflicts and prioritises emotional information as important or unimportant, and the **medial prefrontal cortex** (MPFC) processes social information and memory functions related to the past and the making of long-term decisions for the future.
- Just underneath the cerebral cortex are interconnected sub-cortical masses of grey matter referred to as basal ganglia (or nuclei). Some of the components of the basal ganglia are the **nucleus accumbens (NACC)** and **caudate nucleus.**
- NACC and the medial pre frontal cortex (MPFC) are the major regions of relevance in the reward system. The NACC, which is the brain's centre for lust and desire, is activated by the anticipation of earning money. High NACC activation induces excessive risk taking. The MPFC represents one terminus of the dopamine neurons of the reward system. It is activated by trust and certainty, learning from successes and failures, and satisfaction when rewards are achieved. Hypoactivation of the reward system results in apathy and low energy and a tendency to seek compensatory excitement by way of activities like compulsive shopping and pathological gambling.
- Since the human brain contains approximately 100 billion neurons with about 100 trillion connections between them, it is unlikely that we can fully fathom what it means to be human. No amount of brain research can fully portray a feeling, a memory, a thought, or an experience.

Neurotransmitters

People vary widely in terms of expectations, need for stimulation, excitement, and security. Their differences can be attributed mainly to their unique biology, including their neurochemistry.

Neurotransmitters are molecules that transmit signals between neurons in the brain. A person's neurotransmitter endowment is influenced by genetic factors and past experiences.

So far about 100 neurotransmitters have been discovered. The most important ones seem to be: acetylcholine, dopamine, serotonin, GABA, glutamate, epinephrine and norepinephrine, endorphins, melatonin, and nitric oxide. **Acetylcholine** activates the motor neurons that control the skeletal muscles. It also regulates the activities in certain areas of the brain that

are associated with attention, arousal, learning, and memory. **Dopamine** controls voluntary movements of the body and is associated with the reward mechanism of the brain. Put differently, it regulates the pleasurable emotions. **Serotonin**, an important inhibitory neurotransmitter, has a profound effect on emotion, mood, and anxiety. It is involved in regulating sleep, wakefulness, eating, and perception. **GABA** is an inhibitory transmitter that helps in preventing neurons from getting over excited. So, it helps in preventing anxiety. **Glutamate** is an excitatory neurotransmitter most commonly found in the central nervous system. It is mainly associated with functions like learning and memory. **Epinephrine** also called **adrenaline** is an excitatory neurotransmitter, that regulates attention, arousal, cognition, and mental focus. **Norepinephrine** is also an excitatory transmitter that controls mood and physical and mental arousal. **Endorphins** are neurotransmitters that produce effects that are quite similar to those produced by opioid compounds like opium and morphine. Endorphin is actually the short for 'endogenous morphine.' Endorphins can reduce pain and stress and promote calmness and serenity. **Melatonin** a hormone produced by the pineal gland, also acts as a neurotransmitter. It regulates the sleep-wake cycle and also has a bearing on mood and sexual behaviour. **Nitric oxide** is gas that acts both as a hormone as well as a neurotransmitter, depending on specific needs. It dilates blood vessels and improves circulation and it can improve memory, learning, alertness, and concentration. **Oxytocin** which acts as a hormone and as a neurotransmitter is called the love hormone.

To conclude, neurotransmitters are chemicals that allow the nerves to communicate with each other and thus, regulate various functions of the body. A significantly high or low level of these chemicals can alter the functions of the entire nervous system.

The Accidental Mind

Many people have exalted the elegant design of human brain in reverent tones. In his book *The Accidental Mind*, neuroscientist David Linden dispels this myth and explains how the brain evolved serindipitiously. He shows that the brain is not an optimal machinery for solving problems but rather a weird agglomeration of ad-hoc solutions that have piled on through millions of years of evolution. This explains a number of human characteristics: long childhoods, extensive memory, search for love and long-term relationships, need to create compelling narratives, and the universal cultural impulse to create both religious and scientific explanations.

8.2 ✦ IMPORTANT INSIGHTS[1]

• Reflexive and Reflective Brain

There are two aspects of human brain, the reflexive (or intuitive) system and the reflective (or analytical) system. The reflexive system has served us for millions of years in an environment characterised by immediate threats. But in the modern world, characterised by considerable complexity, it is not enough.

[1] Adapted from Jason Zweig, *Your Money & Your Brain*, Simon & Schuster, 2007.

The reflective (or analytical) system resides largely in the prefrontal lobe of the brain. Neuroscientist Jordan Grafman calls it as "the CEO of the brain." Jason Zweig describes its functioning as follows: "Here, neurons that are intricately connected with the rest of the brain draw general conclusions from scraps of information, organise your past experiences into recognisable categories, form theories about the causes of change around you, and plan for the future."

The thin veneer of relatively modern analytical circuits, housing the reflective brain, are often no match for the emotional power of the most ancient parts of our mind. The 100 billion neurons that are packed in the human brain can produce an emotional tornado when you think about money. That's the reason why knowing the right thing is very different from doing the right thing.

While the reflective system serves as a vital counterweight to the reflexive system, effort is required to use it. Since the human mind functions as a 'cognitive miser,' it shies away from that kind of effort. Indeed, if the reflective brain cannot readily find a solution, the reflexive brain resumes control, relying on sensory and emotional cues.

The reflexive brain is highly sensitive to changes in the amount of reward at stake, but much less responsive to changes in the probability of obtaining that reward. As Jason Zweig puts it: "Because anticipation is processed reflexively while probability is processed reflectively, the mental image of winning $100 million crowds out the calculation of just how unlikely that jackpot really is."

To logically judge the probability of an event, we must ask how often it has actually occurred under similar circumstances. Instead, we judge the probability of an event by the ease with which we can recall it. As Jason Zweig puts it: "the more recently an event has occurred, or the more vivid our memory of something like it in the past, the more 'available' an event will be in our minds – and the more probable it will seem to happen again." This is because the emotional force of the reflexive brain dominates the analytical powers of the reflective brain.

Deep inside the brain is an almond-shaped tissue called the amygdala. When you face a potential risk, the amygdala (which is a part of your reflexive brain) acts as an alarm system. As Jason Zweig explains: "The amygdala helps focus your attention, in a flash, on anything that's new, out of place, changing fast, or just plain scary. That helps why we overreact to rare but vivid risks. After all, in the presence of danger, he who hesitates is lost; a fraction of a second can make the difference between life and death." When you step near a snake, or miss a step on a staircase, or spot a sharp object flying toward you, your amygdala will spur you to jump, duck, or do whatever is required to get out of trouble as quickly as possible. A similar fear reaction is triggered when you lose money or believe that you might.

The fear complex is a vital tool for coping with physical danger. However, when the potential danger is financial, rather than physical, the reflexive fear may play havoc with your investment strategy. You may out of fear sell or shun stocks when the market falls. As Jason Zweig says: "The amygdala seems to act like a branding iron that burns the memory of financial loss into your brain. This may explain why a market crash, which makes stocks cheaper, also makes investors less willing to buy them for a long time to come."

Humans literally have two minds when it comes to time. On the one hand, we are impatient, fixated on the short run, eager to spend now, and keen on becoming rich quickly. On the other hand, we save money for distant goals (like children's college education and our retirement) and build wealth gradually. Invoking the Aesop's fable, neuroscientist Jonathan Cohen argues that a grasshopper and an ant battle within our brains to dominate over our decisions about time. The emotional grasshopper represents the reflexive brain and the analytical ant symbolises the reflective brain. To be a successful investor or a happy person you should learn to check the impulsive power of your inner grasshopper.

Pure rationality without emotions can be as bad as sheer emotions without reason. According to neuroeconomics, you get best investment results when you strike the right balance between emotion and reason.

Our investing brains often drive us to do things that make emotional sense, not logical sense. This is because emotional circuits developed tens of millions of years ago make us crave for whatever feels like rewarding and shun whatever feels risky.

• Intuition

Most judgments are driven by intuition. People who buy stocks rarely analyse the underlying business. Instead, they rely on a feeling, a sensation, amateur investors as well as professional investors. Portfolio managers constantly talk about their "gut feeling."

Intuition can yield fast and accurate judgments only when the rules for reaching a good decision are simple and stable. Unfortunately, investment choices are not simple and the key to success, at least in the short run, is seldom stable. As Jason Zweig puts it: "In the madhouse of the financial markets, the only rule that appears to apply is Murphy's Law. And even that guideline comes with a devilish twist: Whatever can go wrong will go wrong, but only when you least expect it to."

• Emotions and Reasoning

While many important emotions are centered in the amygdala, the frontal lobe too is important. So, it is not possible to separate emotion from cognition. In his pioneering book *Descartes' Error: Emotion, Reason, and the Human Brain* (Putnam, New York, 1994), Antanio Damasio provides remarkable evidence that the neural systems of reason and emotion cannot be separated. Hence, decision making and emotion are intertwined.

Neuroscientists believe that emotion enhances decision-making in two ways. First, when making a decision is important, emotions provide us the push to make one. If there are many options to consider, we can spend inordinate amount of time in evaluating them. Emotions help us to focus on the critical aspects of the decisions without getting entangled with all the details. Since the effort and time involved in processing all information can be overly onerous, emotions help us to optimise our decision. Second, emotions can improve the quality of decision. Positive emotions tend to facilitate access to information in the brain, promote creativity, and sharpen problem-solving. While suboptimal decisions may also arise from flawed emotions, it must be recognised that absence of emotions can impair the process of decision making.

As Jonathan Haidt put it, "Human rationality depends critically on sophisticated emotionality. It is only because our emotional brain works so well that our reasoning can work at all. Plato's image of reason as charioteer controlling the dumb beasts of passion may overstate not only the wisdom but also the power of the charioteer." He further added, "The metaphor of a rider on an elephant fits Damosio's findings more closely. Reason and emotion must work together to create intelligent behaviour, but emotion (a major part of the elephant) does most of the work."

It is now generally believed that a person's ability to succeed is greatly influenced by his emotional intelligence, which is measured by his emotional quotient (EQ). Similar to an IQ test which seeks to measure a person's cognitive intelligence, an EQ test attempts to measure a person's emotional intelligence, the ability to identify and manage his emotions, as well as those of others. It appears that a person's emotional intelligence is determined by five basic emotional competencies: (i) self-awareness, (ii) self-regulation, (iii) motivation, (iv) empathy, and (v) social skills. Emotional intelligence is derived from the prefrontal cortex and the strength of its linkages to the limbic system.

• Reward Pursuit

There are two kinds of goal-directed behaviour, viz., reward pursuit and loss avoidance, operated by neural circuits that run across the three divisions of the brain. These systems encompass complex brain processes that involve emotions, cognitions (thoughts), and actions. Although the reward and loss system are run largely independently, when one system is highly activated, the other system tends to be reciprocally deactivated.

When we perceive something valuable and desire it, our reward system is activated. We value many things and goals. As Harold Peterson put it, "We value pleasant tastes (especially fatty, sweet, and salty foods). We value sex appeal and generosity in others. We value status symbols (such as luxury goods and sports cars). We value laughing and loved ones, and we value revenge and the punishment of deviants." The brain's reward system is activated by the things we value.

The reward system is comprised of neurons that communicate mainly via the neurotransmitter dopamine. That is why dopamine is called the "pleasure chemical" of the brain.

Wolfram Schultz, a neuropsychologist, and others have made important discoveries about dopamine and reward:

1. Getting what you expected does not provide a dopamine kick. Put differently, it is neutrally unexciting. That explains why drug addicts yearn for an even larger fix to get the same kick or investors hanker for fast rising stocks with a "positive momentum."
2. An unexpected gain provides a dopamine kick or neural excitement. This makes people willing to take risks.
3. Dopamine dries up if the expected reward does not materialise.
4. Predictions and rewards of an earlier period evoke a fainter response of dopamine neurons. On the other hand, dopamine neurons fire faster if you have received more positive surprises recently. This is the biological explanation of what psychologists call "recency"—the human tendency to estimate probabilities on the basis of recent experience and not long-term experience.

Over millions of years our brains have developed a dopamine-drunk wanting system that prods us to compete for more money, power, and material things. We are drawn to these things not because they bring happiness, but because those who managed to get the stone-age equivalent of these things are our ancestors, and those who did not turn out, be biological dead-ends. As psychologist Daniel Nettle put it: "I will argue what we are programmed for by evolution is not happiness itself, but a set of beliefs about the kinds of things that will bring happiness, and a disposition to pursue them."

Mismatch between Our Brains and Our Environment

About 99.9 per cent of human life was spent in the hunter-gatherer phase. The selection processes of that phase have sculpted and shaped our genome and plasticity. James Montier put it this way, "But remember, evolution occurs at a glacial pace; so our brains are well designed for the environment we faced 150,000 years ago (the African savannah) but potentially poorly suited for the industrial age of 300 years ago, and perhaps even more ill-suited for the information age we currently live in." As Stephen Ilardia said, "We were never designed for the sedentary, indoor, socially isolated, fast-food laden, sleep-deprived, frenzied pace of modern life." The 10000-12000 years of agriculture phase had a minor bearing on the selection process. Since 1780 when the industrial revolution began, there has been a '**radical environmental mutation**.' This means that the modern life is radically discontinuous from everything before. How much of human genome has changed since 1780? There has been virtually no change. This means that there is a profound mismatch between our genes, bodies, and brains and the demands of the modern day environment.

• Loss Avoidance

A second motivational circuit is concerned with "loss avoidance." When we perceive threats or dangers in our environment, the "loss avoidance system" is activated: This generates worrying and pessimistic thoughts and negative emotions such as anxiety, fear, and panic.

While the anatomy of the brain's loss system is not as well understood as that of its reward system, the brain's loss system is believed to consist of the anterior insula (pain and disgust), the amygdala (emotional processing), the hippocampus (memory), and the hypothalamus (hormone secretion).

When the loss system is activated, the entire body is affected through the release of neurotransmitters as well as bloodstream hormones. When threat is perceived, the hypothalamus-pituitary-adrenal axis (HPA) is activated. This results in the secretion of stress hormones and epiphrenine ("adrenaline") into the bloodstream. The body's sympathetic nervous system (SNS) prepares it for the "fight or flight" response.

• Monetary Gains and Losses

A monetary gain or loss is not merely a financial or psychological outcome. It is also a biological change that has profound physical effects on the brain and the body.

The neural activity of someone whose investments are making money is no different from that of someone who is on cocaine or morphine.

The brain responds to financial losses the way it responds to mortal danger.

• Expectation and Experience

Anticipation of a gain and its actual receipt are expressed in very different ways in the brain. This explains why "money does not buy happiness."

Expectation, both good and bad, is more intense than actual experience. It often feels better to anticipate making money than actually making it. There is an old saying, 'it is better to hope than to receive.' Why do we imagine that money will matter more than it really does? Jason Zweig explains: "It's how the brain is built…. The nucleus accumbens in your reflexive brain becomes intensively aroused when you anticipate a financial gain. But that hot state of anticipation cools down as soon as you actually earn the money, yielding a lukewarm satisfaction in the reflective brain that pales by comparison."

The brain's anticipation circuitry does not evaluate potential gains in isolation. Evolution has designed the human brain to pay closer attention to rewards when they are characterised by risks—we know that we have to be more careful in plucking a rose than picking a daisy. Psychologist Mellers has demonstrated that a gamble that can result in either a gain or a loss provides more "relative pleasure" than a gamble that offers only gain.

• Pattern Seeking

The human brain is extremely well designed to detect and interpret simple patterns. As Jason Zweig put it: "Humans have a phenomenal ability to detect and interpret simple patterns. That's what helped our ancestors survive the hazardous primeval world, enabling them to evade predators, find food and shelter, and eventually to plant crops in the right place at the right time of year."

The human brain incorrigibly searches for patterns even when none exist. Jason Zweig says that *Homo Sapiens*, or "man the wise," may better be called *Homo Formapetens* or "man the pattern-seeker." The human tendency to perceive order when none exists is referred to as the "characteristic conceit of our species" by the renowned astronomer Carl Sagan. According to psychologist Wolford, "There appears to be a module in the left hemisphere of the brain that drives humans to search for patterns and to see casual relationships, even when none exist." His research colleague Gazzamicga has named this part of the brain "the interpreter." He says: "The interpreter drives us to believe that I can figure this out." However, he cautions, "a constant search for explanations and patterns in random or complex data is not a good thing."

• Aversion of Randomness and Ignorance

Human beings hate randomness. So, they compulsively predict the unpredictable. Jason calls this human tendency "the prediction addiction." It is remarkable how easily the prediction circuits in the brain are activated. Researchers discovered that when people were shown a single □ or a single 0, they didn't know what to expect next. But after □ □, they expected a third □;

likewise after 00, they expected a third 0. There's a neuroeconomic reality in the saying "three is a trend." Benjamin Graham, the eminent investment guru, said: "The speculative public is incorrigible. In financial terms it cannot go beyond 3."

Just as nature abhors a vacuum, the human mind abhors the words, "I don't know." As Jason Zweig says: "Inside each of us, there lurks a con-artist who is forever cajoling us into an inflated sense of our powers. The less skilled or experienced you are at something, the harder your inner con man works at convincing you that you are brilliant at it." The principal reason why we claim that we know more than what we do is that admitting our ignorance erodes our self-esteem. That's why it is extremely difficult to say "I don't know." Warren Buffett was quite right when he wrote: "What counts for most people in investing is not how much they know, but rather how realistically they define what they don't know. An investor needs to do a few things right as long as he or she avoids big mistakes."

• Exposure Effect

Human beings tend to like what they experience most often. Psychologist Zajonc call this the "mere-exposure effect." He says, "The repetition of an experience is intrinsically pleasurable. It augments our mood, and that pleasure spills over anything which is in the vicinity." Aesop got it wrong, when he said "familiarity breeds contempt." On the contrary, "familiarity breeds contentment."

Illustrating this, Jason Zweig says: "You might think you like Coke better for the taste, when in fact you like it better mainly because it's more familiar. Likewise, investors plunk money into brand-name stocks, precisely because the brand name makes them feel good."

• Illusion of Control

Humans suffer from illusion of control, an uncanny feeling that they can exert influence over random choice with their actions. For example, when a person wants to roll a high number, he shakes the dice and throws them hard. The illusion of control tends to be stronger when an activity appears at least partly random, offers multiple choices, requires effort, and appears familiar. Since investing satisfies these tests, many investors suffer from the illusion of control.

According to neuroeconomists, the **caudate area** which lies deep in the centre of the brain serves as the **coincidence detector**. In this part of the reflexive, emotional brain, actions are matched against the outcomes in the world around us, irrespective of whether they are actually connected or not.

The illusion of control reduces the neural activity in areas of brain where pain, anxiety, and conflict are processed, thereby creating actual comfort.

An early run of success induces people to believe that they have power over a random process. Instead of attributing the results to chance, they believe in luck (a personal force that favours them) and may take huge risks. As Jason Zweig says: "With your subgenual Cingulate inflamed by a financial hot streak, it's hard not to turn euphoric, restless, and carefree about risk."

Once we learn what actually happened, we look back and believe that we knew what was going to happen. Psychologists call this "hindsight bias." Says Daniel Kahneman, "Hindsight

bias makes surprises vanish. People distort and misremember what they formerly believed. Our sense of how uncertain the world really is never fully developed, because after something happens, we greatly increase our judgments of how likely it was to happen." Hindsight bias can play a cruel trick on you. As Jason Zweig puts it: "By making you believe that the past was more predictable than it really was, hindsight bias fools you into thinking that the future is more predictable than it can ever be. That keeps you from feeling like an idiot as you look back, but it can make you act like an idiot as you go forward."

• Risk Tolerance

The conventional assumption that every person has a certain level of "risk tolerance" is not correct because our perception about risk changes all the time. As Jason Zweig puts it: "In reality, your perception of investment risk is in constant flux, depending on your memories of past experiences, whether you are alone or part of a group, how familiar and controllable the risk feels to you, how it is described, and what mood you happen to be in the moment." Even a slight change in these elements can turn you from an adventurous bull to a cautious bear. If you mindlessly rely on your intuitive perception of risk, you are likely to assume risks that you should avoid and shun risks that you should embrace.

Why are our attitudes toward risk so easily contaminated by emotion? The answer lies in how our brains evolved. Over millions of years of evolution, a "better safe than sorry" reflex has become an ingrained instinct in animals, including humans. As Jason Zweig says: "For the early hominids, underreacting to real risks could be fatal, while overreacting to risks that turned out to be imaginary was probably harmless. Thus, your brain's system, centered in the thalamus, amygdala, and insula, comes with a built-in hair trigger."

Brain imaging of experimental participants making risky choices has revealed the following:

- When gains are anticipated, the **nucleus accumbens (NACC)**, a sub cortical region, becomes active. This region is rich in dopamine, a substance that is associated with positive affect of monetary rewards as well as addictive drug use. Incidentally, this region is active during anticipated gains, but not losses. This lends plausibility to the differential experiencing of gains and losses as suggested by prospect theory.
- Risk and uncertainty are experienced in different ways. Remember that risk is a situation where possible outcomes are known along with the probabilities associated with them whereas uncertainty refers to a situation where the possible outcomes are not known, let alone the probabilities associated with them. Research suggests that in face of uncertainty, the most active regions of the brain are the **orbifrontal cortex** (a region which integrates emotion and cognition) and the **amygdala** (a region which is central to emotional reaction). In contrast, in face of risk, the brain regions that are most active are the **parietal lobes** (which are primarily concerned with cognition). Thus, it seems that uncertainty is more strongly associated with an emotional reaction while risk leads to a cognitive response. Indeed, when times are highly uncertain investors are not able to assess probability distributions. So, they tend to move from rational deliberation to a primarily emotional response.

• Surprise

Humans and great apes—chimpanzees, gorillas, and organgutans—have specialised neurons called spindle cells located in a central forward region of the brain called the **anterior cingulated cortex (ACC).** The ACC helps in generating the feeling of surprise when normal expectations are belied – that is why some neuroscientists call it the "Oops!" centre.

The ACC cells rapidly process large volumes of information across time and space. As John Allman, a neuroscientist, says: "It's an intuitive system that's built for speed. In a state of nature, there's no luxury of working through all the logical steps to arrive at the ideal 'rational' solution. Where uncertainty is maximal, the importance of learning is maximal and attention is highly focused."

The ACC requires inputs from dopamine neurons that carry reward signals and from amygdala neurons that fire in response to risk. Further ACC is closely linked to the thalamus (which lies at the centre of the brain and directs attention to the inputs from senses such as sights, sounds, and smells) as well as hypothalamus (a part of the reflexive brain which acts like a thermostat regulating pulse, body temperature, and so on). So, when a surprise springs on your ACC, it can activate your hypothalamus, knocking it out of kilter. That is why, even a small shortfall in earnings can lead to sharp fall in market prices. Aware of the consequences of negative earnings surprises, corporate managers massage the accounting numbers to meet the expectations of the stock market.

A negative financial surprise startles the reflexive brain. This is followed by a sense of regret in the reflective brain. The sense of regret is deeper when the outcome appears to have been caused directly by your action (rather than by circumstances beyond your control), your mistake is due to an error of commission (what you did) rather than an error of omission (what you did not do), and your action that represents a departure from your normal or routine behaviour.

• Psychological Immune System

Humans have tremendous resilience to recover from adversity. We are equipped with what Daniel Gilbert calls a "psychological immune system." We somehow expect things to be worse than they generally turn out to be; so, it is easier to recover from them. As Jason Zweig puts it: "Because we imagine that our reactions to bad events will never fade, our own powers of recuperation take us by surprise. On the flip side, we also adjust to good things much faster than we anticipate."

8.3 ✦ ADAPTIVE MARKET HYPOTHESIS[2]

Modern investment theory and practice is largely predicated on the Efficient Markets Hypothesis (EMH), which says that market prices reflect all available information accurately and instantaneously. The EMH assumes that market participants are rational economic beings. Driven by self-interest, they make optimal decisions by weighing statistically correct

[2] Based on Andrew Lo, "The Adaptive Markets Hypothesis", *The Journal of Investment Consulting*, Volume 7, Number 2, 2005.

probabilities and marginal utilities. These assumptions and their implications for market efficiency have been challenged from various quarters. For example, psychologists and experimental economists have documented numerous departures from market rationality in the form of behavioural biases.

There is considerable evidence that market participants display behavioural idiosyncracies from time to time, but there seems to be no consensus on what it implies for investment management. Although several alternatives have been suggested, no single theory has succeeded in replacing the EMH in academia or industry.

While there are behavioural versions of utility theory, portfolio theory, asset pricing theory, and so on, these models do not enjoy the kind of general acceptance among behaviouralists that the EMH enjoys among its votaries. There seem to be two main reasons for this.

1. Modern financial economics has had a profound impact on the theory and practice of investment management since the mid-1950s. As Andrew Lo put it, "It is difficult to overturn an orthodoxy that has yielded such insights as portfolio optimisation, the Capital Asset Pricing Model, the Arbitrage Pricing Theory, the Cox–Ingersoll–Ross theory of the term structure of interest rates, and the Black–Scholes/Merton Option Pricing Model." And all of them, in some way or the other, are predicated on the EMH.
2. Behavioural finance is fragmentary in nature. There is a dearth of fundamental axioms from which all behavioural anomalies can be derived. For example, while the prospect theory of Kahneman and Tversky can explain loss aversion, it cannot explain biases such as overconfidence and regret at the same time. Hence behavioural finance is sometimes criticised as an intriguing collection of counterexamples without any unifying principles.

• A Neurosciences Perspective

Since the debate between the EMH and behavioural finance is primarily concerned with rationality in human behaviour, the recent findings of cognitive neurosciences can provide valuable insights. New research tools in the neurosciences such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) have revolutionised much of psychological research. These tools capture in real time the images of a subject's brain while the subject is asked to perform a given task. By comparing the amount of blood flow to different parts of the brain before, during, and after the task, these tools help in associating the performance of the task with certain regions of the brain. Thus, they provide important neurophysiological foundations for a variety of cognitive processes and behaviours.

One interesting example, especially relevant for financial decision making, is the link between rational behaviour and emotion, which till recently were considered diametrical opposites. Damasio found that patients who lost their ability to experience emotion due to surgical removal of brain tumours, suffered in their ability to make rational choices as well. This conclusion is surprising to economists who associate behavioural biases to emotions. After all, as Keynes once suggested, the "animal spirits" or fear and greed, cause prices to deviate irrationally from fundamentals.

According to modern research, emotions are central to rationality. As Andrew Lo put it, "Emotions are the basis for a reward and punishment system that facilitates the selection of

advantageous behaviour, providing a kind of mental yardstick for animals to measure the costs and benefits of the various actions open to them."

If emotions are central to rationality, what then is the source of irrationality? The neurosciences literature provides some clues.

Let us start with a basic fact about the human brain. According to the triune model, proposed by Maclean, the human brain is not a homogeneous mass of nerve cells but has three basic parts, serving different functions: brain stem, limbic system, and cerebral cortex. Located at the top of spinal cord, the *brain stem* controls basic bodily functions such as breathing and heartbeat. It is active even during deep sleep. Comprising of several regions in the middle of the brain, the *limbic system* is the seat of emotions, instincts, social behaviour, sexuality, and fight or flight responses. The *cerebral cortex* is the tangled maze of gray matter that represents the outer layer of the brain. It is the seat of complex and abstract thinking where logical reasoning, language, learning, musical abilities, and so on reside.

Maclean refers to these three areas as the *reptilian*, *mammalian*, and *hominid* brains respectively. This terminology suggests that the human brain has been shaped by an evolutionary process in which basic survival functions, emotional and social behaviour, and cognitive abilities emerged sequentially.

The triune model provides a deeper foundation for understanding some of the behavioural biases characterising financial decision making. According to neuroscientists, emotion is our "first response" to objects and events. Individuals respond emotionally first to objects and events before they can articulate what these are. Indeed, extreme emotional reactions can short-circuit rational deliberation totally. The strong stimulus to the mammalian brain tends to inhibit activity in the hominid brain. This seems to make sense from an evolutionary perspective. As Andrew Lo put it, "From an evolutionary standpoint… emotional reactions are a call-to-arms that should be heeded immediately because survival may depend on it, and higher brain functions such as language and logical reasoning are suppressed until the threat is over, that is, until the emotional reaction subsides."

The three specialised parts of the brain may be viewed as an evolutionary adaptation meant to enhance the odds of survival in response to a particular environmental condition. As Andrew Lo put it, "As environmental conditions change, so too does the relative importance of each component. One of the unique features of *Homo Sapiens* is the ability to adapt to new situations by learning and implementing more advantageous behaviour, and this is often accomplished by several components of the brain acting together."

From this perspective, what economists call "preferences" stem from complicated interactions among the three parts of brain as well as interactions among subparts within each of the three. This means that preferences, which are likely to be shaped by several factors, internal as well as external to the individual, may vary over time. According to Andrew Lo this perspective can be operationalised within an economic context by revisiting the idea of "bounded rationality" first proposed by Herbert Simon, a Nobel laureate in economics, in 1978. Unfortunately, this powerful insight was largely ignored by mainstream economics till recently because rational expectations became the de facto standard for modeling economic behaviour.

The Adaptive Markets Hypothesis

According to Andrew Lo, the neuroscientific perspective suggests an alternative to EMH which he calls the Adaptive Market Hypothesis (AMH). The essence of AMH is that the interaction between market forces and preferences results in a much more dynamic economy, which is driven by competition, natural selection, and diverse individual and institutional behaviour.

Of course, the application of evolutionary ideas to economic behaviour is not new. Thomas Malthus invoked biological arguments to predict dire economic consequences; Joseph Schumpeter used notions of "creative destruction" and "bursts" of entrepreneurial activity which had an unmistakable evolutionary flavour to them; Elredge and Gould proposed the idea of "punctuated equilibrium"; Wilson systematically applied the principles of competition, reproduction, and natural selection to explain certain kinds of human behaviour; Niederhoffer likened financial markets to an ecosystem with speculators as carnivores, dealers as herbivores, and floor traders as distressed investors and decomposers; and Bernstein argued that evolutionary processes provide a better explanation for market dynamics.

Derived from evolutionary principles, the AMH can be viewed as a new version of the EMH. The AMH takes a biological, not physical, view of markets. According to Andrew Lo, the principal architect of the AMH, "The primary components of the AMH consist of the following ideas:

(A1) Individuals act in their own self-interest.
(A2) Individuals make mistakes.
(A3) Individuals learn and adapt.
(A4) Competition drives adaptation and innovation.
(A5) Natural selection shapes market ecology.
(A6) Evolution determines market dynamics."

Key Insights and Implications of the AMH

The key insights and implications of the AMH are:

1. Prices reflect as much information as dictated by the combination of environmental conditions and the ecology of the market (the number and nature of species in economy).
2. The convergence to equilibrium is neither assured nor likely to occur at any point of time – this is the key insight from evolutionary biology. As Andrew Lo put it, "The notion that evolving systems must march toward some ideal stationary state is plain wrong. In many cases, such equilibria do not exist and even when they do, convergence rules may be exceedingly slow, rendering the limiting equilibria virtually irrelevant for all practical purposes."
3. Behavioural biases on account of heuristics are very common.
4. To the extent that a relation exists between risk and return, it is not likely to be stable over time. This means that equity risk premium is time-varying and path dependent.
5. Aggregate risk preferences are not fixed but shaped by the forces of natural selection.
6. While there are no arbitrage opportunities in the classical EMH, in the AMH arbitrage opportunities do arise from time to time. As Sandy Grossman and Joseph Stiglitz

argued persuasively, without arbitrage opportunities there will be no incentive to gather information leading to a veritable collapse of price discovery in financial markets.

7. The EMH predicts an inexorable trend toward higher efficiency, but the AMH implies a far more complex market with cycles, trends, bubbles, crashes, and other phenomena. Such complex market dynamics provide motivation for active management according to Peter Bernstein.
8. Investment strategies will wax and wane, doing well in certain environments and poorly in others.
9. Under certain market conditions, for certain investors active asset allocation policies may make more sense.
10. The bottom line in the AMH is survival and innovation is the key to survival. As Andrew Lo put it: "The AMH has a clear implication for all financial market participants: survival is ultimately the only objective that matters. While profit maximisation, utility maximisation, and general equilibrium are certainly relevant aspects of market ecology, the organising principle in determining the evolution of markets and financial technology is simply survival." The imperative for survival suggests that managers and consultants must maintain a certain degree of breadth and diversity in their skill and focus.

Rational Finance and Behavioural Finance

It appears that rational finance and behavioural finance are both correct and incorrect. Rational finance works when your mammalian brain and hominid brain are properly balanced. But during periods of extreme stress when you are overwhelmed by positive or negative emotion, your behavior is likely to be irrational.

8.4 ✦ FINANCIAL CRISIS AND LIMBIC SYSTEM

A survey of financial history reveals that the world is convulsed by periodic credit booms and busts. Charles Kindleberger, an eminent economic historian, counted 46 such booms and busts from 1618 to 2000. The regularity of financial crises suggests that there is some defect in the hardwiring of our brains. This seems to be the case.

To understand why rational, self-interested participants engage in such destructive behaviour, we must understand a little bit of neuroanatomy. According to the triune model of the brain, our ability to compute consciously resides largely in the neocortex on the left side, in the so called association areas. However, these association areas can perform only relatively simple mathematical operations. When asked to form more complex quantitative judgments, which are not amenable to discrete mental computation, the brain unconsciously relies on the limbic system, which roughly speaking, processes emotions and instinctual responses.

In the front part of the limbic system is a pair of structures, called the *nuclei accumbens,* located roughly behind each eye. It responds very intensely to the *anticipation* of reward (culinary, sexual, social, monetary, or whatever) rather than the reward itself. The nuclei accumbens may loosely be called the "greed centre." It is activated when an investor watches

CNBC televisions during a bull run. It is activated during a bull run and it also fuels the bull run. While Kindleberger did not know at the time, he must have had the nuclei accumbens in mind when he wrote this memorable sentence: "There's nothing so disturbing to one's well being and judgment as to see a friend get rich."

When the financial cycle reverses, another pair of limbic system nuclei kicks in the *amygdalae*. Located deep inside our temples, the *amygdalae* activate in response to revulsion, fear, and financial loss. Loosely called the brain's "fear centre," the amygdalae are, as William Berstein put it, "the financial market's horsemen of the apocalypse, triggering financial pain and discredit wherever they gallop."

It is true that over the past 100,000 years or so—a blink of an eye in the evolutionary scale—the size of the neocortex (the seat of reflective thinking and calculation) has expanded greatly. But unfortunately, in the battle between our older, irrational limbic system and the newer, rational neocortex, the former wins all too often. This results in the familiar boom-bust cycle.

When the nuclei accumbens is stimulated by dopamine, it is very hard or impossible to pull back. This is what addiction is all about. It appears that making money has the same physiological effect as taking cocaine or having sex.

• Need for Regulation

Economists have long argued for regulation because we have public goods, externalities, and incomplete markets. But economists have overlooked the most obvious rationale for regulation: the need for society to prevent itself from doing things that it is predisposed to do but knows that it should not be doing. This can be done for problems like leverage.

SUMMARY

- Neuroeconomics, a hybrid of neuroscience, economics, and psychology, seeks to understand what drives investment behaviour, not only at a theoretical and practical level, but also at a biological level. It provides an understanding of the important neurophysiological foundations underlying a variety of cognitive processes and behaviours.
- The textbook model of economic decision-making assumes that people behave as if they maximise utility. The emerging evidence supports a neural maximisation (NM) hypothesis. This means that an individual chooses the alternative that produces the highest level of activity within certain brain structures during the process of deliberation.
- Our brains, however, evolved in a stone-age world which was characterised by dangers and opportunities that were largely immediate and physical and social interactions that were limited. It is clear that our stone-age brain is not designed optimally for the complexities of the modern, globally interconnected, fast-paced world where physical dangers have been largely eliminated.

- Modern technology, in particular tools like PET (position emission tomography) and fMRI (functional magnetic resonance imaging), have been very helpful in this endeavour. PET scans use harmless radioactive substances for mapping brain activity.
- The structure represents what the brain is made up of (the anatomy of the brain) and the function represents what the brain does (the physiology of the brain). We can only give an approximate characterisation of the functions of different parts of the brain as long as we recognise that they don't act in isolation but act with other parts of the brain. As one neuroscientist put it vividly, the brain is "globally local" and "locally global".
- The brain may be conceptualised as having three anatomical divisions: the brain stem, the limbic system, and the forebrain.
- The brain stem which lies at the base of the brain sits on the top of the spinal cord. Something that we share with reptiles and other mammals, the brain stem keep us alive by governing vital functions. The brain stem consists of three individual structures: medulla oblongata, pons, and cerebellum.
- The **limbic system** consists of a group of structures surrounding the top of the brain stem. The limbic system is the seat of emotions and motivation.
- The **cerebrum** (Latin for brain) consists of the cerebral cortex, along with the underlying white matter and the basal ganglia. The cerebrum has two hemispheres, the right and the left, which are connected in the middle by corpus callosum, a collection of nerves between the two hemispheres.
- There are two aspects of human brain, the reflexive (or intuitive) system and the reflective (or analytical) system. The reflexive system has served us for millions of years in an environment characterised by immediate threats. But in the modern world, characterised by considerable complexity, it is not enough.
- The reflective (or analytical) system resides largely in the prefrontal lobe of the brain. Neuroscientist Jordan Grafman calls it as "the CEO of the brain."
- Pure rationality without emotions can be as bad as sheer emotions without reason. According to neuroeconomics, you get best investment results when you strike the right balance between emotion and reason.
- There are two kinds of goal-directed behaviour, viz., reward pursuit and loss avoidance, operated by neural circuits that run across the three divisions of the brain. These systems encompass complex brain processes that involve emotions, cognitions (thoughts), and actions. Although the reward and loss system are run largely independently, when one system is highly activated, the other system tends to be reciprocally deactivated.
- Over millions of years our brains have developed a dopamine-drunk wanting system that prods us to compete for more money, power, and material things. We are drawn to these things not because they bring happiness but because those who managed to get the stone-age equivalent of these things are our ancestors, and those did not turn out be biological dead ends. As psychologist Daniel Nettle put it: "I will argue

what we are programmed for by evolution is not happiness itself, but a set of beliefs about the kinds of things that will bring happiness, and a disposition to pursue them."

- A second motivational circuit is concerned with "loss avoidance." When we perceive threats or dangers in our environment, the "loss avoidance system" is activated: This generates worrying and pessimistic thoughts and negative emotions such as anxiety, fear, and panic.
- A monetary gain or loss is not merely a financial or psychological outcome. It is also a biological change that has profound physical effects on the brain and the body.
- Anticipation of a gain and its actual receipt are expressed in very different ways in the brain. This explains why "money does not buy happiness."
- Expectation, both good and bad, is more intense than actual experience. It often feels better to anticipate making money than actually making it. There is an old saying, 'it is better to hope than to receive.'
- The human brain is extremely well-designed to detect and interpret simple patterns.
- Human beings hate randomness. So they compulsively predict the unpredictable. Jason calls this human tendency "the prediction addiction." It is remarkable how easily the prediction circuits in the brain are activated.
- Just as nature abhors a vacuum, the human mind abhors the words, "I don't know."
- Human beings tend to like what they experience most often. Psychologist Zajonc call this the "mere-exposure effect."
- Humans suffer from illusion of control, an uncanny feeling that they can exert influence over random choice with their actions.
- The conventional assumption that every person has a certain level of "risk tolerance" is not correct because our perception about risk changes all the time. As Jason Zweig puts it: "In reality, your perception of investment risk is in constant flux, depending on your memories of past experiences, whether you are alone or part of a group, how familiar and controllable the risk feels to you, how it is described, and what mood you happen to be in the moment."
- Humans and great apes—chimpanzees, gorillas, and organgutans—have specialised neurons called spindle cells located in a central forward region of the brain called the **anterior cingulated cortex (ACC).** The ACC helps in generating the feeling of surprise when normal expectations are belied – that is why some neuroscientists call it the "Oops!" centre.
- Humans have tremendous resilience to recover from adversity. We are equipped with what Daniel Gilbert calls a "psychological immune system."
- There is considerable evidence that market participants display behavioural idiosyncracies from time to time, but there seems to be no consensus on what it implies for investment management. Although several alternatives have been suggested, no single theory has succeeded in replacing the EMH in academia or industry.

- According to modern research, emotions are central to rationality. As Andrew Lo put it, "Emotions are the basis for a reward and punishment system that facilitates the selection of advantageous behaviour, providing a kind of mental yardstick for animals to measure the costs and benefits of the various actions open to them."
- According to Andrew Lo, the neuroscientific perspective suggests an alternative to EMH, which he calls the Adaptive Market Hypothesis (AMH). The essence of AMH is that the interaction between market forces and preferences results in a much more dynamic economy, which is driven by competition, natural selection, and diverse individual and institutional behaviour.
- According to Andrew Lo, the principal architect of the AMH, "The primary components of the AMH consist of the following ideas.

  (A1) Individuals act in their own self-interest.

  (A2) Individuals make mistakes.

  (A3) Individuals learn and adapt.

  (A4) Competition drives adaptation and innovation.

  (A5) Natural selection shapes market ecology.

  (A6) Evolution determines market dynamics."
- The bottom line in the AMH is survival and innovation is the key to survival. As Andrew Lo put it: "The AMH has a clear implication for all financial market participants: survival is ultimately the only objective that matters. While profit maximisation, utility maximisation, and general equilibrium are certainly relevant aspects of market ecology, the organising principle in determining the evolution of markets and financial technology is simply survival."
- A survey of financial history reveals that the world is convulsed by periodic credit booms and busts. Charles Kindleberger, an eminent economic historian, counted 46 such booms and busts from 1618 to 2000. The regularity of financial crises suggests that there is some defect in the hardwiring of our brains. This seems to be the case.
- It is true that over the past 100,000 years or so—a blink of an eye in the evolutionary scale—the size of the neocortex (the seat of reflective thinking and calculation) has expanded greatly. But unfortunately, in the battle between our older, irrational limbic system and the newer, rational neocortex, the former wins.
- Economists have long argued for regulation because we have public goods, externalities, and incomplete markets. But economists have overlooked the most obvious rationale for regulation: the need for society to prevent itself from doing things that it is predisposed to do but knows that it should not be doing. This can be done for problems like leverage.

DISCUSSION QUESTIONS

1. Discuss the deep divide between the theory and practice of investing.
2. What is brain stem? What are the three individual structures?
3. What is limbic system? What are its structures and their functions?
4. Describe the different lobes of the cerebrum.
5. What are the different parts of the cerebral cortex?
6. Discuss the important neurotransmitters and their functions.
7. Discuss the reflexive and reflective brain.
8. What are the links between dopamine and reward?
9. Why is there a mismatch between our brains and our environment?
10. Discuss the following: loss avoidance, expectation and experience, pattern seeking, aversion to randomness and ignorance, and exposure effect.
11. Discuss the following: illusion of control, risk tolerance, surprise, and psychological immune system.
12. What according to Andrew Lo are the primary components of the adaptive market hypothesis?
13. What are the key insights and implications of the adaptive market hypothesis?
14. Discuss the link between limbic system and financial crisis.

APPENDIX 8A

NEUROPLASTICITY

The term 'neuroplasticity' is derived from two root words, viz., 'neuron' and 'plastic'. Neurons are nerve cells in our brain. Each neuron is made of an axon, dendrites, and is linked to other neurons by small spaces called the synapses. The word plastic means something that can be moulded, sculpted, or modified. Neuroplasticity means that the brain has the potential to create new neural pathways to adapt to its needs.

Until recently it was believed that: (a) Every person is born with a finite number of neural cells - about 100 billion - and when a cell died no new cell could grow. (b) The brain had a relatively small time window to develop neural pathways. Its ability to generate new pathways dropped off sharply around the age of 20 and stopped around the age of 40.

Recent research using PET and MRI brain scanning technology has shown that neural cells are generated throughout life (generation of new neurons is called as neurogenesis). Likewise, new neural pathways can be created. Although these changes are not always easy, they can happen through focused efforts. Thanks to neuroplasticity, humans can become better problem solvers, learn a new language, and recapture some lost brain function.

You can think of the neurological changes in the brain as the brain's way of tuning itself to your needs. To understand how the brain builds new neural pathways in response to new information and environmental changes, think of the brain as a radio. When you dial the tuning knob on the radio by hand to find something to listen to, you might come across a station that sounds interesting. However, it has a great deal of static so you can't hear very clearly. To improve clarity, you focus and dial the station slowly a digit at a time. This way the distortion is minimised.

In a similar fashion, when you learn something new, the brain builds new neural pathways. The more you focus and practice something, the more obstacles or hurdles you overcome. As a result, new neural connections are created in the brain as synapses that otherwise do not fire together. This helps you to sharpen your skill.

APPENDIX 8B

DESCARTES' ERROR: THE SOMATIC MARKER HYPOTHESIS

The 17th century French philosopher Rene' Descartes argued that people are guided by reason, deliberation, and calculation on one hand and driven by emotion on the other hand. And there is always a struggle between the two. If the emotional side dominates the rational side, biases and distortions in decision making are created. To make rational or smart choices, emotions have to be reined in. Descartes paid special attention to how physiology influences human behaviour, a precursor to modern brain sciences.

Based on extensive brain research, neuroscientist Antonio Damasio developed an argument in which emotions and deliberative behaviour are partners in decision making. His argument is referred to as the *somatic marker hypothesis* and he set forth in his path-breaking book *Descartes' Error: Emotion, Reason, and the Human Brain*. According to the somatic marker hypothesis, a process exists whereby emotions help guide people's decision making. Emotions are of greater help when decisions are complex or decisions take place in a high-pressure environment.

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PART III

Behavioural Aspects of Investing

Chapter **9**

Investor Behaviour

Investor behaviour is impacted by various heuristics and other influences that have been discussed at length in the previous chapters. While heuristics are usually excellent devices for saving time and effort, they often lead investors astray. Similarly, overconfidence and emotional influences impair investor rationality.

This chapter discusses how a variety of factors and influences that have been discussed at length in the previous sections bear on investor behaviour and offers some suggestions for improving investor behaviour. It is organised into nine sections as follows:

- Portrait of an individual investor
- What the heuristics and biases mean for financial decision-making
- Implications of overconfidence for decision-making
- Influence of emotions
- Implications of mental accounting
- Behavioural portfolio theory
- Knowing yourself: Psychographic models
- Basic ingredients of a sound investment philosophy
- Strategies for overcoming psychological biases.

9.1 ✦ PORTRAIT OF AN INDIVIDUAL INVESTOR[1]

It is part of Wall Street folklore that small individual investors are 'dumb.' Behavioural research too paints a 'sorry picture.' It suggests four classes of weaknesses characterising individual investor behaviour.

• Perception of Price Movements

People tend to:

- Spot trends and see patterns where none exist.
- Naively extrapolate recent behaviour on the future.

[1] Adapted from Werner F.M. De Bondt, "A Portrait of an Individual Investor," *European Economic Review,* May 1998, 831–844.

- Perceive likely variation in equity returns to be too narrow.
- Be overconfident of their prediction because they anchor too much on their most likely forecast.

Perception of Value

Most individuals

- Do not have an adequate understanding of or ability to use the valuation techniques recommended in finance texts.
- Perceive value on the basis of popular models or mental frames that are socially shared through stories in the news media.
- Cannot distinguish good stocks from good companies.

The basic problem is that too many people have a short-term orientation and judge a book by its cover.

Managing Risk and Return

People do not manage their risk and return optimally. This is manifested in the following:

- Many households are under-diversified, ignoring the important lesson of modern portfolio that 'diversification pays.'
- The idea that risk is defined at the portfolio level—and not at the level of individual assets—and that risk depends on co-variation between returns is alien to many investors.
- Many people believe that after committing their funds they can manage risk through knowledge and trading skills.
- Most households over-invest in riskless assets, foregoing the attractive long-term returns offered by stocks. When confronted with price volatility, they act myopically. Prospect theory explains this puzzle.

Trading Practices

Seasoned traders use a variety of rules and pre-commitment techniques, such as stop-loss order, to control emotion and discipline themselves. Most individuals, however, lack such discipline. They trade shares on impulse or on random tips from acquaintances, without prior planning. Their trading sentiment trails the market: they tend to buy when the market rises and sell when the market falls. Such trading mistakes suggest that people are unjustifiably optimistic about almost everything that concerns their personal lives.

Indian Investors Tend to Lose in Stock Markets

A study 'Do retail investors in India make rational investment and portfolio decisions,' done by the Indian School of Business, under the leadership of Sankar De, examined the daily trade data of one million retail investors (considered as the largest sample used in

an empirical study in behavioural finance) who collectively carried out 1.4 billion trades, with a total value of ₹ 37 lakh crore between January 2005 and June 2006. The study found that individual retail investors consistently chase a zero rate of return on their stock investments when they decide themselves. The study attributed the dismal performance of retail investors to 'disposition effect' (selling the winners too quickly and holding on to the losers too long) and 'overconfidence' (taking credit for good decisions and attributing bad decisions to luck).

Daniel Kahneman on the Investment Game

"What's really quite remarkable in the investment world is that people are playing a game which, in some sense, cannot be played. There are so many people out there in the market, and the idea that any single individual without extra information or extra market power can beat the market is extraordinarily unlikely. Yet this market is full of people who think they can do it and full of other people who believe them. This is one of the great mysteries of finance: Why do people believe they can do the impossible? And why do other people believe them?"

9.2 ✦ WHAT THE HEURISTICS AND BIASES MEAN FOR FINANCIAL DECISION MAKING

In Chapter 3 we learnt that heuristics are excellent mechanisms for saving time and effort, but they sometimes lead investors astray. This section discusses how heuristics influence investor behaviour.

• Familiarity

The familiarity heuristic induces the following financial behaviour:

Home Country Bias While preferences seem to be changing gradually, it is still true that domestic investors hold mostly domestic securities—Indian investors hold mostly Indian securities, British investors hold mostly U.K. securities, American investors hold mostly U.S. securities. Such behaviour reflects **home country bias**.

Home country bias flies in face of evidence suggesting that international diversification reduces risk without compromising returns.

One reason for home country bias may be that people are optimistic about their markets relative to foreign markets. Another behavioural reason is comfort and familiarity.

As is often the case, where a behavioural explanation is offered to explain an apparent anomaly, rational explanations too are advanced for the same. According to the rational explanation, international investment is less attractive, compared to domestic investment, because of the factors like restrictions on capital movement, differential costs of trading, and varying tax rates. Kenneth French and James Poterba, however, dismiss this argument.

Barriers to capital movement have substantially diminished. As far as differential costs of trading are concerned, one would expect all investors to gravitate to the low-cost country, but this does not seem to be happening. Finally, with the present international system of dividend withholding taxes and counter balancing tax credits, there is practically no difference between domestic and foreign tax burdens.

Bias Toward Employer or Known Brands Investors tend to overweight the stocks of companies they work for or whose brands they are familiar with.

• Representativeness

Representativeness and related biases lead to inappropriate investment decisions.

Good Companies vs. Good Investments An interesting study done by Hersh Shefrin and Meir Statman revealed that executives believed that good companies are good stocks. They used 'quality of management,' as judged by the surveys of *Fortune* magazine[2] as a proxy for company quality. They found that management quality (i.e. good company measure) and long-term investment value (i.e. good stock measure) to be highly correlated. This finding is inconsistent with the efficient markets hypothesis. In an efficient market, no company attribute should be associated with investment value. Since all information about company quality is already embedded in the stock price on an ex ante basis, all companies (good ones and bad ones) represent equally good investments.

Chasing Winners Investors tend to choose securities and mutual funds based on past performance. They regard recent past performances as the representative of future performance. This form of representativeness may be called recency bias. Such momentum-chasing or trend-following is a popular strategy and an important cornerstone of technical analysis. Surveys suggest that momentum-chasing is a popular international phenomenon.

Is momentum-chasing profitable? The answer seems to be both yes and no. Empirical evidence suggests that risk-adjusted returns are positively serially correlated over intervals of 3 to 12 months. However, over longer periods of three years or more, the evidence indicates that there is negative serial correlation. Put simply, there seems to be a pattern of intermediate-term momentum followed by long-term reversal.

Availability When information on certain types of events is freely available, people tend to believe that such events are more likely to occur. For example, prominent news coverage of violent crime persuades people to overestimate their subjective probabilities of violent attacks. Brad Barber and Terrance Odeon found that transactions of retail investors tend to be concentrated on stocks where information is freely available. News reports on a stock, exceptionally high trading volume, and extreme returns tend to grab investor attention and stimulate trading.

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[2] Every year *Fortune* magazine asks executives to assess companies in their industry on various dimensions such as quality of management, quality of products/services, and so on.

• Anchoring

In experimental studies, when subjects are asked to estimate an uncertain magnitude, their estimates are anchored on meaningless red herrings. When the potential anchor prima facie has economic content, anchor is even more likely to occur.

Since anchoring and herding are related, a word about the latter is in order. Financial analysts who publicly estimate target prices, forecast earnings, and make buy/sell recommendation tend to anchor or herd. Likewise, economic forecasters who publicly estimate growth rates, interest rates, and exchange rates, tend to anchor or herd.

9.3 ✦ IMPLICATIONS OF OVERCONFIDENCE FOR DECISION-MAKING

Overconfidence is a pervasive phenomenon. Here we will look at the implications of overconfidence for decision-making by investors and market participants. In a subsequent chapter, we will examine its implications for corporate finance executives.

There is sufficient, though not conclusive, evidence that:

- Overconfidence leads to excessive trading.
- Overconfidence causes investors to have under-diversified portfolios.
- Analysts tend to be overly optimistic about the prospects of companies they follow.

• Excessive Trading

Overconfidence seems to induce excessive trading. Theoretical models, survey evidence, and laboratory experiments suggest that there is a potential nexus between overconfidence and trading activity.

Brad Barber and Terrance Odean examined the trading histories of over 60,000 U.S. discount brokerage investors between 1991 and 1996 to study the link between trading intensity and return performance. They divided their sample of individual investors into five equal groups (quintiles) on the basis of trading turnover (or intensity). Q_1 represented the 20 per cent of the investors who traded the least; Q_2 represented the 20 per cent of the investors who traded the next least; and so on, all the way up to Q_5, which represented the 20 per cent of the investors who traded the most. The gross and net returns for groups with different trading intensity are shown in Exhibit 9.1. From this exhibit, it is clear that while the additional trading resulted in slight improvement in the gross return, the net return declined. It appears that trades were not based on superior information; rather they were often based on misinformation and misplaced overconfidence.

Apart from overconfidence, trading activity is stimulated by sensation seeking. According to M. Zuckerman, sensation seeking is a personality trait that has four dimensions:

Thrill and adventure seeking A desire to engage in thrilling activities which may be even dangerous.

Experience seeking A desire for novel and exciting activities, even if they are illegal.

Disinhibition A behaviour that is not inhibited by social norms and taboos.

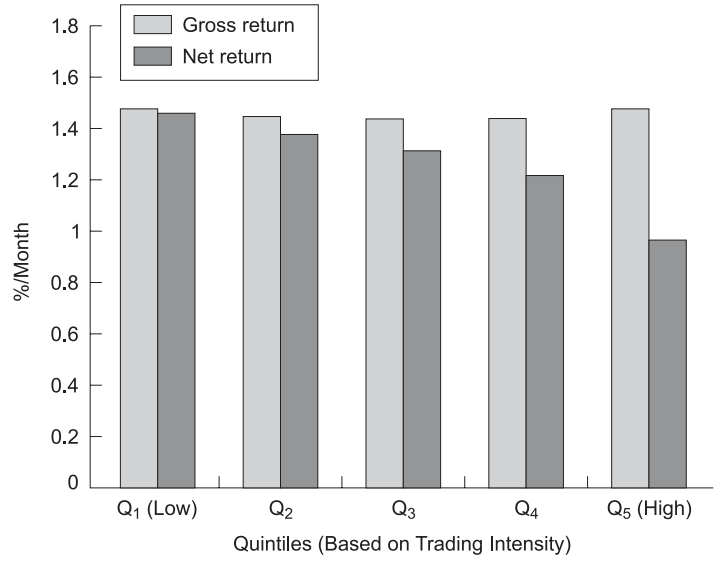
Boredom susceptibility An aversion for routine and repetitive activity.

• Under-diversification

Another investment error that is likely to stem from overconfidence is under-diversification. Overconfident people tend to quickly overweight/underweight securities when they receive positive/negative signal. As a result, they have an under-diversified portfolio.

A study by William Goetzmann and Alok Jumar[3] found that (a) financially sophisticated people were less prone to under-diversification, (b) diversification increased with income, wealth, and age, (c) those who traded the most tended also to be the least diversified—overconfidence seems to drive both excessive trading and under-diversification, and (d) people who were sensitive to price trends tended to be under-diversified.

Exhibit 9.1 Trading Intensity and Returns



Source: Barber, B., and T. Odean, 2000, "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors", *Journal of Finance* 55, 773–806.

• Excessive Optimism of Analysts

Analysts tend to be overly optimistic about the companies they are tracking. Exhibit 9.2 shows how the recommendations of the analysts are distributed among four categories, viz., strong buy, buy, hold, and sell/strong sell. It is evident that analysts are much more likely to recommend a purchase than a sell.

[3] Goetzmann, W.N., and A. Kumar, 2005, "Equity Portfolio Diversification," *Review of Finance* 12, 433-463.

Exhibit 9.2 **Recommendation Distribution (%) in G7 Countries During 1993–2002**

	Strong buy	*Buy*	*Hold*	*Sell/Strong sell*
U.S.	28.6	33.6	34.5	3.3
Britain	24.3	22.3	41.7	11.8
Canada	29.4	28.6	29.9	12.1
France	24.7	28.3	31.1	15.9
Germany	18.3	20.3	41.5	19.9
Italy	19.2	20.0	47.1	13.6
Japan	23.6	22.4	35.7	18.3

Source: Jegadeesh, N., and W. Kim, 2006, "Value of Analyst Recommendation: International Evidence," *Journal of Financial Markets* 9, 274–309.

9.4 ✦ INFLUENCE OF EMOTIONS

In a previous chapter we considered the foundations of emotion. Here, we consider the influence of emotion on investor behaviour.

• Investor Mood and Market Mood

In his book *Irrational Exuberance*, Nobel laureate Robert Shiller argues that, "the emotional state of investors when they decide on their investments is no doubt one of the most important factors causing the bull market." This was experienced the world over around 1990s. Does the emotional disposition of traders translate into a market mood which, in turn, determines the market behaviour? Some recent research on this interesting question suggests that market behaviour can be explained by emotion. One study drawing data from 26 international stock exchanges concludes that good moods from morning sunshine lead to higher returns. Another study suggests that the outcomes of soccer games have a bearing on investor mood. When a country loses in a World Cup elimination game, its market declines.

At a fundamental level, however, one wonders whether there is a simple relationship between investor mood and risk attitude. As we learnt earlier, risk attitude is important in determining how a person values an asset. Does a person take more risk or less risk when he is in a good mood or bad mood? The answer perhaps depends on the context and the personality of the individual. While one person in a sour mood may shun risks, another may become reckless. Likewise, there is no conclusive evidence about the relationship between positive mood and risk aversion. While one person in a good mood may become more risk-tolerant, another may be less likely to gamble, lest he should jeopardise the good mood. On the whole, it is unclear how good and bad moods affect risk attitude and, in turn, market behaviour. Further research is required before we can make definitive assertions.

• Regret, Pride, and Anger

Regret and pride have an important bearing on investment decision-making. Regret is a negative emotion and pride is a positive emotion. If a decision turns sour, you suffer regret. Your negative feelings are accentuated, if you have to report your loss to others. You experience pride, the flip side of regret, if your decision pays off. You may like to boast about it at a barbecue party.

Researchers have found that people are strongly motivated to minimise regret. Further, the effects of regret and pride are asymmetric. It seems that regret is felt more strongly in comparison to pride. Amazon.com founder, Jeff Bezos, has gone to record that his decision to set up Amazon.com was guided by the principle of regret minimisation. In 1994, he observed that the number of Internet users had increased by 2300 per cent in just one year over a not-so-trivial base figure. He decided to take plunge because he wanted to minimise his sense of regret later in life for having overlooked such a tempting possibility. The rest, as they say, is history.

Warren Buffett's Greatest Mistake

In 1962, Warren Buffett began buying the stock of Berkshire Hathaway after observing a pattern in the price movement of the stock whenever the company closed the mill. Finally, Buffett realised that the textile business was waning and the company's financial situation was unlikely to improve. In 1964, Stanton, Berkshire Hathaway's CEO, verbally offered to buy back Buffett's shares at $11½ per share. Buffett agreed to the deal. A few weeks later, Buffett received the tender offer in writing, but it was for only $11⅜. This slightly lower offer incensed him. Instead of selling, Buffett bought more of the stock, took control of the company, and fired Stanton. So, in an unplanned manner he became the majority owner of a faltering textile business. Buffett initially maintained textiles as the core business of Berkshire, but by 1967, he was expanding into the insurance industry and other investments.

Ironically, in 2010, Buffett admitted that purchasing Berkshire Hathaway was his biggest investment mistake. He said that if had invested that money directly in insurance business, his investments would have compounded to about $200 billion by 2010.

In our discussion of prospect theory, we learnt that while people in general are risk-averse, they sometimes seek risk. This occurs in the realm of losses and lottery-type prospects in the realm of gains. Perhaps regret and pride explain these two tendencies to take risk.

People seek risk in the domain of losses, to avoid the negative feeling of regret associated with the recognition of a loss. So, they move away from their natural tendency to avoid risk. As far as the lottery effect is concerned, a big low-probability gain and its associated pride may motivate people to take risk. It is evident that pride and regret are powerful emotions that influence the decisions people make.

Anger too is a powerful emotion that can distort investment decision-making. Its impact is best illustrated by Warren Buffett's greatest mistake described in the accompanying box.

Let us now examine a specific financial behaviour and understand how emotion explains observed choices.

• The Disposition Effect

Investors tend to sell superior performing stocks too early and hold losing stocks too long. This tendency is called the **disposition effect.**

Let us look at an empirical study documenting the existence of the disposition effect. Using a database that included trading records for 10,000 discount brokerage accounts with nearly 100,000 transactions during the period 1987–1993, Terrance Odean[4] provided evidence of disposition effect. Odean used the purchase price of each security (or the average purchase price when there were multiple transactions) as the reference point, in accordance with prospect theory. In a rising market many stocks tend to be winners. So, it is natural that more winners will be sold relative to winners. To address this issue, Odean looked at the frequency of the winner/loser sales relative to the opportunities for winner/loser sales. More specifically, he calculated the proportion of gains realised (PGR) and the proportion of loss realised (PLR) as follows:

$$\text{PGR} = \frac{\text{Realised gains}}{\text{Realised gains} + \text{Paper gains}}$$

$$\text{PLR} = \frac{\text{Realised losses}}{\text{Realised losses} + \text{Paper losses}}$$

Odean tested the hypothesis that PGR > PLR. Exhibit 9.3 shows the results of his analysis.

Exhibit 9.3 Aggregate Proportion of Gains (PGR) and Losses (PLR) Realised

	Entire Year	*December*	*January–November*
PLR	0.098	0.128	0.094
PGR	0.148	0.108	0.152
Difference in proportions	–0.050	0.020	–0.058
t-statistic	–35	4.3	–38

From Exhibit 9.3, which aggregates over all investor accounts, it is clear that investors tend to sell winners over losers (PGR > PLR) over the entire year, even though for tax reasons investors should sell losers, rather than winners. Except for the month of December, when investors are likely to sell losers than winners for tax reasons, the disposition effect dominates in the remaining eleven months (January – November).

• What Explains the Disposition Effect

Investors tend to sell winners too early and ride losers too long. In their classic paper, "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence," published in *Journal of Finance*, Vol. XL, No. 3, Hersh M. Shefrin and Meir Statman provide an

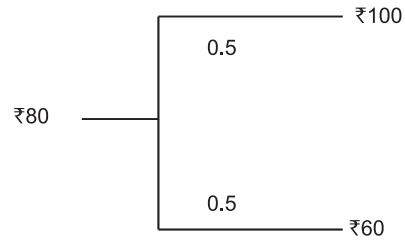
[4] Odean, T., 1998, "Are Investors Reluctant to Realize their Losses?" in *Journal of Finance* 53(5), 1775–1798.

explanation for this phenomenon in terms of four ideas: prospect theory, mental accounting, seeking pride and avoiding regret, and self-control.

Prospect Theory According to the prospect theory, there are two stages of decision-making, viz. editing stage and evaluation stage. In the editing stage, decision-makers frame the choice in terms of potential gain or loss in relation to a fixed reference point. In the evaluation stage, the decision makers employ an S-shaped value curve.

To understand how the disposition to sell winners and ride losers emerges in prospect theory, consider an investor who bought a stock a month ago for ₹100, but the stock is currently selling for ₹80. Let us assume that the investor expects the stock to go back to ₹100 or fall further to ₹60, both outcomes being equi-probable. The possibilities are displayed in Exhibit 9.4.

Exhibit 9.4 Equi-probable Outcome



According to the prospect theory, the investor frames his choice as a choice between two lotteries:

A. Sell the stock now and realise what had been a "paper loss" of ₹20.
B. Hold the stock for one more period with equal odds of "breaking-even" and losing an additional ₹20.

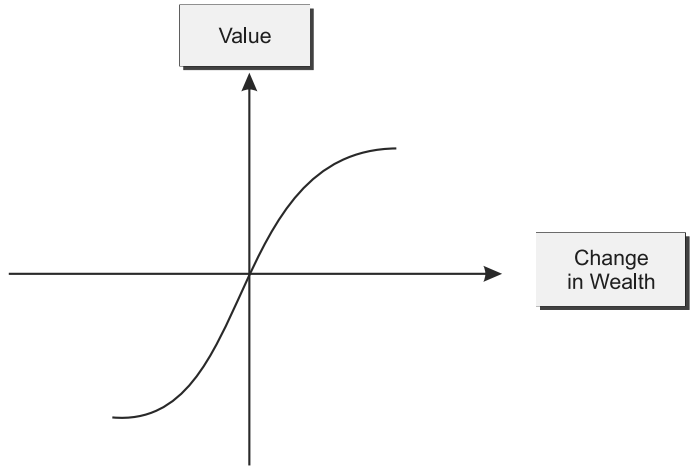
The choice between these lotteries falls in the loss region of Exhibit 9.5. So, it is associated with the convex portion of the S-shaped value function. This implies that B will be preferred to A.

Mental Accounting According to the mental accounting principle, decision-makers segregate the different types of gambles they face into separate mental accounts. Then they apply decision rules based on prospect theory to each account, ignoring the possible interaction. This explains their reluctance to engage in a tax swap, when they have a paper loss.

Seeking Pride and Avoiding Regret People seek pride and avoid regret. So, they are disposed to realise gains and defer losses. However, the asymmetry between the strength of pride and regret (regret is stronger than pride) leads to inaction, rather than action. This explains why investors are often reluctant to realise both gains and losses.

Self-control There is a conflict between the rational part (planner) and the emotional part (agent) of the individual. The planner may not be able to prevail over the agent. For example, even though a trader may be aware that riding a loser is irrational, he may not exhibit enough self-control, thanks to the force of emotion, and close his position and limit the loss.

Exhibit 9.5 Value Function



Other Manifestations of Path-Dependent Behaviour

Path-dependent behaviour, of which disposition effect is an example, means that a person's decisions are influenced by what transpired earlier. There are other manifestations of path dependent behaviour. To understand them, consider this bet on a coin toss: If it shows heads, you win ₹100; if it shows tails, you lose ₹100. Would you accept this bet? Suppose you had won ₹500 earlier. Now would you accept this bet? What if you had lost ₹500 earlier? Would this make the bet look any different to you?

While the odds of winning ₹100 do not change in the different scenarios, many people will take the bet in one situation, but not in the other. Put differently, people seem to consider a past outcome as a factor in evaluating a current risky decision. In general, people are willing to take more risk after earning gains and less risk after incurring losses. Experimental studies suggest a house-money effect, a snake-bite effect, and a trying-to-break-even effect.

After experiencing a gain, people are willing to take more risk. After winning money in a gamble, amateur gamblers somehow don't fully consider the winning as their own and hence are tempted to risk it in further gambles. Gamblers refer to this as the **house-money effect.**

After incurring a loss, people are less inclined to take risk. This is sometimes referred to as the **snake-bite (or risk aversion) effect**. A loss is akin to a snake-bite that makes a person more cautious.

Losers, however, do not always shun risk. People often jump at the chance to recover their losses. This is referred to as **trying-to-break-even effect**. In fact, this effect may be stronger than the snake bite effect. As Kahneman and Tversky put it, "A person who has not made peace with his losses is likely to accept gambles that would be unacceptable to him otherwise."

There are other ways in which what has happened in the past has a bearing on present decisions, actions, and beliefs. Some of the well-known effects are the endowment effect, the

status quo bias, and the avoidance of cognitive dissonance. The **endowment effect** says that people tend to place greater value on what belongs to them relative to the value they would place on the same thing if it belonged to someone else. A concomitant tendency is to put too much emphasis on out-of-pocket expenses and too little on opportunity costs. **Status quo bias** implies that people are comfortable with the familiar and would like to keep things the way they have been. **Cognitive dissonance** arises when the brain is struggling with two opposite ideas—I'm smart, but I'm not smart. Since cognitive dissonance is psychologically painful, people tend to reject information that conflicts with their positive image.

• Evidence of House Money Effect

To test the house money effect, Thierry Post, Martin J. van den Assen, Guido Baltussen, and Richard Thaler examined the choices made by the contestants in the popular game show "Deal or No Deal?" First aired in the Netherlands in 2002, this show has since been broadcast in a number of countries including the United States, Germany, Mexico, and Spain. The stakes in this game are quite large, with possible payouts in Netherlands ranging from 0.01 to 5,000,000 euros. While the rules of the game vary across countries, the basic setup is as follows. Twenty-six suitcases, each containing a hidden payout, are presented to a contestant, who is asked to select one of them as his own. The selected suitcase remains closed as the contestant opens six others and sees their contents. Next, a cash offer is made by a bank to the contestant. If the contestant accepts this cash offer, he walks away with that amount with certainty and surrenders the suitcase. If the contestant rejects the offer, there is "no deal" between the contestant and the bank. The contestant hangs on to his suitcase, selects five more suitcases and looks at their contents. The bank now makes another cash offer, and continues until the contestant accepts a deal or walks away with the contents of his suitcase. Though not perfectly predictable, the cash offer rises over time. Further, it increases when low value suitcases are opened and decreases when high value suitcases are opened.

The researchers found that the decisions of the contestants in the game show are influenced by what has happened before. When low-value suitcases are opened, contestants prefer to take more risk. This is akin to the house money effect because when low payoffs are removed, expected winnings tend to be higher and so contestants experience a gain. When suitcases with high value are opened, contestants again prefer to take more risk because they experience a loss in terms of expected winnings. This behaviour is consistent with the break-even effect. People take risky gambles in an attempt to break-even. Bottomline: Significant changes in expected wealth, regardless of the sign, prod people to take more risk.

• Affect

Affect is the instinctual reaction to a stimulus that occurs before the formation of a more complex emotion based on typical cognitive processes. Some argue that affective reactions can occur without extensive perceptual and cognitive coding. Others believe that affect occurs after a certain amount of cognitive processing. Still others believe that affect can be both pre- and post-cognitive, implying that initial emotional response produces thought which generates affect. Damasio goes a step further and argues that affect is necessary for enabling more rational modes of cognition.

Affect plays a role in financial decision-making, as it does in other areas of life. Affect has a bearing on corporate investment decisions; it also plays a role in financial markets. It appears that the image of a firm has a significant effect on the portfolio allocation decisions of experimental participants. Psychologists suggest that when there is a conflict between affective reactions and cognitive evaluations, the emotional aspects tend to have a dominating influence on behaviour. Perhaps much more research needs to be done before we understand the circumstances in which a particular force is likely to dominate.

9.5 ✦ IMPLICATIONS OF MENTAL ACCOUNTING

Traditional finance holds that wealth, in general, and money in particular, must be regarded as "fungible" and every financial decision should be based on a rational calculation of its effects on overall wealth position. In reality, however, people do not have the computational skills and willpower to evaluate decisions in terms of their impact on overall wealth. It is intellectually difficult and emotionally burdensome to figure out how every short-term decision (like buying a new camera or throwing a party) will bear on what will happen to wealth position in the long run.

So, as a practical expedient, people separate their money into various mental accounts and treat a rupee in one account differently from a rupee in another because each account has a different significance to them. The concept of **mental accounting** was proposed by Richard Thaler, one of the brightest stars of behavioural finance.

Mental accounting manifests itself in various ways:

- Investors have a tendency to ride the losers as they are reluctant to realise losses. Mentally, they treat unrealised "paper loss" and realised "loss" differently, although from a rational economic point of view they are the same.
- Investors often integrate the sale of losers so that the feeling of regret is confined to one time period.
- Investors tend to stagger the sale of winners over time to prolong the favourable experience.
- People are more venturesome with money received as bonus but very conservative with money set aside for children's education.
- Investors often have an irrational preference for stocks paying high dividends, because they don't mind spending the dividend income, but are not inclined to sell a few shares and "dip into the capital".

• Narrow Framing

Ideally, investors should pay attention to changes in their total wealth (comprising of real estate, stocks, bonds, capitalised future income, and other assets) over their investment horizon because it is this that determines how much they can spend on goods and services, which is what ultimately matters to them. In reality, however, investors engage in **narrow framing**—they focus on changes in wealth that are narrowly defined, both in a cross-sectional as well as a temporal sense.

Narrow framing in a cross-sectional sense means that investors tend to look at each investment separately rather than the portfolio in its totality. Hence, they are more focused on price changes in individual stocks and less concerned about the behaviour of the overall portfolio. Narrow framing in a temporal sense means that investors pay undue attention to short-term gains and losses, even when their investment horizon is long (such as saving for son's college education which may be ten years away and saving for retirement which may be many years away).

Narrow framing can lead people to overestimate risk. This happens because the more narrowly an investor frames the more often the investor sees losses. While several individual securities in a portfolio may have negative returns, the portfolio as a whole is likely to have a positive return. Similarly, although the stock market often produces negative returns in the short run, it rarely delivers negative returns in the long run. Since people are loss-averse, narrow framing leads to **myopic risk aversion**.

Narrow framing manifests itself in the following ways:

- Investors allocate too little of their money to stocks due to myopic risk aversion.
- When investors sell stocks, they typically sell stocks that have appreciated, rather than stocks that have depreciated.

9.6 ✦ BEHAVIOURAL PORTFOLIO THEORY

Introduced by Hersh Shefrin and Meir Statman, *behavioural portfolio theory* is a goal-based theory. In this theory, investors divide their money into several mental account layers, arranged as a portfolio pyramid. Each layer corresponds to a specific goal such as buying a house, paying for children's education, having a secure retirement, or being affluent enough to go on a world tour whenever one chooses to.

The seeds for behavioural portfolio theory were sown when Milton Friedman and Henry Savage noted, way back in 1948, that human behaviour is guided by a desire to seek protection from adversity as well as a hope for riches. That is why people buy insurance policies as will lottery tickets.

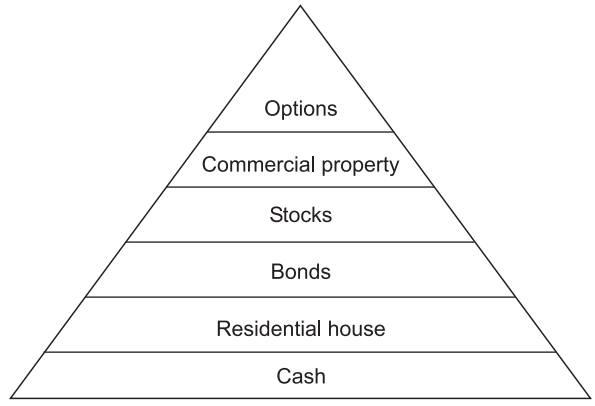
Few years later, Harry Markowitz wrote two papers that were based on two very different views of behaviour. In one, he developed the celebrated mean-variance theory, based on expected utility theory. In the mean-variance theory, people are always risk-averse and hence never buy lottery tickets.

In the second paper, he extended the insurance –lottery framework of Friedman and Savage. He noted that people aspire to move up the social hierarchy. So, a person with $10,000 may accept lottery-like odds to win $1 million, and a person with $1 million may accept lottery-like odds to win $100 million. Taking a cue from this paper of Markowitz, Daniel Kahneman and Amos Tversky developed the prospect theory. This theory explains why people accept lottery-type odds when they are below their aspiration levels.

According to behavioural portfolio theory, investors view their portfolio not as a whole, as the mean-variance portfolio theory prescribes, but as segregated mental accounts forming a pyramid of assets as shown in Exhibit 9.6. The salient features of the behavioural portfolio theory are as follows:

- Investors have several goals such as safety, income, and growth, often in that sequence.
- Each layer in the pyramid represents assets meant to meet a particular goal. The bottom layers of the pyramid (cash, fixed deposits, provident fund) are meant to guarantee financial survival and the upper layers (stocks, options, and so on) offer upside potential with attendant volatility.
- Investors have separate mental accounts for each investment goal and they are willing to assume different levels of risk for each goal. Risk is managed by matching different assets to different investment objectives.
- The asset allocation of an investor's portfolio is determined by the amount of money assigned to each asset class by the mental accounts.
- The co-variation of returns between different asset categories and individual securities is largely ignored. Investors end up with a variety of mini-portfolios as they overlook interactions among mental accounts and among investment assets.
- Diversification stems from investor goal diversification, not from purposeful asset diversification as recommended by Markowitz's portfolio theory. This means that most investors do not have efficient portfolios. They may be taking too much risk for the returns expected from their portfolio. Put differently, they can earn higher expected returns for the level of risk they are taking.

Exhibit 9.6 Behavioural Portfolio



Mental Accounting Portfolio Theory

Sanjiv Das, Harry Markowitz, Jonathan Scheid, and Meir Statman, combined mean-variance portfolio theory and behavioural portfolio theory to develop mental accounting portfolio theory. According to their theory, investors first allocate their wealth across goals into mental account layers, say 50 per cent for retirement income, 20 per cent for children's college education, 15 per cent for bequest, and 15 per cent for getting rich. Then, investors specify the desired probability of reaching the threshold of each goal, say 95 per cent for retirement

income, 75 per cent for children's college education, 50 per cent for bequest, and 40 per cent for getting rich. Finally, investors optimise each mental account as a sub-portfolio using the rules of mean-variance theory. For example, the retirement goal is likely to be achieved by a sub-portfolio that is tilted toward bonds, the college education goal is likely to be achieved by a sub-portfolio that has a balanced mix of stocks and bonds, the bequest goal is likely to be achieved by a sub-portfolio dominated by real estate, and the getting rich goal is likely to be achieved by a sub-portfolio consisting of growth stocks and options with some lottery tickets thrown in. The overall portfolio will be the sum of the mental account sub-portfolios, and, like the mental account sub-portfolios, it will also lie on the mean-variance efficient frontier.

9.7 ✦ KNOWING YOURSELF: PSYCHOGRAPHIC MODELS

Psychographic models seek to classify individuals according to certain characteristics, tendencies, or behaviours. They are helpful in understanding risk tolerance and developing investment strategy.

Many psychographic models have been proposed. We will discuss two such models, viz., the Barnewell two-way model and the Bailard, Biehl, and Kaiser five-way model.

• Barnewell Two-Way Model

One of the oldest and most popular psychographic models was developed by M.M Barnewll[5] to improve the interface of investment advisors with clients. Barnewell made a distinction between two relatively simple investor types, viz., passive investors and active investors.

Passive Investors As Barnewell notes: "Passive investors are defined as those investors who have become wealthy passively, for example, by inheritance or by risking the capital of others rather than risking their own capital."

According to Barnewell: (a) Passive investors have lesser tolerance for risk and greater need and security. (b) The smaller the economic resources of the person, the greater the likelihood that the person will be a passive investor. (c) Certain occupational groups tend to be passive investors (these include corporate managers, lawyers working for large regional firms, CPAs working with large CPA firms, medical and dental non-surgeons, politicians, bankers, journalists, individuals who have inherited wealth, and small business owners who have inherited the business). (d) A large proportion of the middle and lower socio-economic classes are passive investors.

Active Investors Barnewell notes: "Active investors are defined as those individuals who have earned their own wealth in their lifetimes. They have been actively involved in the wealth creation, and they have risked their own capital in achieving their wealth objectives."

According to Barnewell: (a) Active investors have a high tolerance for risk and lesser need for security. (b) Active investors prefer to control their investments. They cull vast amounts of

[5] M. Barnewell, "Psychological Characteristics of the Individual Investor" in *Asset Allocation for the Individual Investor*, ed. William Drons (Charlottesville, VA: Institute of Chartered Financial Analysts, 1987).

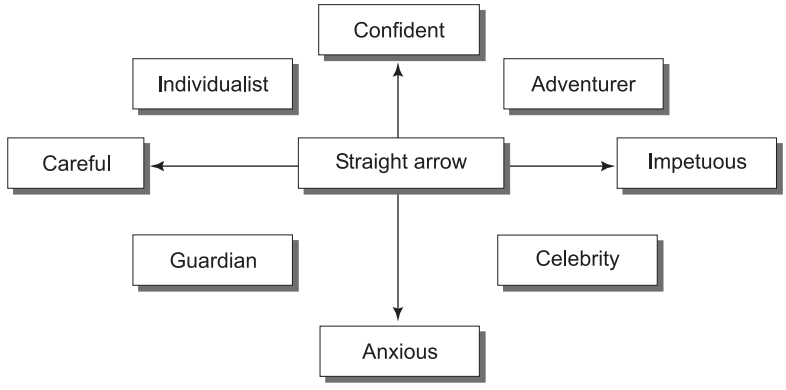
information about their investments and expect a great deal from their investment managers. (c) By their active involvement, they believe that they can reduce risk to an acceptable level. Indeed, if they participate in an aggressive investment over which they do not have control, their risk tolerance declines quickly.

Barnewell suggests that a simple non-intrusive overview of the investor's personal history and career profile can provide the context for portfolio design and suggest the pitfalls that can be avoided in building an advisory relationship.

• Bailard, Biehl, and Kaiser (BB&K) Five-Way Model

BB&K classify investor personalities along two dimensions viz., level of confidence and method of action. BB&K provide a graphic representation of their model (Exhibit 9.7) to explain investor personalities.

Exhibit 9.7 BB&K Five-way Model: Graphic Representation



Source: Thomas Bailard, David Biehl, and Ronald Kaiser, *Personal Money Management*, 5th ed. (Chicago Science Research Associates, 1986).

The first aspect of personality deals with how confidently the investor approaches life, regardless of whether it is his approach to his career, his health, his money. These are important emotional choices and they are dictated by how confident the investor is about some thing or how much he tends to worry about them. The second element deals with whether the investor is methodical, careful, and analytical in his approach to life or whether he is emotional, intuitive, and impetuous. These two elements can be thought of as two 'axes' of individual psychology—one axis is called "confident-anxious" axis and the other is called the "careful-impetuous"axis.

The BB&K model identifies five investor personality types which are described below.

The Individualist An individualist tends to go his own way and is typified by an independent professional (such as lawyer, engineer, doctor, or chartered accountant) or the small business person. Quite confident, an individualist decides, in a careful, methodical, and analytical manner. Since he is rational, the investment counsel can communicate well with him.

The Adventurer A very confident person, the adventurer, is willing to place huge bets. Since he has his own ideas about investing, it is difficult to advise him. From the point of view of the investment counsel, the adventurer is a volatile client.

The Celebrity The celebrity prefers to be where the action is and does not want to be left out. Although he may have his own ideas about other things in life, in the realm of investing he does not have his own ideas. So, he is perhaps the best prey for maximum broker turnover.

The Guardian The guardian is careful and bit concerned about money. Generally, as people get older and begin pondering over retirement, they approach this personality profile. Recognising his limited earnings potential, the guardian focuses on preserving his assets. He is not interested in volatility or excitement. He does not have confidence in his ability to forecast the future. So he looks for guidance.

The Straight Arrow A straight arrow is well balanced. Since he cannot be placed in any specific quadrant, he falls near the centre. He is a relatively balanced composite of the four different investor types and is willing to be exposed to moderate amounts of risk.

- **Investment Wiring**

The investment wiring of a person reflects his inner attitudes, feelings, and biases when it comes to money. It is shaped by one's upbringing and past experiences. Here are a few classic types of investment wiring.

Mr. Cocky He is the Mr. Know-It-All, who thinks that he is smarter than others and has answers about money, investments, and just about everything else.

The Cynic The cynic is skeptical of everything you say and thinks that you are interested only in gathering your fees and commission and not in helping him.

The Putterer With little else to do, the putterer invests to relieve his boredom. If he is very wealthy, he may buy a sports team; if not he hangs around in a broker's office.

Paul Perfect He assures that he has planned his investments very well and he doesn't need outside help.

Amy Amiable You can easily talk to Amy Amiable, but not coax her into action.

The Analytic He dissects everything you propose into its component parts and examines them minutely, but he doesn't get the overall perspective, though he often thinks he does.

Mr. Pennywise A miser, he is unwilling to pay any fees to an investment advisor.

The Hobbyist The hobbyist is a cousin of the Putterer, with an important difference. While the Putterer invests to socialise or keep busy, the Hobbyst is obsessed with investing which he does very meticulously.

9.8 ✦ BASIC INGREDIENTS OF A SOUND INVESTMENT PHILOSOPHY

To inject greater rationality in investment management, one must develop a sound investment philosophy and follow certain guidelines. This section looks at the basic ingredients of a sound investment philosophy and the following section discusses important guidelines. A sound investment philosophy has three basic ingredients: focus on process, long-term perspective, and probabilistic orientation.

Focus on Process In any probabilistic field-investing, business, or gambling, the emphasis should be on the process, not on the short-term outcome. This may be easier said than done because outcomes are objective while processes are more subjective. But a quality process, based on a sound theory, is essential for long-term success. Unfortunately, the investment community, given its incentives and measurement systems, seems to be more focused on outcomes, less on the process. As Robert Rubin said: "It's not that results don't matter. They do. But judging solely on results is a serious deterrent to taking risks that may be necessary to making the right decision. Simply put, the way decisions are evaluated affects the way decisions are made".

Michael Mauboussin provides a matrix, shown in Exhibit 9.8, to think about the process and the outcome.

Long-term Perspective In the world of investments, there is too much randomness in the short run. A sound investment philosophy calls for a long-term orientation.

Probabilistic Approach It is important to adopt a probabilistic approach in the field of investing. According the psychologists, there are a lot of glitches in the probability module of our mental hardwiring: we over-weight low probability events and under-weight high

Exhibit 9.8 **Process and Outcome Matrix of Mauboussin**

		Outcome	
		Good	Bad
Process	Good	Deserved Success	Bad Break
	Bad	Dumb Luck	Poetic Justice

probability events; we fail to consider the full range of possible outcomes; our probability assessments depend on how information is presented to us; we see order in disorder, and so on. So a conscious attempt has to be made to patch up these glitches to improve the prospects of long-term success.

One of the keys is to consider possible outcomes, assign realistic probabilities, and calculate expected values. As Charlie Munger says: "One of the advantages of a fellow like Warren Buffet is that he automatically thinks in terms of decision trees." As Warren Buffet puts it: "Take the probability of loss times the amount of possible loss from the probability of gain times the amount of possible gain. That's what we're trying to do. It's imperfect, but that's what it's all about."

9.9 ✦ GUIDELINES FOR OVERCOMING PSYCHOLOGICAL BIASES

This chapter has discussed many psychological biases that impair the quality of investment decision-making. We will close the chapter by suggesting the following strategies for mitigating the psychological biases.

- **Understand the Biases** Pogo, the folk philosopher created by the cartoonist Walk Kelly, provided an insight that is particularly relevant for investors, 'We have met the enemy – and it's us.' So, understand your biases (the enemy within) as this is an important step in avoiding them.
- **Focus on the Big Picture** Develop an investment policy and put it down on paper. Doing so will make you react less impulsively to the gyrations of the market.

  Don't look at short-term price changes in each investment in your portfolio, but focus on the level of your total wealth. Taking a global view activates your reflective system, whereas looking at losses or gains on single investments engages your reflexive system.

  Listen to the advice of Daniel Kahneman: "Investors should reduce the frequency with which they check how well their investments are doing. Closely following daily fluctuations is a losing proposition, because the pain of the frequent small losses exceeds the pleasure of the equally frequent small gains. Once a quarter is enough, and may be more than enough for individual investors. In addition to improving the emotional quality of life, the deliberate avoidance of exposure to short-term outcomes improves the quality of both decisions and outcomes. The typical short-term reaction to bad news is increased loss aversion. Investors who get aggregated feedback receive such news much less often and are likely to be less risk averse and to end up richer. You are also less prone to useless churning of your portfolio if you don't know how every stock in it is doing every day (or every week or even every month). A commitment not to change one's position for several periods (the equivalent of locking in an investment) improves performance."
- **Rely on Words and Numbers, not Sights and Sounds** In general, the reflexive system of your brain is engaged by sights and sounds, whereas the reflective system of your brain is activated by words and numbers. So rely less on what you see or hear on a television programme and depend more on what you read in the annual report of the company.
- **Follow a Set of Quantitative Investment Criteria** It is helpful to use a set of quantitative criteria such as the price-earnings ratio being not more than 25, the price to book ratio being not more than 3.0, the growth rate of earnings being at least 12 per cent, and so on.

Quantitative criteria tend to mitigate the influence of emotion, hearsay, rumour, and psychological biases. Rules discipline investment behaviour. When the foremost investment guru Benjamin Graham was asked what it takes to succeed as an investor, he replied: 'People don't need extraordinary insight or intelligence. What they need most is the character to adopt simple rules and stick to them.' As Ralph Waldo Emerson said: 'Numbers serve to discipline rhetoric. Without them it is too easy to follow flights of fancy, to ignore the world as it is, and to remold it nearer the heart's desire.'

- **Diversify** If you own a fairly diversified portfolio of say 15 to 20 stocks from different industries, you are less prone to do something drastically when you incur losses in one or two stocks because these losses are likely to be offset by gains elsewhere.
- **Take Care of the Downside** The cornerstone of a good investment strategy is to take care of the downside. If you do so, the upside then takes care of itself. As Joel Greenblatt, an eminent practitioner of value investing, said: "My largest positions are not the ones I think I'm going to make the most money from. My largest positions are the ones I don't think I'm going to lose money in."
- **Control Your Investment Environment** If you are on a diet, you should not have tempting sweets and savouries on your dining table. Likewise, if you want to discipline your investment activity, you should regulate or control your investment environment. Here are some ways of doing so:
  - Check your stocks only once every month.
  - Trade only once every month and preferably on the same day of month.
  - Review your portfolio once or twice a year.

  Instead of devoting time to find the next Infosys or figure out which fund manager is the next Peter Lynch, you should focus on what Jason Zweig calls 'controlling the controllable.' While you have no control over whether the stocks of funds you pick will produce superior returns, you can, says Jason Zweig, control *your expectations* (by setting realistic expectations), *your risk* (by asking how much you can lose if you are wrong), *your readiness* (by making sure you adhere to an investing checklist), *your expenses* (by avoiding mutual funds with high management fees), *your commissions* (by trading infrequently), *your taxes* (by extending your investment period to at least one year), and *your own behaviour* (by not succumbing to the 'prediction addiction').
- **Strive to Earn Market Returns** Seek to earn returns in line with what the market offers. If you strive to outperform the market, you are likely to succumb to psychological biases.
- **Track Your Feelings** Neuroscientist Antoine Bechara says that you should keep an 'emotional registry,' tracking your moods during market's peaks and valleys. Most investors become euphoric when prices (and risk) are rising and turn despondent when prices (and risk) are falling. So, one must train oneself to turn one's investing emotions upside down. Jason Zweig reminds us: "Many of the world's best investors have mastered the art of treating their own feelings as reverse indicators: Excitement becomes a cue that it's time to consider selling, while fear tells them that it may be time to buy.'
- **Review Your Biases Periodically** Once in a year review your psychological biases. This will throw up useful pointers to contain such biases in future. Psychologist Baruch Fischhoff recommends using an investment diary. He says, 'Keep a record of what

was on your mind when you made predictions and try to make those predictions as explicit as possible. 'A periodic review of your diary entries will reveal how good your theories were and how accurate your predictions were. Adds Jason Zweig: 'That will help you in learning whether you were right, or just lucky. And that, in turn, will help keep your inner con-man in check.'

- **Rebalance** Periodically rebalance your portfolio in line with your target asset mix. This way you force yourself, through predetermined reflective commitment, to sell what has risen and buy what has fallen.

The thrust of the above guidelines is to improve your RQ (rationality quotient) which is distinct from IQ (intelligence quotient). According to Michael Mauboussin who has explored this distinction, RQ involves adaptive behavioural acts, judicious decision-making, efficient behavioural regulation, goal prioritisation, reflectivity, and proper calibration of evidence. RQ, a relatively new concept, is not yet fully understood. It must be emphasised that IQ does not confer RQ. Indeed, a high IQ may come in the way of RQ. As Warren Buffett observed, in his preface to Benjamin Graham's *Intelligent Investor*: "Not only does a sky high IQ not guarantee success but it would also pose a danger.. nobody would be allowed to work in the financial markets in any capacity with a [IQ] score of 115 or higher. Finance is too important to be left to smart people."

The cynics may despair and argue that it is not possible for people to change and overcome their irrationality. The latest findings in the "plasticity" of the brain, however, suggests that we can change. As Ming HSU, Director, Neuroeconomics Lab, Hass School of Business, put it, "The good news is that even 'old dogs' can learn new tricks about investing. We can master new skills, alter old ones, overcome crippling emotions, and, through experimentation, teach ourselves psychological responses and styles that can become automatic."

SUMMARY

- It is part of Wall Street folklore that small investors are 'dumb'. Behavioural research too points a sorry picture. Individual investors have a wrong perception of price movements and value, manage risk and return sub-optimally, and trade shares on impulse or on random tips.
- **Familiarity heuristic** induces home country bias and bias toward employer or known brands.
- **Representativeness and related biases** lead to inappropriate investment decisions—such as confusing between good companies and good stocks, chasing winners, concentrating on stocks where information is easily available.
- Overconfidence often leads to under-diversification and excessive risk taking.
- **Regret** and **pride** have an important bearing on investment decision-making.

- Investors tend to sell superior performing stocks too early and hold losing stocks too long. This tendency is called **disposition effect**. Hersh M. Shefrin and Meir Statman provide an explanation for this phenomenon in terms of four ideas: prospect theory, mental accounting, seeking pride and avoiding regret, and self-control.
- **Path-dependent behaviour**, of which disposition effect is an example, means that a person's decisions are influenced by what transpired earlier. Other manifestations of path dependent behaviour are: **house-money effect, snake-bite (or risk aversion) effect, trying-to-break-even effect, endowment effect, and status quo bias.**
- Traditional finance holds that wealth in general and money in particular must be regarded as "fungible" and every financial decision should be based on a rational calculation of its effects on overall wealth position. In reality, however, people do not have the computational skills and will power to evaluate decisions in terms of their impact on overall wealth. So, as a practical expedient, people separate their money into various mental accounts and treat a rupee in one account differently from a rupee in another account because each account has a different significance to them. The concept of **mental accounting** was proposed by Richard Thaler.
- Ideally, investors should pay attention to changes in their total wealth (comprising of real estate, stocks, bonds, capitalised future income, and other assets) over their investment horizon because it is this that determines how much they can spend on goods and services, which is what ultimately matters to them. In reality, however, investors engage in **narrow framing**—they focus on changes in wealth that are narrowly defined, both in a cross-sectional as well as a temporal sense.
- Narrow framing in a cross-sectional sense means that investors tend to look at each investment separately rather than the portfolio in its totality. Narrow framing in a temporal sense means that investors pay undue attention to short-term gains and losses, even when their investment horizon is long.
- Since people are loss-averse, narrow framing leads to **myopic risk aversion.**
- While investors understand the principle of diversification, they don't form portfolios in the manner suggested by portfolio theory developed by Harry Markowitz. How, then, do they build a diversified portfolio?

  According to Hersh Shefrin and Meir Statman, the psychological tendencies of investors prod them to build their portfolios as a pyramid of assets.
- The Barnewell two-way model distinguishes between two relatively simple investor types, viz., passive investors and active investors.
- Bailard, Biehl, and Kaiser five-way model classifies investor personalities along two dimensions viz., level of confidence and method of action. This model identifies five investor personality types; the individualist, the adventurer, the guardian, and the straight arrow.
- The investment wiring of a person reflects his or her inner attitudes, feelings, and biases when it comes to money. Here are a few classic types of investment wiring.

Mr. cocky, the cynic, the putterer, Paul perfect, Amy amiable, the analytic. Mr. Pennywise, the hobbyist.

- A sound investment philosophy has three basic ingredients: focus on process, long-term perspective, and probabilistic orientation.
- The following guidelines are helpful in mitigating psychological biases: understand the biases; focus on the big picture; rely on words and numbers, not sights and sounds; follow a quantitative investment criteria; diversify adequately; control your investment environment; strive to earn market returns; track your feelings, review your biases periodically; and rebalance.

DISCUSSION QUESTIONS

1. What do, according to Meir Statman, investors really want?
2. What does the portrait of an individual investor look like, according to Werner F.M. Debont?
3. What kind of investment behaviour does the familiarity heuristic induce?
4. Discuss the investment implications of representativeness and related biases.
5. Discuss the implications of overconfidence for investment decision-making.
6. What is the relationship between investor mood and market mood?
7. Discuss the impact of regret and pride on investment decision-making.
8. What is disposition effect? What explains the disposition effect?
9. Besides disposition effect, what are the other manifestations of path-dependent behaviour?
10. What is mental accounting? What are its manifestations?
11. What is narrow framing? What are its manifestations?
12. Discuss myopic risk aversion.
13. What are the salient features of the pyramid of behavioural portfolio?
14. Discuss the Barnewell two-way model.
15. Discuss the Bailard, Biehl, and Kaiser Five-Way model.
16. What are a few classic types of investment wiring?
17. Discuss the basic ingredients of a sound investment philosophy.
18. Discuss the strategies for overcoming psychological biases.

MINI CASE

SAVE MORE TOMORROW

In the U.S., since the mid-1990s, there has been a rapid migration from defined-benefits plan to defined-contribution plans, casting greater responsibility on employees for making decisions about how much to save. In the wake of this change, it was observed that some employees at firms that offered only defined-contribution plans contributed very little or even nothing to the plan.

Economic theory, however, generally assumes that people will address this problem rationally. For example, the life cycle theory of savings assumes that households want to smooth consumption over life cycle and so they are expected to optimally decide in each period how much to consume and how much to save.

To help employees improve their savings rate, Richard Thaler and Shlomo Benartzi devised a program called Save More Tomorrow (or SMarT).

More specifically, the program has four ingredients. First, employees are contacted about enhancing their contribution rates sufficiently ahead of their pay increase. Put differently, there is a significant time lag between the sign-up and start dates. Second, if employees enroll, their contribution to the plan is increased starting with the first paycheck after a raise. Third, the contribution rate continues to increase automatically on each scheduled raise till it reaches a prescribed maximum. Fourth, employees have the freedom to opt out of the plan at any time.

Initial Implementation

Here is a brief peep into the first three implementations of SMarT plan as reported by Richard H. Thaler and Shlomo Benartzi in their paper "Save More Tomorrow^{TM}: Using Behavioral Economics to Increase Employee Saving," *Journal of Political Economy*," 2004, Vol.112, No.1.

The SMarT plan was first implemented in 1998 at a midsize manufacturing plant (which prefers anonymity). Those who participated in the SMarT plan improved their savings rate considerably.

The second implementation of the SMarT plan took place at Ispat Inland, a Midwestern steel company in the U.S, in May 2001. The immediate effect on savings was as expected. Those who joined the SMarT plan increased their savings rates by roughly 2 per cent, whereas those not joining the plan did not change their savings rate much.

The third implementation of SMarT plan took place at two divisions (Divisions A and O) of Philips Electronics in January 2002. The remaining 28 divisions of Philip Electronics served as the control group. Here, too, SMarT plan had a favourable impact on the savings rate of the employees.

Commenting on the initial experience with the SMarT plan, Thaler and Benartzi observed, "The initial experience with the SMarT plan has been quite successful. Many of the people who were offered the plan elected to use it, and a majority of the people who joined the SMarT plan stuck with it. Consequently, in the first implementation, for which we have data for four annual raises, SMarT participants almost quadrupled their savings rates."

Huge Policy Impact

Behavioural economics has had a huge impact on the design of 401 (K) plans in the U.S. and defined contribution savings plans all over the world. Behavioural economics has influenced three major changes in these plans: automatic enrollment, Save More Tomorrow, and creation of sensible default investment strategies. The Save More Tomorrow was sponsored by the US congress by an unusual coalition that included liberals and extreme conservatives.

Discussion Question

1. Discuss the psychological principles underlying the success of SMarT.

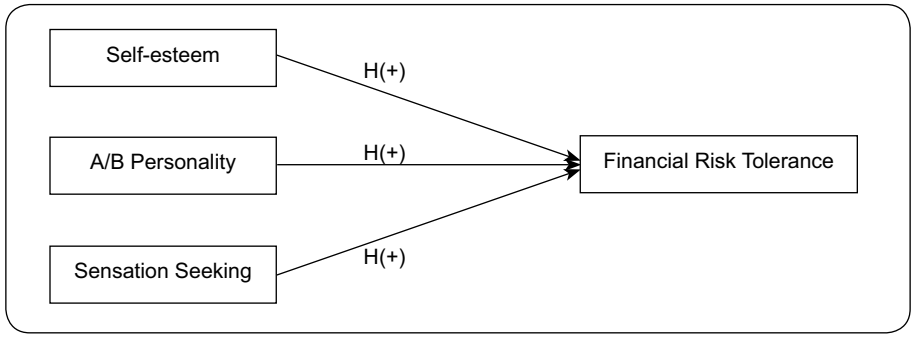
APPENDIX 9A

A MODEL OF FINANCIAL RISK TOLERANCE

People react differently to risk. Some are more willing to accept it, while others are inclined to reject it. Financial risk tolerance (FRT) may be defined as a person's willingness to accept the risk of an unfavourable financial result in return for a chance of achieving a favourable financial result.

FRT is influenced by a multitude of environmental (family situation, socioeconomic status, and social transactions) and biopsychosocial (such as age, gender, birth order, personality traits, and ethnicity) factors.

In a paper titled "Relationship between Biopsychosocial Factors and Financial Risk Tolerance," published in April-June 2016 issue of *VIKALPA*, M. Kannadhasan, S. Aramvalarthan, S.K. Mitra, and Vinay Goel have conceptualised the determinants of financial risk tolerance in the following model.



Source: Conceptualization by the authors.

Note that individuals who are competitive, ambitious, aggressive, and impatient are said to have **Type A personality** and individuals who have opposite qualities are said to have **Type B personality**.

■ ■

Chapter **10**

Market Outcomes

In Chapter 6, we briefly reviewed certain anomalies in the pricing of individual stocks. An anomaly is an empirical finding that runs counter to market efficiency. The important anomalies that we considered were: the momentum and reversal phenomenon, the post-earnings announcement drift, the size effect, and the value premium. These anomalies are referred to as cross-sectional anomalies as they are concerned with the pricing of individual stocks. Along with cross-sectional anomalies, we also have aggregate stock market puzzles such as the equity risk premium, excessive volatility, and bubbles.

This chapter discuses cross-section anomalies and aggregate market puzzles. It is organised into eight sections as follows:

- Size effect and seasonality
- Momentum and long-term reversal
- Post-earnings announcement drift
- The value premium
- Equity premium puzzle
- Excessive volatility
- Bubbles and crashes
- Behavioural asset pricing model

10.1 ✦ SIZE EFFECT AND SEASONALITY

In the U.S., historically small stocks have earned higher returns than large stocks, after adjustment for risk as per the capital asset pricing model. Moreover, the superior return on small stocks was concentrated in the month of January each year.

Several hypotheses have been proposed to explain the January seasonal in stock returns. The more well-known are the **tax loss selling hypothesis** and the **information hypothesis.**

- *Tax Loss Selling Hypothesis* According to the tax loss selling hypothesis, the disproportionately large January returns are due to year-end tax loss selling of shares that have declined in value over the previous year and renewed purchase activity in those shares in the following January. Since size is measured as the market capitalisation of equity, the portfolios of smallest firms will have more shares that have experienced huge price declines and, therefore, are more likely candidates for tax loss selling.

- *Information Hypothesis* Firms in the U.S. typically have the calendar year as the fiscal year. So, the month of January marks a period of uncertainty and anticipation due to the impending dissemination of important information. The gradual release of this information during January is likely to have a greater impact on the prices of small firms compared to large firms because the market is likely to be better informed about the latter throughout the year.

It appears that these hypothesis are not able to explain the January seasonal returns.

10.2 ✦ MOMENTUM AND REVERSAL

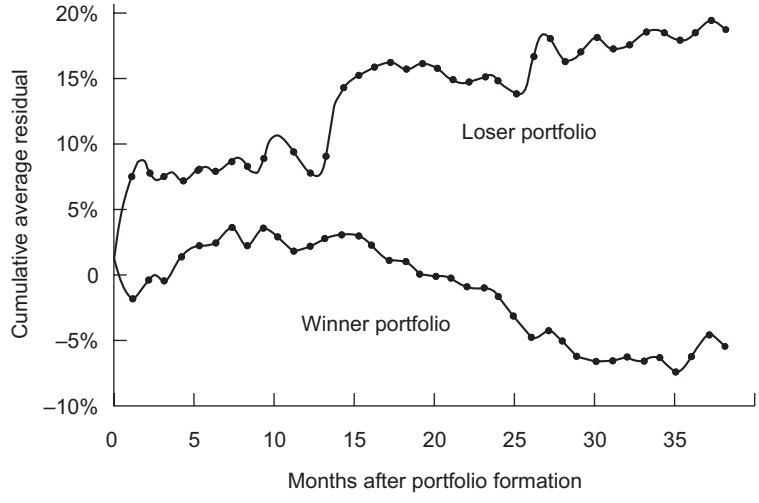
Suppose that, every six months, you form a group of stocks that performed very well over the previous six months (Group A), and also form a group of stocks that performed very poorly over the previous six months (Group B). Then you track the performance of the two groups over the following six months. If you repeat this exercise every six months using many decades of U.S. data, you will find that stocks in Group A do better, on average, than stocks in Group B. Put differently, stocks that do well in the past few months continue to do well subsequently, while stocks that do poorly in the past few months continue to do poorly subsequently. This is called the **momentum effect**.

An important 1993 study by N. Jegadeesh and S. Titman looked at the momentum factor and found that short-term trends (over a period of six months to one year) in the movements in individual stock prices tend to predict future movements in the same direction.

What happens if we look at performance over a longer period? In a well-known 1985 study, W. De Bondt and R.Thaler compared the performance of two groups of companies: extreme losers and extreme winners. They formed portfolios of the best and the worst performing stocks over the previous three years, for each year since 1933. They then computed the returns on these portfolios over the following five years. As shown in Exhibit 10.1, loser portfolios delivered relatively high average post-formation returns and winner portfolios delivered relatively low average post-formation returns. This difference in returns cannot be explained by the risk factor, at least as per the capital asset pricing model. De Bondt and Thaler explain the evidence in terms of market overreaction: extreme losers become too cheap and, on average, bounce back in the post-formation; by the same token, extreme winners become too expensive and, on average, perform poorly in the post-formation period. This explanation squares well with psychological theory. Extreme losers are typically companies with several years of poor performance and investors are likely to extrapolate this into the future, thereby undervaluing these companies; by the same token, extreme winners are typically companies with several years of superior performance and investors are likely to extrapolate this into the future, thereby overvaluing them.

You may be wondering whether the "momentum" finding contradicts the "long-term reversals" finding. "Momentum" says that past winners continue their winning streak, whereas "long-term reversals" seem to say the opposite. However, there is a very important difference between the two. The time interval considered for measuring past performance is *six months* in the case of momentum and *three years* in the case of long-term reversals. And this difference explains the contrasting results.

Exhibit 10.1 **Performance of Loser and Winner Portfolios**



Thus, unlike long-term trends which tend to reverse themselves, relatively short-term trends tend to persist. In the wake of such evidence, even Eugene Fama admitted that stock returns can be predicted from past returns, and this represents a departure from the conclusions reached earlier.

What Explains Momentum and Reversal

There is empirical evidence of intermediate-term momentum and long-term reversal. This means that we have a combination of underreaction (as suggested by the literature on earnings announcement) and overreaction requiring reversal (as suggested by the literature on value strategy).

Several behavioural models have been proposed to explain intermediate momentum and long-term reversal. The important ones are briefly mentioned below:

- Mark Grinblatt and Bing Han explain momentum using prospect theory, mental accounting, and the disposition effect. Very briefly, their argument runs as follows:
  1. According to prospect theory, the value function is concave in the gains domain and convex in the losses domain with a kink at the reference point.
  2. Investors segregate gambles on different securities, thanks to mental accounting.
  3. For securities that have suffered capital losses, demand will increase (the higher is the loss, the greater will be the demand) and for securities that have experienced gains demand will decrease (the higher is the gain, the lower will be the demand). This potentially explains the disposition effect, which is a key element of the Grinblatt–Han model.

- Nicholas Barberis, Andrei Shleifer, and Robert Vishny explain momentum and reversal by invoking conservatism and representativeness. Their model assumes that when salient news arrives, investors first underreact and then overreact. Put differently investors "overreact slowly."
- Kent Daniel, David Hirshleifer, and Avanidhar Subrahmanyam explain long-term reversal on the basis of overconfidence. According to their model, overconfident investors overestimate the accuracy of their private information. This leads to reversal of price movements.

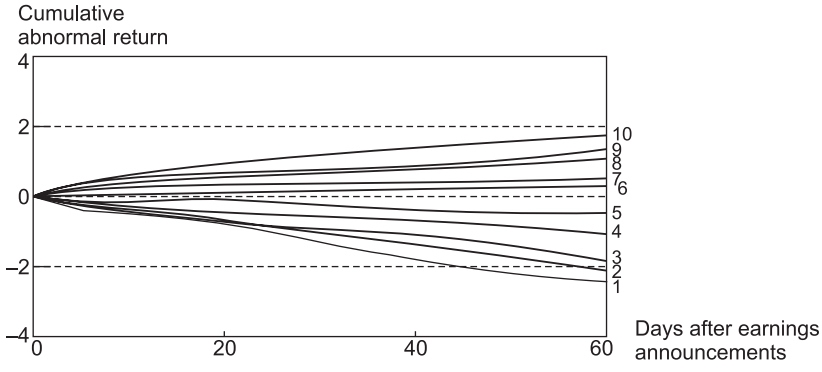
10.3 ✦ POST-EARNINGS ANNOUNCEMENT DRIFT

The quarterly earnings announcement is an important event for firms. According to the efficient markets hypothesis, the market is supposed to digest quickly announcements of unanticipated changes in quarterly earnings. Does the market really do so? In general, empirical studies have found that the market adjusts gradually, not rapidly, to announcements of unanticipated changes in quarterly earnings.

Suppose that, every quarter, you rank stocks on the basis of how surprising their most recent earnings announcements have been (measured by how much the firm's earnings exceeded or fell short of analyst expectations). You form two groups of stocks: A and B. Group A comprises of stocks that delivered surprisingly good earnings news and Group B comprises of stocks that delivered surprisingly bad earnings news. You then keep a track on the performance of the two groups over the following sixty days. If this exercise is replicated, quarter after quarter, using many years of data on the U.S. stocks, you will find that in terms of return performance Group A stocks do better, on average, than Group B stocks. Put differently, stocks that just announced surprisingly good earnings perform better in subsequent 60 days period compared to stocks that just announced surprisingly bad results. Why? It must be mentioned that the prices of stocks in Group A rise when the good news about their earnings is released. Similarly, the prices of stocks in Group B fall when the bad news about their earnings is released. But what is interesting is that Group A stocks *continue* to perform well in the subsequent weeks and Group B stocks *continue* to do poorly in the subsequent weeks.

A typical example of such evidence is a study conducted by V.L. Bernhard and J.K. Thomas. They analysed how stocks performed after the announcement of unexpectedly good or bad earnings during the period 1974 to 1986. Exhibit 10.2 represents graphically the results of their study. Group 1 represents the 10 per cent of the stocks with worst earnings results; Group 2 represents the 10 per cent of the stocks with next worst earnings results; ….; Group 10 represents the 10 per cent of the stocks with best earnings results. Stocks of firms with the best earnings results (Group 10) outperform the stocks of firms with the worst earnings results (Group 1) by about 4 per cent over a period of two months following the earnings announcement.

Exhibit 10.2 **Gradual Adjustments to Earnings Announcements**



• What Explains Post-earnings Announcement Drift

What explains the post-earnings announcement drift? A partial explanation is that both analysts and investors are anchored to previous earnings, so they underreact to new information. Further, there is evidence that among investors it is primarily the small and naïve investors who display a kind of behaviour that causes post-earnings announcement drift.

Conservatism can generate "post-earnings announcement drift" and "momentum" patterns. Suppose that the market believes that a firm has moderate future growth prospects. The firm then posts unexpectedly good earnings growth. If investors suffer from conservatism, they will not change their view on the basis of just one piece of surprisingly good news of earnings. As a result, the stock price will move up only a little on the day of earnings announcement. However, over the following few weeks and months, as investors recognise their error, the stock price will gradually move up to the right level. As a consequence, while the stock price jumps up on the day of earnings announcement, it also drifts upward for weeks after announcement. This represents the "post-earnings announcement drift." A similar line of reasoning shows how conservatism explains "momentum."

10.4 ✦ THE VALUE PREMIUM

Value stocks are defined as stocks which have a low P/E ratio or low price to cash flow ratio or low price to book value ratio. Growth stocks are defined as stocks which have a high P/E ratio or high price to cash flow ratio or high price to book ratio.

Suppose that every year you form a group of value stocks (Group A) and a group of growth stocks (Group B) and then you track the performance of the two groups over the *following* year. It seems that in the U.S. value stocks do better, on average, than growth stocks, in terms of both raw and risk-adjusted returns. The value managers seem to have performed better in several different countries and over extended periods of time.

A landmark study was reported by Sanjoy Basu in 1977 on price-earnings (P/E) ratios. He sampled an average of 500 stocks per year over 1956–1969 and grouped them into quintiles on the basis of P/E ratios: Quintile A represented the 20 per cent with the highest P/E ratios; Quintile B represented the 20 per cent with the second highest P/E ratios; and so on. At the beginning of each year, hypothetical portfolios were formed and then held for 12 months. Exhibit 10.3 presents the median P/E, average return, and estimated beta for each quintile over the 14 years of the sample. While there was hardly any difference between the two highest P/E quintiles (A and B), in terms of their future returns, it is clear that high P/E firms had lower returns compared to low P/E firms. And this difference was not on account of market risk, at least in terms of beta, the low P/E portfolios were actually less risky than the high P/E portfolios.

Exhibit 10.3 P/E Ratios and Investment Performance

	Quintile A: High P/E	*Quintile B*	*Quintile C*	*Quintile D*	*Quintile E: Low P/E*
Median P/E	35.80	19.10	15.00	12.80	9.80
Average return	9.34%	9.28%	11.65%	13.55%	16.30%
Estimated beta	1.11	1.04	0.97	0.94	0.99

Source: Basu, S., 1977, "Investment Performance of Common Stocks in Relation to their Price-earning Ratios: A test of the Efficient Market Hypothesis," *Journal of Finance* 32, 663–682.

A similar anomaly is based on the book-to-market ratio. Research suggests that firms with high book-to-market price ratios tend to outperform firms with low book-to-market price ratios. Exhibit 10.4 provides the findings from a study by J. Lakonishok, A. Shleifer, and R. Vishny. Likewise, another study along these lines in terms of the CF/P (cash flow-to-price) ratio found that firms with higher/lower CF/Ps provide higher/lower future returns.

Exhibit 10.4 B/P Ratio and Investment Performance

	Decile 1: Lowest B/P	*Decile 2*	*Decile 5*	*Decile 6*	*Decile 9*	*Decile 10: Highest B/P*
Annual return	11.0	11.7	13.1	15.4	18.3	17.3
Average return over five years	9.3	12.5	15.8	16.6	19.6	19.8

Source: Lakonishok, J., A. Shleifer, and R. Vishny, 1994, "Contrarian Investment, Extrapolation and Risk," *Journal of Finance* 49, 1541–78.

Can the above results be the outcome of data snooping? It appears that data snooping cannot account for the results discussed above because there is a great deal of consistency over different markets and time periods. Exhibit 10.5 shows the returns from various value investing approaches using data for the United States, Japan, the United Kingdom, France,

and Germany for the period 1975–1995. Within each country, portfolios of value and growth (or glamour) stocks were formed from the top/bottom 30 per cent of stocks each year, using the beginning-of-the-year data on book-to-price (B/P) ratio, earning-to-price (E/P) ratio, and cash flows-to-price (CF/P) ratios. It must be emphasised that in all 15 cases value stocks outperformed growth stocks.

Exhibit 10.5 **Portfolio Performance (%) for Value vs. Glamour Stocks in Various Countries**

Country	*Market*	*B/P*		*E/P*		*CF/P*	
		Value	*Glamour*	*Value*	*Glamour*	*Value*	*Glamour*
U.S.	9.57	14.55	7.55	14.09	7.38	13.74	7.08
Japan	11.88	16.91	7.06	14.14	6.67	14.95	5.66
U.K.	15.33	17.87	13.25	17.46	14.81	18.41	14.51
France	11.26	17.10	9.46	15.68	8.70	16.17	9.30
Germany	9.88	12.77	10.01	11.13	10.58	13.28	5.14

Source: Fama, E.F., and K. R. French, 1998, "Value vs. Growth: The International Evidence," *Journal of Finance* 53, 1975–99.

• What Explains Value Advantage

In the U.S., historically value stocks have out-performed growth stocks. Apart from the risk factor (which we will examine later), Joseph Lakonishok, Andrei Shleifer, and Robert Vishny suggest that there are four behavioural reasons why retail and institutional investors seems to prefer growth (glamour) stocks rather than value stocks. The first two are concerned with judgmental errors and individual investors are more prone to them, compared to institutional investors. The next two reasons stem from agency considerations and apply more to institutional investors as they have career concerns.

1. Investors tend to extrapolate past growth rates far into the future. So, they are surprised when value stocks outperform growth stocks. This is referred to as the expectational error hypothesis.
2. Investors assume that good companies represent good investments, thanks to the representativeness bias.
3. By choosing companies with steady earnings and buoyant growth, institutional investors appear to act prudently in fulfilling their fiduciary obligations. Put differently, they are averse to out-of-favour value stocks, as it is difficult to defend them. As Keynes said famously, it is better for professional investors to fail conventionally, rather than succeed unconventionally.
4. Institutional investors are evaluated over short periods. Since a value strategy often takes time to pay off, it does not appeal to career-oriented institutional investors.

A Model of Investor Sentiment

A lot of research has been done on "cross-section of average stock returns" which seeks to ask why certain kinds of stocks perform better, on average, than certain other kinds of stocks. In particular, researchers are trying to explain four puzzling facts.

- Long-term reversals
- The value premium
- Momentum
- Post-earnings announcement drift

Why are the above four results about the cross-section of average returns called "puzzles"? Generally, if you find that one set of stocks (Group A stocks) does better, on average, than another set of stocks (Group B stocks) and you believe that investors are rational and market is efficient, then you have to assume that Group A stocks are riskier than Group B stocks–Group A stocks provide higher average return to compensate for their higher risk. The problem is that in all the four cases discussed above there is no clear evidence that Group A stocks are riskier than Group B stocks.

In their paper "A Model of Investor Sentiment," *Journal of Financial Economics*, September 1998, Nicholas Barberis, Andrei Shleifer, and Robert Vishny argue that the above four facts reflect investor irrationality. More specifically, they stem from two prominent psychological biases: *representativeness* and *conservatism*.

Representativeness Representativeness refers to the tendency to quickly draw inferences from the data. For example, if a firm posts high earnings growth for several quarters in a row, investors may quickly decide that the firm has superior long-term earnings growth. The error that they commit is to forget that even a firm with modest long-term earnings growth can post impressive growth for a few quarters.

Representativeness can generate "Value premium" and "Long-term reversals." If a firm reports a few quarters of surprisingly good earnings, investors may readily believe that the firm has superior long-term earnings growth. They will then bid the firms' stock price so much that it becomes a high P/E stock (growth stock). Thanks to their exaggerated expectations, investors will, on average, be disappointed by the subsequent earnings performance. Hence, the stock will subsequently deliver low returns. Thus, we have an explanation for 'value premium' puzzle (A similar line of reasoning shows how representativeness can provide an explanation for the 'long term reversals' puzzle.)

Conservatism Representativeness says that people sometimes tend to be too quick to draw inferences from data. However, in some circumstances, people tend to be too slow to draw inferences from data and adhere too much to their prior beliefs. This psychological tendency may be labeled "conservatism."

Conservatism can generate "post-earnings announcement drift" and "momentum" patterns. Suppose the market believes that a firm has moderate future growth prospects. The firm then posts unexpectedly good earnings growth. If investors suffer from conservatism, they will not change their view on the basis of just one piece of surprisingly good news of earnings. As a result, the stock price will move up only a little on the day of earnings announcement. However, over the following few weeks and months, as investors recognise

their error, it also drifts upward for weeks after announcement. This represents the "post-earnings announcement drift." A similar line of reasoning shows how conservation explains "momentum."

Reconciliation In some ways, representativeness and conservatism are opposite effects. The former leads people to assign too *much* weight on the sample data and the latter leads investors to assign too *little* weight on the data sample. When does one effect or the other effect dominate? How can the two be reconciled? In their paper, Barberis, Shleifer, and Vishny propose their reconciliation. Essentially, they argue that if investors see a good earnings announcement in *isolation,* then conservatism dominates and the market reacts too little, but if investors see a *sequence* of good earnings announcement, then representativeness takes over and the market reacts too much.

10.5 ✦ THE EQUITY PREMIUM PUZZLE

• The Equity Premium

In a 1985 paper, ("The equity Premium: A Puzzle," *Journal of Monetary Economics* 15 (2), 145-161), Raj Mehra and Edward Prescott first announced the *equity premium puzzle*. It is surprising that Prescott, a hard-core member of the conservative, rational expectations establishment, announced an anomaly. His work in the domain of rational expectations model, called "real business cycle," later fetched him a Nobel prize in economics.

What distinguishes the Mehra and Prescott work is that instead of just asking whether economic theory can explain the existence of equity premium, they went further and asked if economic theory can explain how large the premium actually is. Based on their model, the largest value of the equity premium they could predict was 0.35 per cent, far removed from the historically observed premium of 6 per cent. Clearly, to justify such a premium, investors would have to be implausibly risk averse.

The equity premium is the excess of the expected return on the aggregate stock market over the expected return on a portfolio of fixed-income securities. Since it is very difficult to observe expected returns, it is common to approximate the equity premium using past or historical returns. Based on historical returns, the estimate of the equity premium depends on what past period you consider, which average returns (arithmetic average or geometric average) you use, and what proxies you employ for stock market and fixed income securities. Since there is no right answer, it is helpful to calculate the equity premium in different ways.

A rich source of data on the equity premium in the U.S. is Jeremy Siegel's classic book *Stocks for the Long Run*, 2nd edition, published by McGraw Hill, New York, in 2008. Although his sample ends in 2006, yet it goes all the way back to 1802. Thanks to its long history, it is quite relevant even today. Seigel examined the returns of four asset classes, viz. stocks, bonds (long-term government securities), Treasury bills (short-term government securities), and gold in the U.S. over a period of 204 years (1802–2006). Exhibit 10.6 summarises his key findings.

Exhibit 10.6 Total Real Return on Various Asset Classes (1802–2006)

Comp = compound annual return
Arith = arithmetic average of annual returns
Risk = standard deviation of arithmetic returns
All data in per cent (%)

Period	Stocks			Bonds			Bills			Gold
	Comp	Arith	Risk	Comp	Arith	Risk	Comp	Arith	Risk	
1802–2006	6.8	8.4	18.1	3.5	3.9	8.8	2.8	3.0	6.0	0.3
1802–1870	7.0	8.3	16.9	4.8	5.1	8.3	5.1	5.4	7.7	0.2
1871–1925	6.6	7.9	16.8	3.7	3.9	6.4	3.2	3.3	4.8	–0.8
1926–2006	6.8	8.8	20.1	2.4	2.9	10.3	0.7	0.8	4.0	1.2

From the above exhibit we find that the equity premium (the excess of compound annual return on stocks over the compound annual returns on bonds) over the period 1802–2006 was 3.5 per cent and over the period 1926–2006 was 4.4 per cent.

The neoclassical finance model implies the following:

- The equity risk premium should be very low barely 0.1 per cent for the U.S. and not the historical 3.5 per cent (Equity premium puzzle).
- The standard deviation of the market should be 12 per cent not the historical 18 per cent (Volatility puzzle).
- The stock prices are always right, but we have periodic episodes of bubbles (Bubbles puzzle).

What Explains the Equity Premium Puzzle

There is a lot of debate surrounding the observed equity premiums. Some explanations rely on rationality, whereas others invoke behavioural factors. An important rational explanation is based on **survivorship bias**. Stephen Brown, William Goetzmann, and Stephen Ross examined the performance record of national stock markets around the world. At the beginning of the twentieth century, there were 36 national stock markets. Due to wars or nationalisation, more than one-half of these suffered at least one major breakdown. Such events often inflict huge losses on investor. But if we consider only markets with continuous trading record, the average market returns will be biased upward, on account of survivorship bias.

There are two main behavioural explanations for the equity premium puzzle. The first one is based on **ambiguity aversion**. If the equity risk premium is attributed only to risk aversion, the implied risk aversion is incredibly high. But what if investors in addition to being risk-averse are also ambiguity-averse. Investors naturally do not know what the random draw will be from a return distribution. But, in addition, they do not often know the parameters of the distribution. Survey evidence reveals that investors disagree widely on the level of ex ante equity premium, suggesting that investors don't know the mean of the return distribution.

Under such conditions their aversion to risk (which now takes the character of uncertainty) effectively increases. If ambiguity aversion is combined with risk aversion, the observed equity premiums seem reasonable.

There is another behavioural explanation for the equity premium proposed by Shlomo Benartzi and Richard Thaler. In a path breaking 1995 paper, Benartzi and Thaler offered a solution based on what they called "myopic risk aversion." Their argument is based on two notions: loss aversion and myopia.

Loss aversion People regret losses 2 to 2.5 times more than similar size gains. Since the reference point is the stock price, the probability of loss or gain is important. As the holding period becomes longer, the probability of gains becomes higher.

Myopia The more frequently people evaluate their portfolios, the more likely they have to see losses and suffer from loss aversion.

If we assume a loss aversion factor of 2,

$$\text{Utility} = \text{Probability of price increase} - 2 \times \text{Probability of price decrease}$$

Michael Mauboussin examined the relationship between time, returns, and utility, assuming that stock prices follow a random walk and the loss aversion factor is 2. His analysis is presented in Exhibit 10.7.

Exhibit 10.7 Time, Returns, & Utility

Time Horizon	*Return*	*Standard Deviation*	*Prob. of Positive Return*	*Utility*
1 Hour	0.01%	0.48%	50.4%	–0.488
1 Day	0.04	1.27	51.2	–0.464
1 Week	0.18	2.84	53.19	–0.404
1 Year	10.0	20.5	72.6	0.177
10 Years	159.4	64.8	99.9	0.997
100 Years	1,378,061	205.0	100.0	1.000

Using simulation, Benartzi and Thaler estimated that the evaluation period consistent with the realised equity premium is roughly one year. It must be emphasised that the evaluation period and the investor's planning period are not the same. As Mauboussin put it, "An investor may be saving for retirement thirty years from now, but if he evaluates his portfolio annually or quarterly, he is acting as if he has a short-term planning horizon." He added, "I will now make a leap (and hopefully it's not too far) and suggest that for most funds, portfolio turnover is a reasonable proxy for the evaluation period."

Bernartzi and Thaler argue that **myopic loss aversion** can explain why since 1926 equities have outperformed the long-term bonds by 4.8 per cent in the U.S. (the **equity premium puzzle**). Using ingenious analysis, Bernartzi and Thaler have shown that the observed equity premia are consistent with myopic loss aversion and yearly monitoring of returns.

According to them, if the evaluation period increases to 10 years, 20 years, and 30 years, the equity premium need only be 2 per cent, 1.4 per cent, and 1 per cent to entice investors into stocks.

10.6 ✦ EXCESSIVE VOLATILITY

Apart from valuations that sometimes seem bizarre, the stock market seems to be characterised by excessive volatility. David Cutler, James Poterba, and Larry Summers provide some empirical evidence. They examined news events and major stock price movements in the U.S. over a five-decade period ending in the late 1980s. First they looked at major market news events (reported in the *New York Times*) and examined the market response to them. For example, in response to the Japanese attack on Pearl Harbor on December 8, 1941, the U.S. market fell by 4.37 per cent. However, when Johnson defeated Goldwater in the U.S. presidential election in 1964, the market hardly budged (it just went up by 0.05 per cent), as Johnson was expected to win by a landslide. Second, they considered the 50 biggest price moves over the five-decade period and tried to find what caused them. While in most cases it was easy to identify the cause, in other cases there appeared to be no compelling reason for the market reaction. For example, when the market fell by 6.73 per cent on September 3, 1946, the *New York Times* reported that there was "no basic reason for the assault on prices."

• Shiller's Argument of Excessive Volatility

Robert Shiller, a Nobel laureate in economics, developed an innovative inequality relationship to examine volatility in his seminal 1981 paper. "Do Stock Prices Move too Much to be Justified by Subsequent Changes in Dividends?" *American Economic Review* 71 (3), 421–436. According to the dividend discount model, a stock's current price should equal the present value of dividends expected in future. While investors have to form expectations, what if investors actually know the dividends that will be paid in future? Shiller refers to the present value of actual (rather than expected) dividends as the "ex post rational stock price," which is the price, if investors know all future dividends. If the market is efficient, the price today (p_t) is the best forecast of the "ex post rational stock price" (p_t^*). Based on this insight, Shiller derived an inequality which he argues should not be violated, if the market is efficient. Shiller's inequality says that the standard deviation of the stock price should be less than the standard deviation of the ex post rational stock price.

Shiller's defence for his inequality is as follows:

- The efficient markets model asserts that :

$$p_t = E_t (p_t^*) \tag{10.1}$$

  where p_t is the mathematical expectation of p_t^*, conditional on all information available at time t. Put differently, p_t is the optimal forecast of p_t^*.
- The forecast error may be defined as:

$$u_t = p_t^* - p_t \tag{10.2}$$

- A fundamental principle of optimal forecasts is that the error term is uncorrelated with the forecast. This means that the covariance between p_t and u_t must be zero.
- The variance of the sum of two uncorrelated variables is the sum of their variance. So,

$$\text{Variance } (p^*) = \text{Variance } (p) + \text{Variance } (u) \tag{10.3}$$

- Since variance cannot be negative,

$$\text{Variance } (p) \leq \text{Variance } (p^*) \tag{10.4}$$

- Converting this into more easily interpreted standard deviations, gives:

$$\sigma(p) \leq \sigma(p^*) \tag{10.5}$$

An Important Property of Rational Forecasts

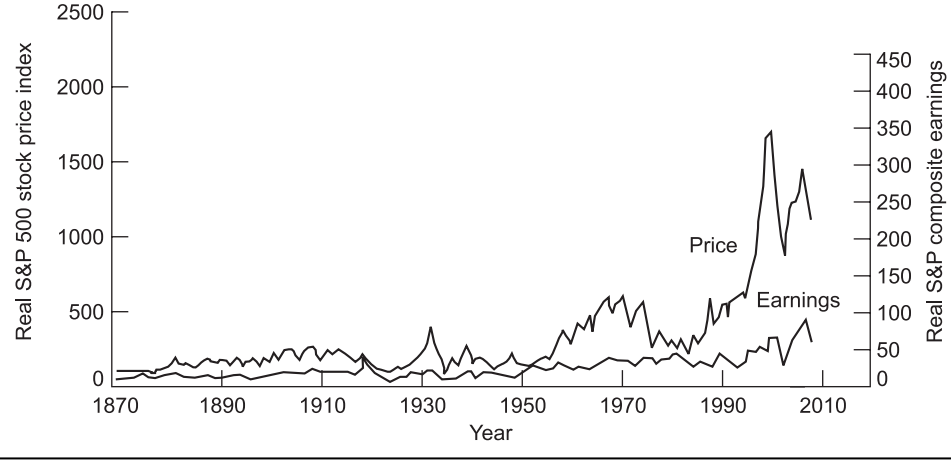
An important property of rational forecasts—a stock price is supposed to be a rational forecast—is that forecasts cannot vary more than the thing being predicted. Suppose you are trying to forecast the daily high temperature in Mumbai. Typically, the daily high temperature in Mumbai varies between 27°C and 39°C with an average of 33°C. If you forecast 33°C everyday you would never be far off. If some highly inebriated weather forecaster in Mumbai predicts 15°C one day-colder than it ever gets—and 45°C the following day-hotter than it ever gets, he would he flagrantly violating the rule that forecasts cannot vary more than the thing being predicted.

Shiller's dramatic result came from applying this principle to the stock market.

Shiller's Test

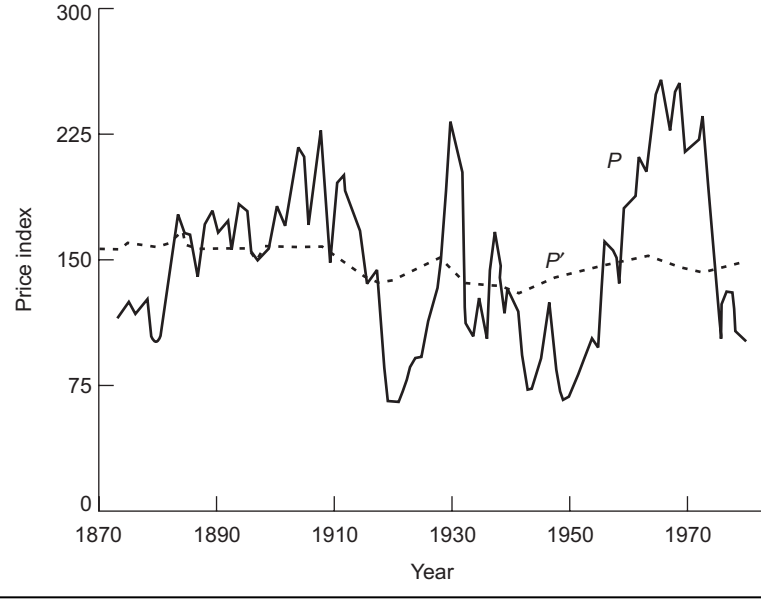
To test his inequality, Shiller used the real S&P 500 stock price index, shown in Exhibit 10.8.

Exhibit 10.8 Real S&P Stock Prices and Earnings



To compute the *ex post* rational stock price, Shiller assumed a long-run growth rate in dividends. Exhibit 10.9 compares the observed value of the S&P 500 index (p), shown by the solid line, with the ex post rational stock price (p^*), shown by the broken line. From the exhibit, it is unmistakably clear that stock prices are far too volatile relative to the present value of future dividends. Depending on the parameter values used, the volatility of stock prices over the past century seems to be 5 to 13 times too large. One wonders why stock prices are so volatile when dividends are so smooth?

Exhibit 10.9 Shiller's Volatility Comparisons



While academic economists still quarrel over the right methodology for conducting Shiller's test, it appears the debate was effectively settled a few years later on Monday, October 19, 1987 and the days following it.

As Richard Thaler put it, "It is hard to argue that the price at the close of trading on Thursday, October 15, 1987, and the price at the close of trading the following Monday—which was more than 25% lower—can both be rational measures of intrinsic value, given the absence of news."

What Explains Volatility

To explain behaviourally the volatility puzzle, let us look at the *P/D* ratio:

$$\frac{P_t}{D_{t+1}} = \frac{1}{r - g} \tag{10.6}$$

Thus *P/D* is a function of r (the required return) and g (the expected dividend growth). If these are stable over time, the neoclassical theory predicts that *P/D* would remain stable. In reality, *P/D* is highly volatile, even though there is little evidence that the long run g is volatile.

This means that r is the primary driver of the volatility of P/D.

Now,

$r = f$ (Risk-free rate, degree of market risk, over-all risk aversion)

Nicholas Barberis and Richard Thaler argue that of the above three factors, the main contributor to the volatility of r is the volatile risk aversion. Investors become risk-averse, if a market decline leads them to experience losses relative to the amount they invested originally. Further losses makes them much more averse to risk. By the same token, investors become less risk-averse, if a market rise leads them to experience gains relative to the amount they invested originally. Further gains makes them even less averse to risk. In addition, if investors have ambiguous beliefs about stock market returns, they are likely to demand an ambiguity premium.

Thus, in contrast to neoclassical expected utility theory which assumes that investors have stable attitude towards risk, prospect theory emphasises that the attitude towards risk is not stable as it varies according to whether outcomes are registered as gains or as losses.

Robert Shiller's Views

Commenting on the implications of the observed market anomalies, Robert Shiller wrote "May be something as dramatic as a scientific revolution is in store for us. That does not mean, however, that the revolution would lead to 'the abandonment of assumptions of rational expectations in favour of mass psychology." Instead, he said, "I tend to view the study of behavioral extensions of these efficient market models as leading in a sense to the enhancement of the efficient market models. I would teach the efficient market models to my students with much more relish if I could describe them as special cases before moving to the more realistic models."

10.7 ✦ BUBBLES

In general, the stock market is remarkably efficient in pricing stocks in terms of their growth prospects and risk attributes. Investment professionals commonly use price-earnings ratio to judge how richly a stock is valued. If a stock sells for ₹66 and its earnings per share is ₹3, it is said to a have a price-earnings ratio (or multiple) of 22. A stock commands a high price-earnings multiple, if it has superior growth prospects and risk attributes. On the other hand, a stock commands a low price-earnings multiple, if it has inferior growth prospects and risk attributes.

Although the stock market is generally efficient, it is prone to commit mistakes, given the extraordinary difficulties in divining the future. As an investor you should be aware that occasionally the market displays high irrationality causing a substantial discrepancy between intrinsic value and market price. In market parlance it is called bubble time.

Perhaps the word bubble is used carelessly. Eugene Fama, the most important proponent of the "efficient markets hypothesis" certainly thinks so. In an interview with John Cassidy for *The New Yorker*, he said, "I don't even know what a bubble means. These words have become popular. I don't think they have any meaning."

In the second edition of his path-breaking book *Irrational Exuberance*, Robert Shiller, tried to define a bubble. He wrote, "A speculative bubble is a situation in which news of price increases spurs investor enthusiasm, which spreads by psychological contagion from person to person, in the process amplifying stories that might justify the price increase." He continued, "This attracts a larger and larger class of investors, who, despite doubts about the real value of the investment, are drawn to it partly through envy of other's successes and partly through a gambler's excitement."

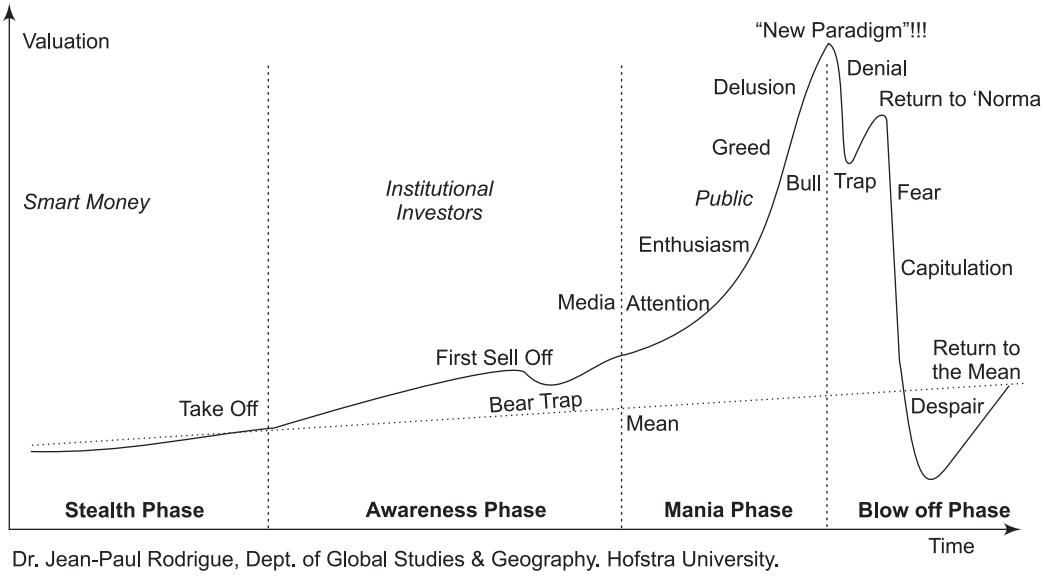
One problem with the word bubble is that it conjures up a mental picture of an expanding soap bubble that eventually pops. Speculative bubbles, however, don't end so easily. Indeed, they deflate considerably, as the story changes, and then reflate.

Bubbles are often associated with the development of an exciting new technology or the emergence of a new business opportunity. As Shiller noted, a bubble forms when there is a 'positive feedback loop.' A rise in the price of an asset encourages more people to buy it which, in turn, fuels further price rise and induces more and more people to join the bandwagon. The mechanism resembles a Ponzi mechanism, where more and more gullible (foolish) investors must be found to buy the assets from those who joined the game earlier. Eventually, however, the bubbles burst as one runs out of fools.

The Four Stages of a Bubble

According to Jean-Paul Rogrigue, there are four stages of a bubble as shown in Exhibit 10.10.

Exhibit 10.10 Four Stages of a Bubble



Stealth Phase During this stage the "smart money" enters the market quietly, causing a very modest – almost imperceptible price rise.

Awareness Phase In this stage, institutional money flows into the market, leading to a perceptible take off in prices.

Mania Phase As the price momentum builds up and the activities of institutional investors receive media attention, the general investing public participates enthusiastically, leading to a self-reinforcing upward movement.

Blowoff Phase The irrational exuberance at the end of the mania phase is followed by a return to sanity when prices decline. The price fall, however, triggers fear and sets in motion a downward spiral.

• A Guide to Spotting Bubbles

Benjamin Graham said that every investor should "have an adequate idea of stock market history, in terms particularly of major fluctuations. With this background he may be in a position to form some worthwhile judgment of the attractiveness or dangers … of the market." It behooves an investor to understand the dynamics of bubbles. In 1867, John Stuart Mill, a multi-faceted genius, wrote a paper that provides a useful framework for thinking about bubbles. His model has been utilised by luminaries like Hyman Minsky, an exceptionally perceptive economist, and Charles Kindleberger, the eminent chronicler of financial manias. According to Mill, the rise and fall of a bubble can be broken down into five phases as shown below:

Displacement → Credit creation → Euphoria → Critical stage/Financial distress → Revulsion

Displacement An exogenous shock creates profit opportunities in some sectors, while eroding profitability in other sectors. The opportunities created are greater than those that are being destroyed. As a result, the seeds of a boom are sown. As Mills put it, "a new confidence begins to germinate in this period, but its growth is slow."

Credit creation Just as oxygen is required to fire, credit is needed for a boom to flourish. According to Minsky, monetary expansion and credit creation, largely endogenous to the system, feed the boom. During this phase, as Mill noted, "The rate of interest (is) almost uniformly low….Credit… continues to grow more robust, enterprise to increase and profits to enlarge."

Euphoria A wave of over-optimism and overconfidence pervades. Everyone starts to buy into the new era and hence prices spiral upwards. Traditional valuation standards are supplanted by new valuation metrics to justify the high prices as investors believe 'This time is different."

According to Mill, "There is a morbid excess of belief…healthy confidence…has degenerated into the disease of a too facile faith. The crowd of..investors.. do not, in their excited mood, think of pertinent questions, whether their capital will become quickly productive, and whether their commitment is out of proportion to their means… Unfortunately, however, in

the absence of adequate foresight and self-control, the tendency is for speculation to attain its most rapid growth exactly when its growth is most dangerous."

Critical stage-Financial distress This is the stage when insiders cash out, financial distress occurs on account of excessive leverage built up in the boom stage, and frauds emerge.

The excessive leverage can easily lead to fire sales. As Mill noted, "The… trader who employs, in addition to his own means, a proportion of borrowed capital has found, in the moment of crisis, the conjuring power of his name utterly vanished, and has been compelled to provide for inexorably maturing obligations by the forced sale of goods or produce at such prices as would tempt forth reluctant capital."

Revulsion Revulsion is the final stage in the life cycle of a bubble. Mortified by their experience, investors withdraw from the market, causing bargain basement asset prices. As Mill wrote, "As a rule, panics do not destroy capital; they merely reveal the extent to which it has been previously destroyed by its betrayal into hopelessly unproductive works. The failure of great banks... and mercantile firms... are the symptoms incident to the disease, not the disease itself."

Mill recognised the prolonged nature of recovery after the bubble burst. He wrote: "Economy, enforced on great numbers of people by losses from failures and from depreciated investments restricts their purchasing power. Profits are kept down to the stunted proportions of demand. Time alone can steady the shattered nerves, and form a healthy cicatrice over wounds so deep."

• Are Bubbles Black Swans

Some people think that bubbles are somehow "black swans." In the words of Nassim Taleb: "A black swan has three attributes: 1. It is an *outlier*, as it lies outside the realm of regular expectations. 2. It carries an *extreme impact*. 3. The human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable."

If bubbles are black swans we can absolve ourselves from our behaviour. Such a belief has found support at the highest policy levels—both Alan Greenspan and Ben Bernanke have held it. But such a view is untenable, a mere attempt to abdicate responsibility.

Bubbles are not black swans, but "predictable surprises." In the words of James Montier, "Predictable surprises also have three defining characteristics: 1. At least some people are aware of the problem. 2. The problem gets worse over time. 3. Eventually the problem explodes into a crisis, much to the shock of most."

What prevents people from seeing predictable surprises? According to James Montier, the following psychological hurdles hamper us:

- **Over-optimism** The tendency to look at things through rose-colored lenses blinds us to the dangers posed by predictable surprises.
- **Illusion of control** The belief that we can influence the outcome of uncontrollable events lulls us into complacency.
- **Self-serving bias** People tend to interpret information in ways that support their self-interests. As Montier put it, "Wherever lots of people are making lots of money, it is unlikely that they will take a step back and point out the obvious flaws in their action."

- **Myopia** Obsessed with the short run, people tend to ignore the long-term consequences of their action. As Montier put it, "Myopia can be summed up via Saint Augustine's plea, 'Lord, make me chaste, but not yet'-one more good year, one more good bonus, and then I promise to go and do something worthwhile with my life, rather than working in finance!"
- **Inattentional blindness** A final barrier to spotting predictable surprises is *inattentional blindness*: we are not likely to see what we are not looking for.

John Kenneth Galbraith on Speculative Bubbles

John Kenneth Galbraith, an eminent Harvard economist, was a pioneer in studying the origins of housing and real estate bubbles. He wrote:

"... there is a basic and recurrent process. It comes with rising prices, whether of stocks, real estate, and works of art, or anything else. This increase attracts attention and buyers, which produces the further effect of even higher prices. Expectations are thus justified by the very action that sends prices up. The process continues; optimism with its market effect is the order of the day. Prices go up even more. Then, for reasons that will endlessly be debated, comes that end. The descent is always more sudden than the increase; a balloon that has been punctured does not deflate in an orderly way."

Some Well-known Bubbles

Market bubbles followed by crashes are examples of market inefficiency. There are many examples in history of bubbles in stock, bond, and commodity markets. The process of bubble formation may be illustrated with four well-known speculative bubbles, the Tulip bubble, the South Sea bubble, the Japanese stock market bubble, and the Internet bubble.

Tulip Bubble The tulip bubble was not a stock market bubble but an egregious mania involving tulip bulbs. The frenzy erupted when some tulip bulbs, infected by non-fatal virus, acquired bizarre contrasting coloured stripes and caught the fascination of Dutch people. They prized these infected bulbs and a speculative mania was set into motion. In his book *Extraordinary Popular Delusions and the Madness of Crowds,* Charles Mackay observed, 'Nobles, citizens, farmers, mechanics, seamen, footmen, maid-servants, even chimney sweepers and old clothes women dabbled in tulip.' At the peak of the bubble, in early 1637, a unique bulb fetched a price equal to that of a noble-man's castle. Eventually, selling pressure built and in no time tulip bulb prices went down and down until most bulbs became practically worthless, bankrupting thousands of mindless speculators.

The South Sea Bubble The seeds of the South Sea bubble were sown in 1711 when the South Sea Company of Great Britain was granted monopoly by the government to trade to the South Seas. As investors became enthusiastic about the profits the company would potentially make, the stock of the South Sea Company rose nearly ten-fold.

Since the South Sea Company could not satiate the demands of investors, the investors looked for other new ventures. Just as speculators look for the next Infosys today, they looked for the next South Sea Company in England in the 1700s. Unscrupulous promoters obliged by inventing weird proposals, from importing jackasses from Spain (although England had an abundant supply of its own) to making machine-guns that would revolutionise the art of war. One promoter even started 'A company for carrying on an undertaking of great advantage, but nobody to know what it is.'

Eventually, the bubble burst and many investors suffered grievous losses in most of the issues of the period. One of the biggest losers was Isaac Newton, who confessed, 'I can calculate the motions of heavenly bodies, but not the madness of people.' Commenting on Isaac Newton's experience, Warren Buffett wrote: 'If he had not been traumatised by his loss, Sir Isaac might well have gone on to discover the Fourth Law of Motion: For investors as a whole, returns decrease as motion increases.'

The Japanese Stock Market Bubble On January 2, 1985, Japan's Nikkei 225 index stood at 11,543. In the following five years, it soared relentlessly and reached a level of 38,916 on December 29, 1989. The phenomenal gain of 237.1 per cent over a five-year period tantamount to a stunning 27.5 per cent compound annual rate of return. Then the bubble deflated over the following year. In December 2014, fifteen years after the Japanese market peaked the Nikkei stood at 10,796. This means that over this period it fell by 72.3 per cent from its 1989 peak and was even below the level at which was at the beginning of 1985.

The Internet Bubble The big daddy of all the bubbles in human history, the Internet bubble was spawned by a new technology and new business opportunities. It triggered the largest creation and the largest destruction of wealth ever-by the end of 2002 more than $7 trillion of market value was decimated.

Many believed that the Internet heralded the New Economy and its drum majors, such as *Amazon.com* and *Priceline.com*, soared to dizzy heights. The obsession with Internet-enabled companies to double their price by merely changing their name to suggest some web orientation (such as *.com* or *.net*).

Investors lapped new issues enthusiastically, even when the company had neither profits, nor even revenues. Some IPOs rose 500 per cent. For example, VA Linux climbed over 730 per cent on its first trading day to nearly $200 per share. In 2002, the same share fell below $1. Investment bankers, analysts, and media contributed to the hot air inflating the Internet bubble which finally burst as sanity returned to the market.

• Experimental Bubble Markets

We have discussed how the results of experiments have improved our understanding of financial decision-making. Experimental asset markets have provided fresh insights into how markets work. A very perplexing finding of this research is the tendency of prices to rise significantly above fundamental value and then subsequently crash.

In a typical bubbles market design, participants are asked to trade an asset at fixed intervals over a period of time. The asset earns a dividend at the end of each trading period, according to a known probability distribution. The prices at which the trades take place are noted to determine how they behave over time.

To illustrate, let us consider an experiment in which the participants are asked to trade an asset over 12 five minutes, determined at the end of each trading period (5 minutes), as per the following probability distribution.

Dividend (₹)	*Probability*
1.00	0.40
2.00	0.40
3.00	0.20

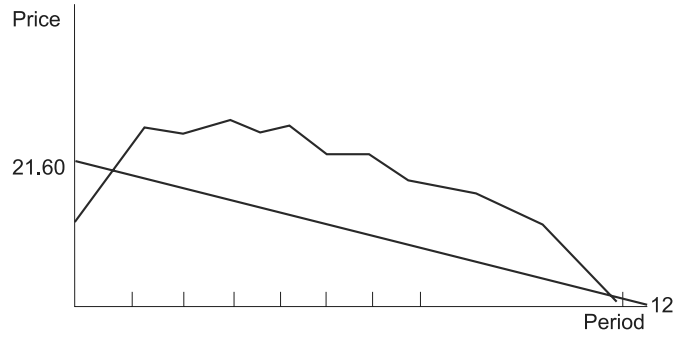
The expected value of the dividend for each period is:

$$1.00\ (0.40) + 2.00\ (0.40) + 3.00\ (0.20) = ₹1.80$$

How much would a participant pay for the asset in Period 1? If he is risk-neutral, he would pay the expected dividend per period (₹1.80) times 12 periods, or ₹21.60. This represents the fundamental value of the asset in period 1. The fundamental value of the asset in all subsequent periods can be determined by multiplying the number of periods remaining times the expected dividend of ₹1.80. For a risk-averse participant, however, the fundamental value of the asset would be lower.

Exhibit 10.11 shows the typical price pattern in an experimental bubbles market. The solid line reflects the fundamental value each period—it begins with ₹21.60 and falls by ₹1.80 each period. The dashed line reflects the median transactions prices. Typically, the median transaction, price is less than the fundamental value in Period 1. This may be because the participants are initially risk-averse as they trade in an unfamiliar environment. However, the median transaction price quickly rises above the fundamental value suggesting bubble formation, shown by the dashed line. The bubble persists for a while and then deflates. Finally, the price converges to the fundamental value.

Exhibit 10.11 Bubbles in Experimental Market



• What Lessons Do These Experiments Provide

Research in experimental markets provides several lessons:

- When traders are knowledgeable about financial markets and have prior experience in experimental bubble markets, bubbles tend to be more moderate and deflate faster.
- A great deal of cash in a market fuels speculation and bubbles. This is similar to the house money effect.
- In experiments where participants are allowed to trade a lottery asset (an asset that has a negligible probability of a high payoff) and a standard asset (whose payoff has a probability distribution of the kind described earlier), both having the same expected payoff, participants are willing to pay more for the lottery asset. This may be because people overweight low probabilities (as suggested by prospect theory) or become more risk-prone when they are caught up in the excitement of trading.
- Bubble formation is abetted, if there are restrictions on short-selling. This happens because in the presence of restrictions on short-selling, prices are driven by traders who have a more optimistic view of the asset value.

10.8 ✦ BEHAVIOURAL ASSET PRICING MODEL

All asset pricing models are essentially versions of the demand-and-supply model of introductory economics. The demand for any product or service depends on the benefits the product or service produces.

Very broadly, investments (like jobs, products, and services) provide utilitarian benefits, expressive benefits, and emotional benefits. These benefits are the answers to the following questions.

Utilitarian Benefits:	What does the investment do to my pocketbook? Utilitarian benefits of investments are reflected mostly in wealth, augmented by high investment returns.
Expressive Benefits:	What does the investment say about me to others and to me? For example a stock picker may say, "I am smart. I can identify winners," or an option trader may say, "I can assume risk and know how to control it."
Emotional Benefits:	How does it make me feel? An insurance policy may give one a sense of security, a speculative stock may provide hope, and stock trading may offer excitement.

In the world of investments, utilitarian benefits are often labeled "fundamental," whereas expressive and emotional benefits are often labeled "sentiment." The utilitarian benefits of a stock are high expected return and low risk. The demand function of rational investors is driven by utilitarian benefits. It is not easy to extend the rubric of rationality to expressive and emotional benefits, such as the fulfillment of social responsibility through a socially responsible mutual fund, the display of wealth through participation in a hedge fund, or the comfort of investing in well-known names.

What Investors Really Want

In a fascinating book *What Investors Really Want* (published by McGraw-Hill in 2011), Meir Statman says: "We want high returns from our investments, but we want much more. We want to nurture hope for riches and banish fear of poverty. We want to be number 1 and beat the market. We want to feel pride when our investments bring gains and avoid the regret that comes with losses. We want the status and esteem of hedge funds, and the patriotism of investing in our own country. We want good advice from financial advisors, magazines, and the Internet. We want to be free from governmental regulations, yet to protected by regulators. We want financial markets to be fair, but search for an edge that would let us win, sometimes fair and at other times not. We want to leave a legacy for our children when we are gone. The sum of our wants and behviours makes financial markets go up or down as we herd together or go our separate ways, sometimes inflating bubbles and at other times popping them."

The characteristics that stocks buyers like are large capitalisation, low volatility in prices and earnings, low leverage, high price-to-earnings ratios , and high market-to-book ratios (growth stocks). The characteristics that stock buyers do not like are small capitalisation, high volatility in prices and earnings, high leverage, low price-to-earnings ratios, and low market-to-book ratios (value stocks). In the *behavioural asset pricing model* stocks with desirable characteristics provide low expected returns and stocks with undesirable characteristics provide high expected returns.

It is worth noting that the asset pricing model of standard finance is moving away from the capital asset pricing model (CAPM) – a model in which beta is the sole factor that determines expected stock returns-toward a model that resembles the BAPM. For instance, in the three-factor model developed by Eugene Fama and Kenneth French, which is now popular in standard finance, besides beta there are two more factors viz., market capitalisation and book-to-market ratio, that affect the expected return. However, the three-factor model of standard finance and the BAPM put different interpretations on these factors. In standard finance, market capitalisation and book-to-market ratios are considered as measures of risk: small-cap stocks and stocks with high book-to-market ratios (value stocks) are considered to be high risk stocks and hence have high expected returns.

In *behavioural asset pricing model*, in contrast, the same factors are interpreted as manifestations of affect, an emotion, and representativeness (a cognitive bias). Thanks to these emotional and cognitive factors, investors consider large-cap stocks and stocks with low book-to-market ratios (growth stocks) as good stocks and small-cap stocks and stocks with high book-to-market ratios (value stocks) as bad stocks. Good stocks have positive affect, so investors embrace them, pushing their prices and lowering their expected returns. Bad stocks have negative affect so investors avoid them, depressing their prices and increasing their expected returns. In a 2008 study, M. Statman, K.L. Fisher, and D. Anginer found that in the *Fortune* surveys of admired companies, stocks of admired companies (which were typically large cap companies with low market-to-book ratios) generated lower returns, on average, compared to stocks of spurned companies (which were typically stocks of small-cap, high book-to-market companies.

It is instructive to look at how the BAPM compares with the CAPM and the three-factor model.

The CAPM is expressed as follows:

Expected return of a stock = *f*(market factor)

The three-factor model is expressed as follows:

Expected return of a stock = *f*(market factor, book-to-market factor, market cap factor)

The BAPM is expressed as follows:

Expected return of a stock = *f*(market factor, book-to-market factor, market cap factor, momentum factor, affect factor, status factor, social responsibility factor, and more).

SUMMARY

- The extensive literature on stock market efficiency and behaviour, as we have learnt in a previous chapter, has thrown up a number of anomalies and puzzles. In particular, the following anomalies and puzzles have engaged the attention of researchers and practitioners:
  - Size effect and seasonality
  - Momentum and long-term reversal
  - Post-earnings announcement drift
  - The value premium
  - Equity premium puzzle
  - Excessive volatility
  - Bubbles and crashes
- In the U.S. small stocks seem to provide a higher return, which is concentrated in January.
- Stocks that do well in the past few months continue to do well subsequently, while stocks that do poorly in the past few months continue to do poorly subsequently. This is called the **momentum effect.**
- Momentum says that past winners continue their winning streak, whereas **long-term reversals** seems to say the opposite. However, there is a very important difference between the two. The time interval considered for measuring past performance is *six months* in the case of momentum and *three years* in the case of long term reversals. And this difference explains the contrasting results.
- There is empirical evidence of intermediate-term momentum and long-term reversal. This means that we have a combination of underreaction (as suggested by the literature on earnings announcement) and overreaction requiring reversal (as suggested by the literature on value strategy).
- In general, empirical studies have found that the market adjusts gradually, not rapidly, to announcements of unanticipated changes in quarterly earnings.

- Empirical evidence in the U.S. suggests that, in general, **value stocks** have outperformed **growth stocks**, in terms of both raw and risk-adjusted returns. The value managers seem to have performed better in several different countries and over extended periods of time.
- The neoclassical finance model implies the following:
  - The equity risk premium should be very low barely 0.1 per cent for the U.S. and not the historical 3.5 per cent (Equity premium puzzle).
  - The standard deviation of the market should be 12 per cent not the historical 18 per cent (Volatility puzzle).
  - The stock prices are always right, but we have periodic episodes of bubbles (Bubbles puzzle).
- There are two main behavioural explanations for the **equity premium puzzle**. The first one is based on **ambiguity aversion**. There is another behavioural explanation for the equity premium proposed by Shlomo Benartzi and Richard Thaler. It is based on **loss aversion** and **mental accounting.**
- Robert Shiller, a Nobel laureate in economics, developed an innovative inequality relationship to examine volatility.
- Although the stock market is generally efficient, it is prone to commit mistakes, given the extraordinary difficulties in divining the future. As an investor you should be aware that occasionally the market displays high irrationality causing a substantial discrepancy between intrinsic value and market price. In market parlance, it is called **bubble time**.
- The process of bubble formation may be illustrated with four well-known speculative bubbles, the Tulip bubble, the South Sea bubble,the Japanese stock market bubble, and the Internet bubble.
- A very perplexing finding of experimental research in markets is the tendency of prices to rise sharply and correct thereafter.

DISCUSSION QUESTIONS

1. List the key stock market anomalies and puzzles.
2. What explanations have been offered for momentum and long-term reversal?
3. What is post-earnings announcement drift? What explains it?
4. What is value premium? What explains it?
5. What is the equity premium puzzle? What explains it?
6. Discuss Shiller's argument for excessive volatility.

7. What can possibly explain excessive volatility?
8. What is a bubble?
9. Discuss the following bubbles: Tulip bubble, the South Sea bubble, the Japanese stock market bubble, and the Internet bubble.
10. What are experimental bubble markets?
11. What lessons does the research in experimental markets provide?
12. Discuss the explanations for the four puzzling facts (long-term reversals, value premium, momentum, and post-earnings announcement drift) in terms of representativeness and conservatism, as provided by Nicholas Barberis, Andrei Shleifer, and Robert Vishny.
13. What are the utilitarian benefits, expressive benefits, and emotional benefits provided by investments?
14. Discuss the behavioural asset pricing model (BAPM). How does it differ from the CAPM?

■ ■

Chapter **11**

Value Investing

The portrait of the individual investor presented in Chapter 10 suggests that investors in general are prone to behavioural biases and emotional influences which impair their performance. While such a description applies to most of the investors, there is a minority of investors who are psychologically smart and who follow a disciplined approach that gives them an edge over others.

Though these investors may pursue diverse approaches, a good proportion of them seem to be practitioners of an approach called value investing. Genuine value investors seem to bring to bear a great deal of rationality to their investment decisions to mitigate the destructive effects of psychological biases and emotional forces.

This chapter discusses the central tenets of value investing and describes the strategies of some of the well-known value investors. It is divided into four sections as follows:

- Central tenets of value investing
- Evidence and prospects of value investing
- Strategies of some well-known value investors
- Academic research on value investing

11.1 ✦ CENTRAL TENETS OF VALUE INVESTING

As an investment paradigm, value investing refers to purchases of securities or assets for less than their worth. When we say value investing, both the words, value and investing, are significant. First, value investors do careful valuation. Second, value investors believe in investing, not trading or speculating.

Almost all value investors seem to swear by Benjamin Graham and Warren Buffett. Value aficionados regard Benjamin Graham as the intellectual father and Warren Buffett as the most pre-eminent practitioner of value investing. Hailed as the world's most successful stock market investor, Warren Buffett's track record in accumulating wealth through successful long-term investments is nonpareil. No wonder, value investors pay close attention to the actions and writings of Warren Buffett.

Central Tenets or Ideas

A careful perusal of the literature on value investing suggests that its central tenets or ideas are as follows:

- Mr. Market and Mr. Value
- Fractional ownership
- Margin of safety
- Circle of competence
- Mean reversion
- Concentrated portfolio
- Focus on absolute return
- Humility
- Bottom up approach
- Skepticism of Wall Street recommendations
- Contrary thinking
- Marathon and patience
- Composure
- Flexibility and openness
- Decisiveness
- Long-term investment orientation
- Different perspective on risk
- Simplicity
- Selling discipline

Mr. Market and Mr. Value The stock market is very exciting and misleading in the short turn, but boringly reliable and predictable in the long run. These two facets of the market may be called Mr. Market and Mr. Value.

Introduced by Benjamin Graham in his classic work *The Intelligent Investor* Mr. Market is emotionally unstable. At times he feels euphoric and sees only positive things and at times he feels depressed and looks at only negative things. Depending on the mood of Mr. Market, stock prices rise and fall. Mr. Market constantly fascinates and provokes investors by changing his prices. He will knock at your door every trading day with his quotations and give you the option to trade with him. He will faithfully come to you every trading day, irrespective of whether you do business with him or not.

Mr. Market constantly titillates investors with a variety of gimmicks such as earnings surprises, corporate takeovers, bonus declarations, grim news about recession, announcements of technological breakthroughs, corporate scandals, and political changes.

While Mr. Market teases and attracts our attention, Mr. Value hardly appears and rarely evokes any emotions. A remarkably stolid and reliable person, Mr. Value steadily plods in the real world. As Charles Ellis put it: "He works all day and night investing, making and distributing goods and services. His job is to grind it out on the shop floor, at the warehouse and in the store, day after day, doing the real work of the economy."

Mr. Value's role may not be exciting, but it is extremely important. Although Mr. Market may tickle us all the time, Mr. Value prevails in the long run. As Graham said, the stock market is a voting machine in the short run but a weighing machine in the long run.

Value investors seek to exploit the discrepancy between value and price. If the price is significantly less than value, they buy. If the price exceeds value, they sell. For them, the market is there to serve them, not to instruct them.

Fractional Ownership Value investors regard securities as fractional ownership in the underlying business and not as speculative instruments. So, the value of a security reflects the value of the underlying business.

Warren Buffett has said that he is not bothered, if the stock market is closed for ten years after he purchased a stock. That is because he does not look at stocks as pieces of paper to be traded frequently. Rather, he buys them with the objective of becoming a part-owner of the entire business. Given such an approach, value investors do careful due diligence when they purchase a stock and concentrate on how well the business is progressing.

Margin of Safety Value investors buy stocks at a significant discount to their intrinsic value, implying that they look for a large 'margin of safety.' In theory, the intrinsic value of a stock is equal to the present value of the cash flows generated by it in future. As a practical expedient, the intrinsic value of a company may be defined as the price a company would fetch in the open market if it were sold in its entirety to a private investor.

Circle of Competence Based on their competence and the perceived opportunity set, value investors have clarity about where they'll look for investment ideas. Instead of relying on tips or paying attention to the continual flow of news, value investors conduct in-depth, proprietary, and fundamental research.

Mean Reversion Business cycles and company performance tend to revert to the mean. Value investors understand the import of mean reversion and profit from it. They avoid the common belief that the immediate past best informs the indefinite future.

Concentrated Portfolio Truly great investment ideas are rare. Value investors patiently wait for such ideas and when they come across them, they take large positions, in line with their convictions. In other words, they make few but big bets. As a result, they often have a concentrated portfolio.

Focus on Absolute Returns Value investors don't focus on their performance relative to a benchmark. Instead, they focus on achieving satisfactory absolute performance.

Humility A common trait of value investors is humility. They admit their mistakes and learn from them. They refrain from the tendency of taking credit only for successes and attributing failures to bad luck.

Bottom Up Approach There are two broad approaches to portfolio building: top-down and bottom-up. Top down investors begin by looking at the macro-economic environment and market trends. Then they identify sectors or industries that are expected to do well. And, finally they choose individual stocks that fit into these themes. By contrast, bottom up investors (and value investors are typically bottom up investors) pay little heed to macroeconomic

and sectoral analysis. Instead, they assess individual stocks, one at a time, on the basis of fundamental analysis. They do not try to time the market, but sift the financial markets to identify undervalued securities and then buy them regardless of the level or recent trends of the market or economy. It they cannot find bargains, they hold cash by default.

Skepticism of Wall Street Recommendations Value investors are wary of the recommendations of Wall Street analysts because of potential conflict of interest. As Jean–Marie Eveillard, a highly respected international value investor, says: "We look at outside research, but we don't trust anybody. There is a conflict of interest associated with investment banking and research. Most of the research is done for growth investors who are looking for securities to move into today and out of in six or nine months."

Value investors, of course, look at research reports to deepen their understanding of a company's working. As Ron Muhlekamp, a value investor, comments: "(The research) certainly can be useful, but I never ask an analyst what stock to buy. I want an analyst to tell me what's going on in the industry and what's going on in the company." He adds: "Their job is to know their companies. My job is to figure out what the values are and what companies I want to own."

Contrary Thinking Investors tend to have a herd mentality and follow the crowd. Two factors explain this behaviour. First, there is a natural desire on the part of human beings to be part of a group. Second, in a complex field like investment, most people do not have enough confidence in their own judgment. This impels them to substitute others' opinion for their own. As Keynes incisively observed: "Investors may be quite willing to take the risk of being wrong in the company of others, while being much more reluctant to take the risk of being right alone."

Following the crowd behaviour, however, often produces poor investment results. Why? If everyone fancies a certain share, it soon becomes overpriced. Thanks to bandwagon psychology, it is likely to remain bullish for a period longer than what is rationally justifiable. However, this cannot persist indefinitely because sooner or later the market corrects itself. And when that happens the market price falls, sometimes very abruptly and sharply causing widespread losses.

Given the risk of imitating others and joining the crowd, you must cultivate the habit of contrary thinking. This may be difficult to do because it is so tempting and convenient to fall in line with others. Perhaps the best way to resist such a tendency is to recognise that investment requires a different mode of thinking than what is appropriate to everyday living. As James Gipson said: "Being a joiner is fine when it comes to team sports, fashionable clothes, and trendy restaurants. When it comes to investing, however, the investor must remain aloof and suppress social tendencies. When it comes to making money and keeping it, the majority is always wrong."

The suggestion to cultivate 'contrary thinking' should not, of course, be literally interpreted to mean that you should always go against the prevailing market sentiment. If you do so, you will miss many opportunities presented by the market swings. A more sensible interpretation of the contrarian philosophy is this: go with the market during incipient and intermediate phases of bullishness and bearishness but go against the market when it moves towards the extremes.

Here are some suggestions to cultivate the contrary approach to investment:

- Avoid stocks which have a high relative price-earnings ratio. A high relative price-earnings ratio reflects that the stock is very popular with investors.
- Recognise that in the world of investment, many people have the temptation to play the wrong game.
- Sell to the optimists and buy from the pessimists. While the former hope that the future will be marvellous, the latter fear that it will be awful. Reality often lies somewhere in between. So it is a good investment policy to bet against the two extremes.

Counterintuitive Trading

Successful investors usually trade in a counterintuitive manner: they increase turnover when they are doing well, but patiently endure disappointments. This behaviour is at variance with human nature and the culture of most investment committees. If investments have fared well, it is human nature to complacently adhere to the strategy that has served well. Yet, investments that have performed well in the recent past, may no longer be attractively priced to generate good returns. Conversely, if investments have performed badly, human instincts prompt us to fix the problem by changing the portfolio. Yet, the portfolio may now be attractively priced to generate better returns.

More specifically, remember the following rules which are helpful in implementing the contrary approach:

- Discipline your buying and selling by specifying the target prices at which you will buy and sell. Don't try overzealously to buy when the market is at its nadir or sell when the market at its peak (these can often be known only with the wisdom of hindsight). Remember the advice of Baron Rothschild when he said that he would leave the 20 per cent gains at the top as well as at the bottom for others as his interest was only on the 60 per cent profit in the middle.
- Never look back after a sale or purchase to ask whether you should have waited. It is pointless to wonder whether you could have bought a share for ₹10 less or sold it for ₹20 more. What is important is that you buy at a price which will ensure profit and sell at a price where you realise your expected profit.

Marathon and Patience Value investors consider stock investing to be a marathon, not a 400-meter sprint. In this marathon, winners and losers are determined over periods of several years, not months. As a virtue, patience is strangely distributed among investors. Young investors, with all the time in the world to reap the benefits of patient and diligent investing, seem to be the most impatient. They look for instantaneous results and often check prices on a daily basis. Old investors, on the other hand, display a high degree of patience even though they have little chance of enjoying the fruits of patience.

Whatever may be the temperamental basis for the young to be impatient, in the field of investment there are compelling reasons for cultivating patience. The game of investment requires patience and diligence. In the short run, the factor of luck may be important because of randomness in stock price behaviour, which may be likened to the Brownian motion in physics. In the long run, however, investor performance depends mainly on patience and diligence, because the random movements tend to even out.

Instead of paying constant attention to the company's stock price, value investors focus on the progress of the business, which will lead to increased returns in long run. As Bret Stanley, a successful value investor, notes: "We're not trying to find companies that are going to go up in the next six months." He adds: "We're truly adopting long-term horizon. We think about whether it's a business we want to be involved in, and whether there's a big gap between perception and reality that's causing a disconnect between price and value."

As Warren Buffett puts it: "I should emphasise that we do not measure the progress of our investment by what their market prices do during any given year. Rather we evaluate their performance by two methods we apply to the businesses we own. The first test is improvement in earnings with our making due allowance for industry conditions. The second test, more subjective, is whether their moats—a metaphor for the superiorities they possess that makes life difficult for their competitors—have widened during the year."

Composure Rudyard Kipling believed that an important virtue for becoming a mature adult is to keep your head when all around you are losing theirs. The ability to maintain composure is also a virtue required to be a successful investor. Conscious of this, as an investor you should try to (a) understand your own impulses and instincts towards greed and fear; (b) surmount these emotions that can warp your judgment; and (c) capitalise on the greed and fear of other investors.

While the above advice sounds simple, it is difficult to practise. Greed and fear are far more powerful forces than reason in influencing investment decisions. Rarely do you come across an investor who is immune to these emotions that are so pervasive in the market place. Greed and fear tend to be insidiously contagious. In your attempt to overcome them, you may find the following suggestions helpful.

- Maintain a certain distance from the market place. Your vulnerability to the contagious influences of greed and fear diminishes, if your contact with others caught in the whirlpool of market psychology decreases.
- Rely more on hard numbers and less on judgment (which is more prone to be influenced by the emotions of greed and fear). This is the advice given by Graham, widely regarded as the father of security analysis.

Flexibility and Openness Nothing is more certain than change in the world of investments. Macroeconomic conditions change, new technologies and industries emerge, consumer tastes and preferences shift, investment habits alter, and so on. All these developments have a bearing on industry and company prospects on the one hand and investor expectations on the other.

Despite the inexorability of change, most of us adjust to it poorly. We often base our expectations assuming that the status quo will continue. As J.M. Keynes said: "The facts of the existing situation enter, in a sense disproportionately into the formation of our long-term expectations; our usual practice being to take the existing situation and project it into a future modified only to the extent that we have more or less definite reasons for expecting a change."

We tend to compound the problem further by being over-protective of our judgment, mainly due to psychological reasons. This leads to a failure to absorb and interpret new

information with an open mind. This inability to consider new evidence blinds us to the flaws in our operating premises. As Arthur Zeikel said: "We tend to develop a 'defensive' interpretation of new developments, and this cripples our capacity to make good judgments about the future."

Since an open mind, not blocked by prejudices and biases, is crucial for success in investing, conscious and deliberate efforts should be made to re-examine old premises, assimilate new information, and cultivate mental flexibility. Barton M. Briggs put it this way: "Flexibility of thinking and willingness to change is required for the successful investor. In the stock market, in investing, there is nothing permanent except change. The investment manager should try to cultivate a mix of healthy skepticism, open-mindedness, and willingness to listen."

Decisiveness An investor often has to act in face of imperfect information and ambiguous signals. Investment decisions generally call for reaching conclusions on the basis of inadequate premises. To succeed in the investment game, the investor should be decisive. If he procrastinates, he may miss valuable opportunities; if he dillydallies, he may have to forego gains.

Decisiveness does not mean rashness. Rather, it refers to an ability to quickly weigh and balance a variety of factors (some well understood and some not-so-well understood), form a basic judgment, and act promptly. It reflects the ability to take decisions, after doing the necessary homework of course, without being overwhelmed by uncertainties characterising the investment situation. The most successful investors tend to be those who are willing to make bold positions consistent with their convictions. Vacillation and half-hearted commitments often produce lacklustre investment results.

Different View of Risk When financial academics refer to risk, they almost always mean only *market risk* and that too very short-run market risk. For value investors, such risk is of little concern. What matters most to them is *investment risk*—the possibility that something could go wrong with the company or securities covenants. Value investors think about risk as the probability and amount of potential loss. So, they find beta, a measure of historical volatility, to be meaningless. In fact, a volatile stock may become deeply undervalued, making it a very low risk investment.

Simplicity A shared characteristic of eminent value investors is simplicity, which is a powerful construct. As Thoreau said, "Our life is frittered away by detail… simplify, simplify." Einstein recognised that simplicity was the key to his breakthroughs is physics. The genius behind $E = mC^2$ embodied simplicity and elegance. Einstein noted that the five ascending levels of intellect were, "Smart, Intelligent, Brilliant, Genius, Simple." Likewise, the hallmark of Buffett's style is simplicity. Indeed, thinkers like Einstein and Buffett, who exemplify simplicity, achieve great heights.

Selling Discipline The decision to sell a stock is often harder to make than the decision to buy. Value investors try to achieve selling discipline by laying out well defined criteria for determining when to sell. As James Gipson, a value investor, said: "We will sell a stock when it reaches intrinsic value. It can reach intrinsic value in two ways. Either the price can go up, or the value can go down." Another reason value investors may sell is when they find something more attractive.

11.2 ✦ EVIDENCE AND PROSPECTS OF VALUE INVESTING

Value investing is at least in three different ways or senses demonstrably the most successful approach to investing from an empirical point of view. First, portfolios based on simple quantitative indicators, without any deeper knowledge of the companies, consistently outperform market portfolios by a wide margin. This means that the efficient market theory in the traditional academic sense is contradicted. Second, institutional investors who follow value investing significantly outperform institutional investors who follow other approaches to investing. Third, if you look at individual investors who have done extraordinarily well over long periods of time, you find that value investors (such as Warren Buffett) are grossly disproportionately represented in the group of highly successful investors.

• Prospects for Value Investing

With the growing competition in the investment business, one may argue that market inefficiencies and mispricings may be corrected. With more well capitalised and skilled investors, what are the prospects of value investing? Better than what many think for the following reasons:

1. Even with a growing value community, market participants tend to pay meagre attention to value criteria. Most managers focus on growth, momentum, or indexing, as they find value investing unappealing.
2. Money managers, including some hapless value managers, have an absurdly short investment horizon as they are driven by the performance pressures (real or imaginary) of the investment business.
3. It is difficult to take a contrarian approach. Under the relentless message from the market that they are wrong, even highly capable investors may succumb to the prevailing market mood.
4. While it appears that anyone can be a value investor, the personality traits required for value investing—patience, diligence, discipline, independence, and risk-aversion-are perhaps genetically determined. As Seth Klarman, a distinguished value investor, put it "When you first learn of the value approach it either resonates with you or doesn't. Either you're able to remain disciplined and patient, or you're not."

   Value investors are inherently value-conscious people. As Kirk Karanzian says in his book *Value Investing with the Masters*, "By and large, they look for bargains in life as much as they do in the stock market. As several of them point out, you don't really learn to become a value investor. You must have these inherent beliefs within you in the first place. If you never buy anything on sale, and don't pinch pennies, it will likely be harder for you to truly adopt the value philosophy."

11.3 ✦ STRATEGIES OF SOME WELL-KNOWN VALUE INVESTORS

This section seeks to provide a synoptic view of the methods and strategies followed by some well-known investment wizards. Obviously the succinct presentation here cannot do full

justice to their rich style and subtle technique. The reader interested in learning more about their approaches is advised to read full-length volumes dedicated to them, which have been referred to in the following pages.

• Benjamin Graham: The Quantitative Navigator

Benjamin Graham, the father of security analysis, loved mathematics and followed a quantitative approach to investment. He looked at investments solely through numbers, without bothering about the quality of the business or the capability of its management. Throughout his professional career, Graham tried to develop specific, quantitative techniques that he could teach to others to enable them to manage their investments profitably.

Apart from being an eminently successful money manager, who ran Graham–Newman Corporation from 1936 to 1956, he was an outstanding investment theorist and educator. In 1934, along with David Dodd, he wrote *Security Analysis,* (published by McGraw Hill), a monumental work, which is regarded as a basic text for serious students of investing.

In a tribute written in the November/December 1976 issue of the *Financial Analysts Journal*, Warren Buffett made the following comment on the book *Security Analysis*: "It is rare that the founder of a discipline does not find his work eclipsed in rather short order by successors. But over forty years after publication of the book that brought structure and logic to a disorderly and confused activity, it is difficult to think of possible candidates for even the runner-up position in the field of security analysis. In an area where much looks foolish within weeks or months after publication, Ben's principles have remained sound – their value often enhanced and better understood in the wake of financial storms that demolished flimsier intellectual structures." Jason Zweig echoed a similar view "Graham was not only one of the best investors who ever lived; he was also the greatest practical investment thinker of all time. Before Graham, money managers behaved much like a medieval guild, guided largely by superstition, guesswork, and arcane details. Graham's *Security Analysis* was the text book that transformed this musty circle into a modern profession."

In 1949, Benjamin Graham wrote *The Intelligent Investor* (published by Harper Collins) which appeals to almost all readers and which according to Warren Buffett is: "By far the best book on investing ever written." From 1928 to 1956, Benjamin Graham taught an immensely popular course at Columbia Business School that attracted students like Warren Buffett.

Till the end of his long and illustrious professional career, Graham emphasised the "look for values with a significant margin of safety relative to prices approach to security analysis." His focus was on developing methods that could be used by anybody and hence, relied entirely on readily available published material, such as the company's own reports.

All his professional life, Graham sought to develop explainable techniques that he could teach others to help them in selecting safe and profitable investments. His focus was on methods that were entirely quantitative and that did not depend on things that one could not be sure about, such as social trends, management quality, or a company's innovative abilities. In other words, he was the antithesis of the futurology approach advocated by T. Rowe Price.

To illustrate Graham's methods, let us look at the following set of standards developed by him for stock selection by the defensive investor in his book *The Intelligent Investor*.

1. **Adequate Size of the Enterprise** A company should not have less than $100 million of annual sales, if it is an industrial company or less than $50 million total assets, if it is a public utility.
2. **A Sufficiently Strong Financial Condition** For an industrial company, the current ratio should be at least two and the long-term debt should not be greater than the net current assets. For a public utility, the debt-equity ratio (at book value) should not exceed 2.
3. **Earnings Stability** Equity earnings must be positive in each of the past ten years.
4. **Dividend Record** The company must have a record of paying uninterrupted dividends for at least the past twenty years.
5. **Earnings Growth** Earnings per share must have increased by at least one-third in the past ten years, using three-year averages at the beginning and end.
6. **Moderate Price/Earnings Ratio** The current price should not exceed 15 times average earnings for the past three years.
7. **Moderate Ratio of Price to Assets** The current price should not exceed 1 ½ times the last reported book value. However, a price-earnings multiplier of less than 15 may justify a higher price-to-book value approach. As a rule of thumb, the product of the price-earnings multiplier and the price-to-book value ratio should not be more than 22.5.

• Phillip Fisher: The Investigative Growth Stock Investor

Philip Fisher set up his office as an investment counsellor in 1931, when he was just 24 years old, and gradually acquired a reputation as an original, profound, and thorough investment thinker. He became the dean of investment counsellors in San Francisco and maintained that stature for decades.

A pioneer in growth stock investing, he took huge positions in companies like FMC, Texas Instruments, Motorola, and Dow chemicals in their nascent stages. He received national recognition with his book *Common Stocks and Uncommon Profits and Other Writings* (published in 1958 by Wiley). Deeply impressed with this book, Warren Buffett went to meet Fisher and learn his strategies first hand. On Phil Fisher's death in 2004, Warren Buffett wrote in a letter published in the May 10, 2004 issue of *Forbes*: "I met Phil Fisher in the early sixties, after reading his first book. It has been over 40 years since I integrated Phil's thinking into my investment philosophy. As a consequence, Berkshire Hathaway shareholders are far wealthier than they otherwise would have been. Forty years ago Ben Graham and Phil Fisher were my only investment heroes. They remain so today."

Outstanding Companies Fisher concentrated on identifying outstanding companies. As he said: "I don't want a lot of good investments; I want a few outstanding ones." To evaluate whether a company is outstanding, Fisher employed several criteria, which can be grouped under two main categories: characteristics of the business and qualities of management.

Characteristics of the Business An attractive business has the following characteristics: (a) growth from existing products and new products, (b) high profit margin and return on capital along with favourable trends in them, (c) effective research, (d) an excellent sales organisation, (e) a leading industry position, and (f) a durable "franchise."

Qualities of Management The desirable qualities of management include the following: (a) integrity, (b) accessibility, (c) long-term orientation, (d) appreciation that change is pervasive, (e) strong financial controls, (f) sound personnel policies, (g) special skills required for particular industries, and (h) multi-disciplinary skills where relevant.

Fisher's Technique Fisher suggests that a proper analysis of a company involves three phases:

a. Absorbing printed material including the annual and interim reports and the 10-K statement.
b. Gathering additional information from business sources – Fisher emphasises the importance of scuttlebutt, which he also refers to as "the business grapevine" in investing. As he put it: "The business grapevine is a remarkable thing… Go to five companies in an industry, ask each of them intelligent questions about the points of strength and weakness of the other four, and nine times out of ten a surprisingly detailed and accurate picture of all five will emerge."
c. Visiting the company to assess the management and ascertain whether they are carrying out the stated policies.

• Warren Buffett: The Ultimate Businessman

Hailed as the world's most successful stock market investor, Warren Buffett was ranked as the richest American in a list compiled by Forbes in 1993. His track record in accumulating wealth through successful stock market investments is non-pareil. In 1956, he commenced his investment partnership with $10,000; in 2015 his net worth was estimated at $60.0 billion.

Buffett and his business partner Munger have blended Graham's "margin of safety" and detachment from the market with their innovative approach. Jason Zweig offers a very brief summary of Buffett's approach: "He looks for what he calls franchise companies with strong consumer brands, easily understandable businesses, robust financial health, and near monopolies in their markets, like H&R Block, Gillette, and the Washington Post. Buffett likes to snap up a stock when a scandal, big loss, or other bad news passes over it like a storm cloud as when he bought Coca Cola after its disastrous roll out of Diet Coke."

Robert G. Hagstrom, Jr. has described the investment strategies of Warren Buffett in a fascinating book titled *The Warren Buffett Way: Investment Strategies of the World's Greatest Investor* (published by John Wiley & Sons, 1994). The key tenets of the Warren Buffett way are:

- Turn off the stock market
- Don't worry about the economy
- Buy a business, not a stock
- Manage a portfolio of business

Turn Off the Stock Market The stock market exhibits manic-depressive tendencies. At times it is widely euphoric and at other times it is unduly pessimistic. Hence Buffett says that one should not take direction from the market. In fact, Buffett does not have a stock quote machine in his office. He says, "After we buy a stock, consequently, we would not be disturbed if markets closed for a year or two." In a similar vein, he adds "We don't need a daily quote on our well-being in a 100 per cent subsidiary. Why, then, should we need a quote on our 7% interest in Coke?"

While the stock market should not be regarded as a preceptor, its wild gyrations present wonderful opportunities for a disciplined investor. As Buffett says, "As far as I am concerned, the stock market doesn't exist. It is there only as a reference to see if anybody is offering to do anything foolish."

Don't Worry About the Economy A commonly recommended approach to investments calls for forecasting the economic environment and selecting stocks that are likely to benefit most from it. Buffett, however, does not subscribe to this approach for two reasons:

(a) It is as difficult to predict the economy as to forecast the stock market.
(b) A strategy of selecting stocks that benefit from a particular economic environment invariably leads to speculation and excessive turnover. Instead, Buffett prefers to invest in businesses that do well irrespective of what happens to the economy.

Buy a Business, Not a Stock Buffett believes that when one invests one must buy a business, not a stock. This means that the investment must be viewed from the long-term perspective of a businessman.

How should one think about an investment? Buffett applies the following tenets.

Business Tenets Buffett is interested in businesses which satisfy the following criteria:

Simplicity and Understandability The business must be simple and understandable. Otherwise you may not be able to figure out how it generates profits.

Consistent History In order to bet on the future of the company you should know how it has fared in the past. A good track record provides an assurance about the ability of the company to earn profits.

Franchise A franchise offers the best long-term prospects. A franchise is a business that sells a desired product or service which has no close substitute. Further, its profits are not subject to regulation. As against a franchise, a commodity business offers poor prospects.

Coca-Cola, Gillette, See's Candy, and the *Washington Post* are excellent examples of franchise businesses in which Berkshire Hathaway, a Buffett controlled company, has huge investments. Buffett's edge seems to be in his ability to invest in and, if required, shape the franchise businesses.

Management Tenets For assessing the quality of management, Buffett employs the following criteria:

Management Rationality Rational managers invest cash in projects that earn returns in excess of the cost of capital. If such projects are not available, they will return the money to shareholders. Irrational managers, on the other hand, look for ways to invest surplus funds, somewhat unmindful of their profitability. As a consequence, they tend to earn returns less than the cost of capital.

Managerial Candour The openness with which the management communicates with shareholders is important. Does the management explain how various operating divisions are performing? Does the management forthrightly claim that its primary objective is to maximise the returns to shareholders?

Resistance to Institutional Imperative Most managements succumb to the institutional imperative. They mindlessly imitate the behaviour of others and tend to build a big empire, often hurting the shareholders in the process. An important measure of managerial competence is its ability to resist the institutional imperative and its unwavering commitment to the welfare of shareholders.

Financial Tenets The following financial yardsticks are considered important by Buffett:

Return on Equity Investors often judge a company's annual performance by its earnings per share. A better measure of a company's annual performance is its return on equity – this measure takes into account the company's growing equity base.

Profit Margin High profit margins reflect a strong business as well as a firm managerial determination to control costs.

Market Tenets Naturally, Buffett is interested in buying businesses which are available at a significant discount over their value. He focuses on the following:

Value of the Business A strong advocate of the discounted cash flow method, Buffett values a business by discounting its estimated cash flow at a suitable discount rate.

Purchase at a Significant Discount Buffett believes in purchasing the business when its price is substantially lower than its value. Note that Buffett looks at the stock market price only at this juncture. To deal with the potential errors in valuation, Buffett (a) adheres to businesses which are simple and stable in character, and (b) insists on a 'margin of safety' which acts as a cushion.

Manage a Portfolio of Business Since Buffett manages a portfolio of businesses and not stocks, he does not believe in wide diversification. He thinks that wide diversification makes sense only for the "know-nothing" investors who would do well to buy an index fund. "Paradoxically," he says, "when 'dumb' money acknowledges its limitations, it ceases to be dumb."

"On the other hand," Buffett argues, "if you are a know-something investor, able to understand business economics and to find five to ten sensibly-priced companies that possess important long-term competitive advantages, conventional diversification makes no sense to you." "In our view," Buffett says, "what makes sense in business also makes sense in stocks: an investor should ordinarily hold a small piece of an outstanding business with the same tenacity that an owner would exhibit if he owned all of that business."

• John Templeton The Bargain Hunter

John Templeton has excelled in bargain hunting. His style is characteristically reflected in an order that he placed with his broker in 1939: "I want you to buy me a hundred dollar's worth of every single stock on both major exchanges that is selling for no more than one dollar a share."

Templeton is considered as one of the most outstanding fund managers of twentieth century. As Peter Lynch says: "John Templeton is one of the best. He is a pioneer in the global market,

one of the first to make money all around the world. His shareholders avoided the 1972–74 collapse in the US because he had cleverly placed most of his fund's assets in Canadian and Japanese stocks. Not only that, he was one of the first to take advantage of the fact that the Japanese Dow Jones (the Nikkei average) is up seventeen fold from 1966 to 1988, while the US Dow Jones has only doubled."

Templeton, founder and former Chairman of the Templeton organisation, has distilled his years of experience and expertise into the 16 Rules of Investment Success[1].

1. *If you begin with a prayer, you can think clearly and make fewer mistakes*.
2. *Outperforming the market is a difficult task*. The challenge is not simply making better investment decisions than the average investor. The real challenge is in making investment decisions that are better than those of the professionals who manage the big institutions.
3. *Invest – don't trade or speculate*. The stock market is not a casino, but if you move in or out of stocks every time they move a point or two...the market will be your casino. and…you may lose eventually – or frequently.
4. *Buy value, not market trends or the economic outlook.* Ultimately, it is the individual stocks that determine the market, not vice versa. Individual stocks can rise in a bear market and fall in a bull market. So, buy individual stocks, not the market trend or economic outlook.
5. *When buying stocks, search for bargain among quality stocks.* Determining quality in a stock is like reviewing a restaurant. You don't expect it to be 100% perfect, but before it gets three or four stars, you want it to be superior.
6. *Buy low. So simple in concept. So difficult in execution.* When prices are high, a lot of investors are buying a lot of stocks. Prices are low when demand is low. When investors have pulled back, people are discouraged and pessimistic. But, if you buy the same securities everyone else is buying, you will have the same results as everyone else.
7. *There's no free lunch. Never invest on sentiment. Never invest on a tip.* You would be surprised how many investors do exactly this. Unfortunately, there is something compelling about a tip, its very nature suggests inside information, a way to turn a fast profit.
8. *Do your homework or hire wise experts to help you.* People will tell you: Investigate before you invest. Listen to them. Study companies to learn what makes them successful.
9. *Diversify—by company, by industry.* In stock and bonds, there is safety in numbers. No matter how careful you are…you can neither predict nor control the future. So you must diversify.
10. *Invest for maximum total return.* This means the return … after taxes and inflation. This is the only rational objective for most long-term investors.
11. *Learn from your mistakes.* The only way to avoid mistakes is not to invest—which is the biggest mistake of all. So, forgive yourself for errors…and certainly don't try to recoup your losses by taking bigger risks. Instead, turn each mistake into a learning experience.

[1] Sir John Templeton, *16 Rules for Investment Success,* Templeton Investment Series.

12. *Aggressively monitor your investments. Remember, no investment is forever.* Expect and react to change. And there are no stocks that you can buy and forget. Being relaxed… doesn't mean being complacent.
13. *As investor who has all the answers doesn't even understand all the questions.* A cocksure approach to investing will lead, probably sooner than later, to disappointment, if not outright disaster…the wise investor recognises that success is a process of continually seeking answers to new questions.
14. *Remain flexible and open-minded about types of investment.* There are times to buy blue chip stocks, cyclical stocks, convertible bonds… And there are times to sit on cash. The fact is that there is no one kind of investment that is always best.
15. *Don't panic.* Sometimes you won't have sold when everyone else is buying and you will be caught in a market crash. Don't rush to sell the next day…instead, study your portfolio…if you can't find more attractive stocks, hold on to what you have.
16. *Do not be fearful or negative too often.* There will, of course, be corrections, perhaps even crashes. But over time studies indicate, stocks go up…and up…and up. In this century or the next, it's still "Buy low, sell high".

The Templeton approach, although clear and simple, requires skill, dedication, and astute judgment. For, it is never easy to deliver consistently superior performance by investing differently from the crowd. Templeton's time-tested strategy is "buying bargains where they exist." The key ingredient is the search for those few investment opportunities that offer outstanding long-term value.

• Peter Lynch: The Relentless Chaser

Arguably one of the most successful money managers of our times, Peter Lynch was responsible for the phenomenal growth of Fidelity Magellan Fund. Under his stewardship, Magellan Fund became the largest mutual fund in history, with $12 billion in assets at its peak in August 1987. More important, during the thirteen years when Lynch managed the Magellan Fund, till he retired in 1990, Magellan was the top-ranked general equity mutual fund. An investment of $1,000 in Magellan in 1977 grew to $28,000 in 1990. No wonder *Time* called Lynch the "#1 Money Manager".

How did Lynch accomplish this? What are the tenets of his investment strategy? What are his prescriptions for the lay investor? In a highly readable and insightful book, *One Up on Wall Street* (published by Penguin in 1990) which became a runaway bestseller, Lynch shares his secrets and offers a number of valuable suggestions. Here is a distillation of his advice.

Address Basic Personal Issues before Buying Shares The important personal issues that you should address are: (a) Do I own a house? Investment in a house is most attractive for various reasons. (b) Do I need the money? Losses from investment should not have an effect on your standard of living in the foreseeable future. (c) Do I have personal qualities that will bring me success in investments? According to Lynch, this is the most important question. He says, "It seems to me the list of qualities ought to include patience, self-reliance, common sense, a tolerance for pain, open-mindedness, detachment, persistence, humility, flexibility, a

willingness to do independent research and an equal willingness to admit to mistakes and the ability to ignore general panic."

Devote Time and Effort If you want to manage your investment on your own, you should, says Lynch, devote at least one hour a week to investment research. Merely adding the dividend income and figuring our gains and losses does not serve any purpose.

The need to spend effort in investment research is driven vividly when Lynch says: "Invest at least as much time and effort in choosing a new stock as you would in choosing a new refrigerator." For those who can't devote such attention, Lynch recommends the mutual fund. As he says: "The mutual fund is a wonderful invention for people who have neither the time nor the inclination to test their wits against the stock market, as well as for people with small amounts of money to invest who seek diversification."

Try Going it Alone When you have decided to invest on your own, you should try going it alone. As Lynch says: "This means ignoring the hot tips, the recommendations from brokerage houses, and the latest can't miss suggestion from your favourite newsletter, in favour of your own research. It means ignoring the stocks that you hear Peter Lynch, or some, similar authority, is buying."

Invest in Something You Know or Understand Your edge in investment comes from something you know or understand. If you find that some product is moving very fast in the departmental store you visit, you have a potential investment idea. Ironically, people ignore such clues and look for exotic propositions that they don't understand. As Lynch says: "People seem more comfortable investing in something about which they are entirely ignorant. There seems to be an unwritten rule on Wall Street: If you don't understand it, then put your life savings into it. Shun the enterprise around the corner, which can at least be observed and seek out the one that manufactures an incomprehensible product."

Look for Companies that are "Off the Radar Scope of the Market" The scope for appreciation seems to be greater for small, obscure and apparently unexciting companies which the market does not fancy. As Lynch says: "If it's a choice between owning stock in a fine company with excellent management in a highly competitive and complex industry, or a humdrum company with mediocre management in a simple minded industry with no competition, I'd take the latter."

Apply Simple Fundamental Criteria Lynch relies on fundamental analysis and eschews technical analysis. He looks at the price-earnings (P/E) ratio carefully. He says: "In general, a P/E ratio that's twice the growth rate is very negative. We use this measure all the time in analysing stocks for the mutual funds." Other factors considered are the cash position, the debt factor, dividends, book value, cash flow, and profit after tax.

Don't Try to Predict the Market It is impossible to predict the direction of the market over one year or even two years. Hence, it is futile to predict the market. As Lynch says: "When it comes to predicting the market, the important skill is not listening, it's snoring. The trick is not

to learn to trust your gut feelings, but rather to discipline yourself to ignore them. Stand by your stocks as long as the fundamental story of the company hasn't changed."

Avoid Market Timing Lynch believes in staying in the stock market all the time, rather than switching from stock to cash and vice versa as market timers do. As he says: "Going into cash would be getting out of the market. My idea is to stay in the market forever, and to rotate stocks depending on the fundamental situations. I think, if you decide that a certain amount you have invested in the stock market will always be invested in the stock market, you will save yourself a lot of mistimed moves and general agony."

Avoid Generic Formulae Lynch thinks that it is erroneous to rely on generic formulae. As he says: "Basing a strategy on general maxims such as 'Sell when you double your money,' 'Sell after two years,' or 'Cut your losses by selling when the price falls 10 per cent,' is absolute folly. It's simply impossible to find a generic formula that sensibly applies to all the different kinds of stocks."

Diversify Flexibly *A priori* one should not fix the number of stocks to be included in the portfolio. Instead, the degree of diversification should be determined on a case-by-case basis. As Lynch says: "In my view it's best to own as many stocks as there are situations in which (a) you've got an edge; and (b) you've uncovered an exciting prospect that passes all the tests of research. May be that's a single stock, or may be it's a dozen stocks."

Be Patient Don't expect quick results. Remain invested in your stocks, if the fundamentals continue to be good. Eventually patience is rewarded. As Lynch says: "It takes remarkable patience to hold on to a stock in a company that excites you, but which everybody else seems to ignore. You begin to think everybody else is right and you are wrong. But where the fundamentals are promising, patience is often rewarded."

Carefully Prune and Rotate Based on Fundamentals Lynch practised very successfully the art of rotating this portfolio based on fundamentals. As John Train says: "The essence of Lynch's technique is fluency, letting his portfolio flow easily from one idea to another. He notices some apparent opportunity in the market and moves on it forthwith, without delaying for extensive analysis. Of course, this requires flair and a sure judgment based on a long experience of the subject." He further adds: "Since like a racing skipper, he is constantly changing course to take advantage of small shifts in the wind, there is unending movement in Lynch's Portfolio."

Eschew Financial Derivatives Lynch is not favourably disposed towards financial derivatives. He says: "I have never bought a futures nor an option in my entire investing career. It's hard enough to make money in regular stocks without getting distracted by these side bets, which I'm told are nearly impossible to win unless you're a professional trader." He further adds: "I know that the large potential return is attractive to many small investors who are dissatisfied with getting rich slow. Instead, they opt for getting poor quick. That's because an option is a contract that's good only for a month or two, and unlike most stocks, it regularly expires worthless."

David Dreman: The Contrarian Investor

Regarded by many as the "dean" of contrarians, David Dreman is the Chairman and Chief Investor of Dreman Value Management, a firm that manages several billion dollars of individual and institutional funds and has a very impressive track record. Dreman has articulated his views and strategies in several works, the most influential being *Contrarian Investment Strategies: The Next Generation*, (published by Simon Schuster, 1998), a highly acclaimed work. About this book Marshall Loeb, former editor, *Fortune* magazine, says: "David Dreman has written one of those rare, original books on the market that appear every generation or so. Powerful, profound and extremely well-documented, it provides totally new strategies for investing in the 1990s and beyond."

Dreman has discussed 41 rules of contrarian investment in his above cited work. For our purpose, these 41 rules may be distilled into 11 rules which are discussed below:

Ignore Technical Analysis Technical analysis is based on the assumption that past behaviour of prices can be used to forecast the future behaviour of prices. Though widely used on Wall Street (Dalal Street in India), technical analysis does not seem to have any validity. Scientific studies have demonstrated that stock prices behave like a random walk. This implies that future price movements cannot be forecast on the basis of past price behaviour. Given the unpredictability of stock prices, it makes no sense to rely on technical analysis.

Don't Rely on Experts Experts, like lay persons, are prone to errors. The failure of experts is traceable to difficulties in processing information. Current psychological research suggests that man is primarily a serial or sequential processor of information. He can handle information reliably for problems that require essentially linear processing of information. However, many decision situations, including investment decision situations, require configural or interactive reasoning and not linear reasoning. In configural problems, the interpretation put on some piece of information depends on how other pieces of information are evaluated. For example, the interpretation placed on earnings would depend on how the analyst evaluates several other inputs like leverage, business risk, growth, payout ratio, tax structure, quality of accounting, and so on. When multiple factors interact in complicated ways and point in different directions, human judgments, however, well-informed and well-reasoned, tend to be fallible. As Dreman says: "What had not been known until recently is that under certain conditions, experts err predictably and often. There is a consistency to the mistakes made by professionals in fields as diverse as psychology, engineering and publishing. And the conditions for such errors are as fertile in the stock market as anywhere."

In his revolutionary book, *The Limits of Scientific Reasoning*, David Faust says that "Human judgment is far more limited than we think. We have a surprisingly restricted capacity to manage or interpret complex information." In a variety of professions, Faust found that simple quantitative models outperformed human judges.

Beware of the Forecasts of the Analysts The investment analyst operates in an environment of considerable complexity and uncertainty. To cope with this challenge he demands as much information as possible and information services emerge to cater to this demand. The availability of more information, however, does not necessarily improve the judgment of the

analyst because he cannot realistically comprehend, digest, and interpret the sea of information that swamps him.

Although more information does not improve the accuracy of analysis, it seems to increase the degree of confidence that analysts have in their forecasts. This is evident in the high rate of forecasting errors, despite the supreme confidence displayed by the analysts. Hence beware of the forecasts of the analysts. As Dreman warns: "The analysts' chances of being on the money with their forecasts are not much higher than winning a lottery. Current investment practice seems to demand a precision that is impossible to deliver. Putting your money on these estimates means that you are making a bet with the odds stacked heavily against you."

Invest in Out of Favour Stocks Stocks that are perceived to have glowing prospects sell at a high price in relation to earnings, cash flow, and book value and invariably have a negligible dividend yield. Conversely, stocks that are perceived to have bleak prospects sell at a low price in relation to earnings, cash flow, and book value and typically have a high dividend yield. Often the disparities between the two groups are exaggerated. Favourite stocks command fancy multiples and neglected stocks get dismal multiples because investors are in general over-confident of their forecasts.

What happens, if the forecasts miss the mark? Positive surprises (actual performance exceeds forecast performance) seem to affect the favourite stocks and neglected stocks in very different ways. A positive surprise leads to a small increase in the price of a favourite stock, but a large increase in the price of a neglected stock. A negative surprise, on the other hand, causes a significant drop in the price of a favourite stock but only a small decline in the price of a neglected stock.

Given such an asymmetric impact of surprises—and thanks to forecasting errors, surprises are common—it makes a lot of sense to invest in neglected stocks and to eschew favourite stocks. Empirical evidence suggests that such a strategy works. As Dreman argues: "For the findings show that companies the market expects the best futures for, as measured by the price-earnings, price-to-cash flow, price-to-book value and price-to-dividend ratios, have consistently done the worst, while the stocks believed to have the most dismal futures have always done the best."

Supplement Your Analysis with Ancillary Financial Indicators In his application of the low P/E approach, Dreman looks at the two lowest quintiles (that is the bottom 40 per cent) of the stocks and considers the following ancillary indicators:

- A strong financial position—reflected in ratios like the current ratio, debt-to-equity and interest coverage ratio—which provides the sinews to the company to weather a difficult period.
- Favourable operating and financial ratios that provide an assurance that the company has no structural flaws.
- An above-average past earnings growth rate and fair indication that it will not plummet in the near future.
- Earnings estimates that are conservative.
- An above-average dividend yield that the company can maintain and even increase.

Diversify Broadly If your assets are of sufficient size, Dreman suggests that you should invest equally in 20 to 30 stocks across 15 or more industries. Defending the diversification principle, Dreman argues: "Returns among individual issues will vary widely, so it is dangerous to rely on only a few companies or industries. By spreading the risk, you have a much better chance of performing in line with the out-of-favour quintiles shown above, rather than substantially below or above this level."

Within an Industry Buy the Cheapest Stocks as Determined by the Contrarian Strategies When Dreman wrote *Contrarian Investment Strategy* in 1980, he advocated the low P/E strategy as it was the best documented strategy to outperform the market at the time. In this later book *Contrarian Investment Strategies: The Next Generation*, he argues that there are other contrarian strategies that perform well. One of them, a powerful one, is to buy the cheapest stocks within an industry, as determined by the four contrarian strategies, irrespective of how high or low the general price of the industry group is. This is the 'relative' contrarian strategy and it enables you to participate in stocks across the board. Empirical evidence suggests that this strategy works. Dreman says: "Our study indicates the returns dwarf those of an index fund. While it is not a strategy of everybody, it will work out for investors who can afford to own a 40 or 50 stock portfolio across 30 or 40 major industry groups."

In defence of the 'relative' contrarian strategy, Dreman says: "The advantage of the relative contrarian strategy is that you have more diversification by industry than you do in the original contrarian strategies. This diversification should protect you from the underperformance that occurs when the most out-of-favour stocks and industries in the market are taboo."

Why does this strategy work? Dreman speculates: "Industry laggards often tighten their belts, improve their management and find ways of increasing their market share or developing new products, which results in their continued outperformance of the market for long periods… Now when earnings surprise pleasantly the market applauds and awards higher prices."

Don't Be Carried Away by the Short-term Record of an Analyst or a Money Manager Due to the chance factor, many experts have an excellent record for a while and occasionally even for several years. However, they are most likely to stumble later. Hence, don't be carried away by short-term performance, however impressive it may be, and don't accept investment news without ample substantiation. Dreman cautions: "If you buy the record just after a period of spectacular performance, chances are the letter writer or manager will not sustain it."

Rely More on the Base Rate and Less on the Case Rate While making a decision we are overly influenced by a recent experience and less by what happens in similar situations in the long run. As Dreman says: "People, it appears, become prisoners of such experience and view the future as an extension of the immediate past. The more memorable the circumstances are, the more they're expected to persist, no matter how out-of-line with prior norms." Put differently, we rely heavily on the 'case rate' and tend to ignore the 'base rate.'

The law of regression to the mean, however, suggests that we must pay more attention to the 'base rate' than to the 'case rate' because deviations from the long term norms are corrected sooner or later. As Dreman says: "The greater is the complexity and uncertainty in the investment situation, the less emphasis you should place on your current appraisal and

the more you should look at the rate of success or failure of similar situations." In a similar vein, Dreman says: "Don't be seduced by recent rates of return for individual stocks or the market when they deviate sharply from past norms… If returns are particularly high or low, they are likely to be abnormal."

Give Your Strategy a Reasonable Time to Work Out Investors abhor uncertainty and hence expect quick results. Any investment strategy, however, takes time to deliver results. More so, a contrarian investment strategy that is pitted against the market mood. So, give it reasonable time to work out. As Dreman argues: "Demanding immediate success invariably leads to playing the fads or fashions currently performing well rather than investing on a solid basis. A course of investment, once charted, should be given time to work out. Patience is a crucial, but rare investment commodity."

View Risk Differently Investors often equate risk with short-term volatility because they are unnerved by price fluctuation. This view is reinforced by modern portfolio theory which regards variance of returns as the measure of risk. Dreman, however, argues that a risk measure that reflects short-term volatility is not appropriate for investors who have long investment horizons – 5, 10, 15, or even 30 years.

According to him a good measure of risk should focus on preservation and enhancement or purchasing power in real terms in the long run and not on volatility of short-term nominal returns. More specifically, he lays down two criteria: (a) the probability that the investment will preserve capital (in real terms) over time; and (b) the probability that the investment selected will outperform alternative investments over time. Judged by these criteria, equities have been less risky compared to other investments, even though they are characterised by a great deal of short-term volatility.

• Charles Ellis: Playing The Loser's Game

The investment game (or money game) was a phenomenal Winner's game from late 1970s to late 2000s. Most investors who participated in this game earned healthy returns. Naturally this game attracted a lot of talented, determined, and aggressive players. Thanks to the intense competition among numerous institutional players, the money game has now become a Loser's game.

The investment management business traditionally operated on the simple premise that professional money managers can outperform the market. This premise, in turn, rested on two assumptions: (i) liquidity offered by the stock market is an advantage, and (ii) institutional investing is a Winner's game.

Unfortunately, due to important changes in the investment field, these assumptions are no longer valid. Market liquidity seems to be more of a **liability** and less of an **asset** and institutional investors may underperform the market because money management is now a **Loser's game** rather than a **Winner's game**.

Before explaining why institutional investing has become a Loser's game, let us understand the key difference between a Winner's game and a Loser's game. In an interesting book, *Extraordinary Tennis for the Ordinary Tennis Player*, Simon Ramo points toward the crucial

difference between a Winner's game and a Loser's game. Based on his extensive observation he says that tennis is not one game, but two. While professional tennis is a Winner's game, amateur tennis is a Loser's game. Professional tennis players stroke the ball with well-aimed shots and play long and often exciting rallies. Eventually one player wins the point by driving the ball or placing it deftly, beyond the reach of his opponent. It is a Winner's game because the outcome is determined by the actions of the Winner. The victor gets a higher score by **winning** more points.

Amateur tennis, on the other hand, is a different game. Well aimed powerful shots, long and splendid rallies, deft placements, and brilliant serves are rare. On the contrary, the ball is often hit into the net or pushed out of bounds. In addition, double faults at service are rather common. The amateur player rarely beats his opponent; instead he beats himself. The victor in this game is the player who gets a higher score, not because he wins more points, but because his opponent loses even more. To win this game one must avoid mistakes.

Charles Ellis[2] says that if you want to win the Loser's game, you should adhere to the following guidelines.

1. **Play your own game** Define your investment policy intelligently, adhere to it, and play your game in accordance with it. As Charles Ellis puts it: "The exciting truth is that while investors are doomed to lose if they play the loser's game of trying to beat the market, every investor can be a winner. All we need to do to be long-term winners is to orient ourselves and concentrate on realistic long-term goal setting, sound policies to achieve our goals, and the requisite self-discipline, patience, and fortitude required for persistent application."
2. **Keep it simple** As Ramo says: "Every game boils down to doing the things you do best, and doing them over and over again." Armour echoes this view: "Simplicity, concentration, and economy of time and effort have been the distinguishing features of the great player's methods, while others lost their way to glory by wandering in a maze of details." Charles Ellis put it this way: "Why not bring turnover down as a deliberate, conscientious practice? Make fewer and better investment decisions. Simplify the professional investment management problem. Try to do a few things unusually well."
3. **Concentrate on your defence** In the investment business, most of the information is purchase-oriented. Hence it is hard to outperform others in buying. So, concentrate your efforts on selling. As Charles Ellis says: "In a Winner's game, 90 per cent of all research effort should be spent on making purchase decisions; in a Loser's game most researchers should spend most of their time in making sell decisions."

• Joel Greenblatt : Magic Formula

Joel Greenblatt, one of the best value investors of our time, manages over $1 billion at Gotham. He has over the past 20 years generated an annualised return of 40 per cent. This is an extraordinary achievement. For the first 10 years, his performance was even better – an annualised return of 50 per cent.

[2] Charles D. Ellis, *Investment Policy: How to Win the Loser's Game,* Business One Irwin, 1989.

Joel Greenblatt wrote a book, *The Little Book That Beats the Market*, in which he argues that buying good businesses when they are cheap is likely to produce vastly better returns than any broad index.

Greenblatt recommends a Magic Formula that involves the following:

1. Sort out all listed U.S. stocks in descending order based on the return on invested capital (ROIC) they earn. If there are 3000 stocks in this universe, stocks like Google are ranked near the top (and hence get a very low number) and stocks of some state-owned steel companies are ranked at the bottom of the list (and hence get a high number).
2. Sort out stocks on the basis of the ascending order of price-earnings (P/E) ratio. The lowest P/E stock is ranked as 1 and the highest P/E stock is ranked 3000. Google which has a very high P/E will rank close to 3000.
3. Add the two numbers for each stock. A company like Google might get a rank close to 1 for ROIC and a rank close to 3000 for P/E ratio. Hence, the sum of the ranks for Google may be around 3001.
4. Develop a list of Magic Formula stocks. Magic Formula stocks are stocks with the lowest combined score on the two variables. To help individual investors, Greenblatt has set up the free website *www.magicformulainvesting.com*. On this website, you can enter two variables, viz., the minimum market capitalisation stocks you want to look at and the number of such stocks – 25, 50 or any other. So, if you enter $100 million minimum market cap and 100 stocks, the website will generate a list of 100 stocks with the lowest combined scores on the two variables (ROIC and P/E).
5. Build a portfolio of about 25 to 30 of these Magic Formula stocks. Greenblatt recommends that the investor buys 5–10 of these stocks every two to three months.
6. After a given stock has been held for a year, sell it and replace with another one from the updated Magic Formula.

Greenblatt, who manages over $1 billion at Gotham, uses the Magic Formula as a screen and then, after careful research and analysis, decides the stocks to buy. He seems to bet heavily on a few stocks and run a concentrated portfolio—typically his top five stocks account for more than 80 per cent of the portfolio.

• Mohnish Pabrai: The Dhandho Investor

Mohnish Pabrai is a successful entrepreneur who set up TransTech in February 1990 at a young age of 25 with a meagre investment of $30,000. TransTech, which provided client-server computing, scaled up nicely and was recognised in 1996 as one of the 500 fastest growing businesses in the U.S. In 2000, he sold the entire business for several million dollars. His investment of $30,000 fetched him nearly $4.5 million.

Inspired by Warren Buffett, he founded Pabrai Funds in 1999, modelled after the original Buffett Partnerships of 1950s and 1960s, Pabrai Funds has the following characteristics:

1. Investors pay no management fees. They only pay a performance fees which kicks in only when the return exceeds 6 per cent a year.
2. Its investment team consists of just one person, Mohnish Pabrai.
3. Mohnish Pabrai, the managing partner, ploughs back virtually all the fees he earns back into the fund.

4. Unlike other hedge funds, it does not discuss its portfolio positions in real-time with its investors. This helps in keeping noise and distractions down to a minimum.
5. It has a small number of holdings.
6. Starting with just eight investors, Pabrai Funds has (in 2007) about 400 families as investors. This is perhaps the only hedge fund with $300+ million in assets belonging to about 400 families all over the world, with virtually no participation from institutional investors and mom-and-pop investors.
7. It focuses on value investing.

From 1999, the year when Pabrai Funds was set up, to 2007 (the year when Mohnish Pabrai published his book *The Dhandho Investor*), Pabrai Funds, delivered an annualised return of over 28% (net to investors), achieving extraordinary success.

The Dhandho framework of investing is based on nine principles.

1. Focus on buying existing businesses which have a well-defined business model and a long history of operations.
2. Buy simple businesses in industries with an ultra-slow rate of change.
3. Buy distressed businesses in distressed industries. In such circumstances, the odds of finding bargains are high.
4. Buy businesses with a durable competitive advantage—the moat.
5. Bet heavily when the odds are overwhelmingly in your favour.
6. Focus on arbitrage.
7. Buy businesses at big discounts to their underlying intrinsic value.
8. Look for low-risk high-uncertainty businesses.
9. Invest in copycats rather than innovations.

• Anthony Bolton: Twelve Qualities that Make a Good Portfolio Manager

Anthony Bolton is regarded as the most successful stock market investor and fund manager of U.K. As the manager of Fidelity Special Situations Fund, he delivered a market-beating return of 20 per cent over twenty five years.

In his insightful book *Investing Against the Tide* (published by Pearson Education Limited in 2009), Anthony Bolton tells the story of his contrarian approach to investing. According to him, there are twelve qualities that make a good portfolio manager.

'The Seeing Eye' Fund management is similar to playing chess. The best fund managers can visualise ahead of their competitors. They have the vision to see not just the immediate effects of a change but also its secondary effects.

Temperament While a reasonable intelligence is essential, the right temperament is even more important. The portfolio manager must be equanimous, humble, open-minded, questioning, and persevering.

Organised Since information often comes in an unstructured manner, the portfolio manager must be well organised and disciplined. It is essential for him to prioritise his time.

Hunger for Analysis A good portfolio manager has hunger for analysis and understanding. As Anthony Bolton put it, "I think all fund managers are intellectually curious. A fund manager is always questioning and always thinking. There is no substitute in investment for doing your own thinking and one must allow time for this."

Detailed Generalist A good fund manager should be fairly knowledgeable about a wide range of businesses and industries. His knowledge should be both broad and reasonably deep. He should also be able to get up to speed quickly on new subject.

Desire to Win Fund management is a highly competitive business where performance is measured on a daily basis. While investment management business produces no value, it costs at least 1 per cent to play this game. As Jeremy Grantham put it: "In total, we are the market, and given costs, we, collectively *must* underperform. It is like a poker game in which the good portfolio manager must inflict his costs and his profits on to the loser. To win by 2 per cent, you must find a volunteer to lose by 4 per cent every year." In this intensively competitive environment, fund managers must have a strong desire to succeed.

Flexible Conviction While a fund manager needs conviction in his views, he should have sufficient flexibility to change his views. As Anthony Bolton put it, "In investment, there is often a narrow line between certainty and uncertainty and to be too certain can be a disadvantage—one needs a continually open mind."

Happy to Go Against the Crowd A good fund manager has an independent mind, willing to challenge conventional wisdom. As Anthony Boulton put it, "A good investor is not worried about what others think despite Keynes' observation that 'worldly wisdom teaches that it is better for the reputation to fail conventionally than to succeed unconventionally'."

Know Yourself There are many approaches to play the stock market game. As a fund manager, you must establish what works for you and then stick to it. Find a style or method that suits you and then adhere to it.

Experience Mark Twain said, 'history never repeats itself, but it rhymes.' In the world of investments, some patterns tend to recur over time. A fund manager with long experience has better ability to put today's events in a historical context. Further, a good fund manager is always learning.

Integrity Integrity means being honest with clients, colleagues, and companies – and above all, with oneself.

Common Sense When you come across something new or unusual in an investment, always ask: Does it make sense? Use your common sense and remember that when something is too good to be true it probably is.

India's Money Monarchs

In an interesting book titled *India's Money Monarchs*, Chetan Parikh, Navin Agarwal, and Utpal Seth reported their interviews with leading investors and money managers of India. Here are some insightful observations made by them.

1. Raamdeo Agarwal: "I believe that if you identify about ten fast growing large companies and even if you are wrong on 3–4 of these, you could still get the desirable result."
2. Sameer Arora: "We really aim to anticipate and recognise change early. Perhaps the maximum amount of money is made early in the cycle, when there is a maximum change in a company, an industry, the perception of a company, in corporate governance, and so."
3. Sanjoy Bhattacharya: "Asset allocation is far more important than valuation… Valuation is the most overworked thing going around in investing. Because it is simple and permits analytical dexterity, people spend too much time over it… Common sense and discipline are key to investing success."
4. Manish Chokhani: "So when everyone thinks that the trend is down, things are going to basically completely crash and burn and die, we get excited. Or when the trend is up and people think that this is going to grow to the moon, we are fearful."
5. Kisan Choksey: "Most investors do not look at risk, but look at returns. One must ensure margin of safety in investment decisions and wait for opportunities rather than diving headlong into markets, especially in frenzies… If you have the money and the patience, you will get the opportunity to make money."
6. Arjun Divecha: "We have two very simple ideas. We buy cheap and we buy momentum. But we do it every single month and we don't flinch… We place a big bet when there is value and positive momentum."
7. Sanjiv Duggal: "We are basically business cycle investors, wherein we decide which sectors to buy or sell depending upon the business or economic cycle we are in. Having analysed India from an investment point of view, we are then able to assess the Indian markets and identify investment opportunities."
8. Prashant Jain: "I think it (i.e. portfolio management) is an art to the extent that you are dealing with something that is not definite. I mean you have to anticipate the future. Ascertaining the quality of the management and the sustainability of the business is an art… It is science to the extent that you have benchmarks available – you have equations and formulae that help you to arrive at a particular value."
9. Rakesh Jhunjhunwala: "I look at an investment opportunity where I feel that my capital is safe and the possible upside is large. I keep reviewing my investment decisions continuously and sell when I feel that the time is ripe. So I have no fixed targets."
10. Parag Parikh: "I believe in diversification, but diversification in another way is investing in different vehicles like stocks, debt, bonds, mutual funds, real estate, etc. As far as stocks are concerned, ideally we would like to have a maximum of 15 stocks in a portfolio. We don't put more than 10 per cent of the corpus in any stock."
11. Sukumar Rajah: "My investment philosophy is very simple. My objective is to invest in businesses that can generate superior return on capital over a period of time. I think this can come primarily out of intellectual capital mostly in terms of quality of

management and depending on the businesses, the types of competitive advantages the management can build into a business."

12. Chandrakant Sampat: "I think there are 5 attributes that an investor should be looking at: (1) Management quality. (2) Is there any allocable capital in the balance sheet? (3) The competitive advantage period. (4) The RONW (return on net worth). (5) The understanding of risk and what we pay for it."
13. Bharat Shah: "The most important thing is to read the annual report carefully… The annual report also contains discussions by management that tells you what they think will happen in the future… In addition, an objective dispassionate analysis of the past numbers done meticulously is an indispensable attribute to good stock picking."
14. Nilesh Shah: "In a real sense, we don't have any fixed valuation tool. We don't use the DCF valuation model because our forecasts are fairly hazy beyond one or two years. Also, in emerging markets like ours we have high event risks. So, we try to arrive at valuations based on multiples (P/E, P/B)."
15. Ruchir Sharma: "There are three cornerstones to our investment philosophy—valuations, dynamics and sentiment—that we pay a lot of attention to when it comes to analysing any asset class (or stock or market or currency). However, the weightage that one gives to each of them is very subjective."

11.4 ✦ ACADEMIC RESEARCH ON VALUE INVESTING[3]

This section discusses how value investing is treated in recent academic research and explores the basics of Piotroski's F-Score. The F-Score uses publicly available financial information to identify stocks that are likely to provide superior rates of return.

Practitioners who identify themselves as *value investors* tend to analyse each stock and combine the results of the analysis with their judgement to arrive at a valuation. As noted earlier, they take large positions in the stocks they consider are undervalued and tend to hold concentrated portfolios. They also find beta to be not useful in thinking about risk. Nor do they believe CAPM to be a useful model of how assets are priced. Their approach is to employ case by case analysis rather than an algorithmic method.

In contrast, when the terms "value investing" or "value stocks" are discussed in academic research, they usually refer to selection of stocks based on some mechanistic screening process–typically based on some valuation ratio such as price to earnings ratio or price to book ratio. In recent literature the term "value stocks" typically refers to stocks with high book to market ratios (or low price to book ratios), as in the title of the paper "Size, Value, and Momentum in International Stock Returns" by E. Fama and K. French (*Journal of Financial Economics*, 2012.)

It should be noted that when the term "value" is used to describe mutual funds or exchange traded funds it is in the sense in which it is used in academic research rather than the practitioners who follow the Graham and Dodd approach. For example, the S&P 500 Value Index has stocks chosen based on the price to book ratio or the price earnings ratio and the price to sales ratio.

[3] Contributed by Richard Ponarul, Professor of Finance, California State University, Chico.

• CAPM and Alpha and Undervalued Stocks

According to the capital asset pricing model (CAPM), the risk premium to be earned from a stock is proportional to its risk measured as beta.

As shown in Chapter 2, the security market line (SML) relationship states the following.

Expected return on security *i* = Risk free return + Market risk premium x Beta of security *i*

Since risk premium for any stock is its expected return minus the risk free rate, we can state this relationship as: Risk premium for a given stock is simply the stock's beta times the risk premium for the market portfolio. If it was possible to identify stocks with risk premia in excess of what is stated in the SML relationship then those stocks are considered undervalued as per the CAPM. Undervalued stocks are said to have a positive alpha.

Alpha = Estimated risk premium – Risk premium as per SML

The term alpha to measure undervaluation (equivalently, superior future returns) has become standard usage in the investment industry.

When CAPM is combined with the efficient market hypothesis we conclude that when markets are efficient the alpha will be zero for every stock since there will be no under or overvalued stocks.

• Market Inefficiency or Model Inadequacy?

As discussed in Chapter 10, research by S. Basu and J. Lakonishok, A. Shleifer, and R. Vishny shows that low P/E stocks and high book to market ratios outperform the market average on a risk adjusted basis. Such results that contradict the received pricing model are usually listed as anomalies in the textbooks. One conclusion is that the markets, for some reason, do not value these stocks correctly. And this misevaluation happens period after period. Behavioural finance theorists are comfortable with this view.

An alternative conclusion, usually embraced by the traditional finance camp, is that the pricing model is missing some dimensions of risk and these missing dimensions of risk are producing compensation for risk bearing. Such compensation for risk that is not accounted for in CAPM appear as alphas. This approach led Fama and French to add two additional types of risk factors – size and value (book to market) – in their pricing model so that the value premium is now part of the pricing model. Over time, additional risk factors were added and currently we have a five factor model. The five factors are: (1) beta from CAPM, (2) size, (3) book to market ratio, (4) profitability and (5) investment patterns.

• Identifying Winning Value Stocks Using Financial Information

In his paper titled "Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers," (*Journal of Accounting Research*, 2000) Joseph Piotroski proposed an approach to identify those value stocks (defined as stocks with low price to book ratios) which are likely to perform better than others. His paper is from a long line of research into the value of fundamental analysis for selecting stocks for investment.

Piotroski seeks to sort the high BM stocks (high book to market or low price to book ratio stocks) based on published financial data to identify a subset of these stocks that are expected to perform better than the rest. High BM stocks tend to earn a risk premium. However, the subset identified appears to be undervalued relative to the average high BM stock.

The financial information to identify undervalued stocks comes from three areas: profitability, leverage/liquidity, and efficiency. The F-Score is computed for each stock for each year from the following nine signals assigning either 0 or 1 to each of the 9 signals as shown below.

- Profitability
  - Return on assets (ROA) (1 if positive and 0 otherwise)
  - Cash flow from operations scaled by total assets (CFO) (1 if positive and 0 otherwise)
  - Change in ROA from the previous year (1 if positive and 0 otherwise)
  - Accrual (1 if CFO > ROA and 0 otherwise)
- Leverage/liquidity
  - Change in the long term debt to assets ratio (1 if negative and 0 otherwise)
  - Change in the current ratio (1 if positive and 0 otherwise)
  - Equity offering in the previous year (1 if no offering and 0 otherwise)
- Efficiency
  - Change in gross profit margin from the previous year (1 if positive and 0 otherwise)
  - Change in asset turnover from the previous year (1 if positive and 0 otherwise)

The F-Score computed thus should range from 0 to 9. Portfolios of high BM stocks are formed for each F-Score after a 5 month period after the financial ratios are available to ensure that market has had sufficient time to digest the publicly available financial results. One year rates of return for high F-Score portfolios outperform a portfolio of all high BM stocks. The results are found to be similar when the test is repeated for small cap, mid cap and large cap firms.

Piotroski's F-Score is shown to predict superior financial performance in future periods. Thus F-Score results cannot be interpreted to mean a hidden dimension of risk that earns a risk premium. They have to be due to the slowness with which market processes financial information. According to Piotroski "the results show that investors can use relevant historical information to eliminate firms with poor future prospects from a generic high BM portfolio."

Piotroki's results are based on data from the years 1976 to 1996. Subsequent research in this area seems to confirm the effectiveness of the F-Score for more recent periods and for other markets. For example, Nicole Choi and Richard Sias (*Review of Financial Studies, 2012*) confirm the basic F-score results. They further show that institutional trading plays an important role in the gradual incorporation of the available financial information. In addition to forecasting future financial performance, the F-Score also forecasts future demand for the stock by institutional investors.

SUMMARY

- There is a minority of investors who are psychologically smart and who follow a disciplined approach that gives them an edge over others. Though these investors may pursue diverse approaches, a good proportion of them seem to be practitioners of an approach called value investing.
- As an investment paradigm, value investing refers to purchases of securities or assets for less than their worth. When we say value investing, both the words, value and investing, are significant. First, value investors do careful valuation. Second, value investors believe in investing, not trading or speculating.
- Almost all value investors seem to swear by Benjamin Graham and Warren Buffett. Value aficionados regard Benjamin Graham as the intellectual father and Warren Buffett as the most pre-eminent practitioner of value investing.
- The stock market is very exciting and misleading in the short turn, but boringly reliable and predictable in the long run. These two facets of the market may be called Mr. Market and Mr. Value.
- Value investors seek to exploit the discrepancy between value and price. If the price is significantly less than value, they buy. If the price exceeds value, they sell. For them the market is there to serve them, not instruct them.
- Value investors regard securities as fractional ownership in the underlying business and not as speculative instruments. So, the value of a security reflects the value of the underlying business.
- Value investors buy stocks at a significant discount to their intrinsic value, implying that they look for a large 'margin of safety.'
- Based on their competence and the perceived opportunity set, value investors have clarity about where they'll look for investment ideas.
- Value investors are wary of the recommendations of Wall Street analysts because of potential conflict of interest.
- Given the risk of imitating others and joining the crowd, you must cultivate the habit of contrary thinking. This may be difficult to do because it is so tempting and convenient to fall in line with others. Perhaps the best way to resist such a tendency is to recognise that investment requires a different mode of thinking than what is appropriate to everyday living.
- Value investors consider stock investing to be a marathon, not a 400-meter sprint. In this marathon, winners and losers are determined over periods of several years, not months.
- The ability to maintain composure is also a virtue required to be a successful investor. Conscious of this, as an investor you should try to (a) understand your own impulses and instincts towards greed and fear; (b) surmount these emotions that can warp your judgment; and (c) capitalise on the greed and fear of other investors.

- Since an open mind, not blocked by prejudices and biases, is crucial for success in investing, conscious and deliberate efforts should be made to re-examine old premises, assimilate new information, and cultivate mental flexibility.
- An investor often has to act in face of imperfect information and ambiguous signals. Investment decisions generally call for reaching conclusions on the basis of inadequate premises. To succeed in the investment game, the investor should be decisive. If he procrastinates, he may miss valuable opportunities; if he dillydallies, he may have to forego gains.
- When financial academics refer to risk they almost always mean only *market risk* and that too very short-run market risk. For value investors, such risk is of little concern. What matters most to them is *investment risk*—the possibility that something could go wrong with the company or securities covenants.
- A shared characteristic of eminent value investors is simplicity, which is a powerful construct.
- Value investors try to achieve selling discipline by laying out well-defined criteria for determining when to sell.
- Value investing is at least in three different ways or senses demonstrably the most successful approach to investing from an empirical point of view.
- Benjamin Graham, widely acclaimed as the father of security analysis, was an exceptionally gifted quantitative navigator who relied on hard financial facts and religiously applied the 'margin of safety' principle.
- Philip Fisher, a prominent growth stock advocate, displayed rare ability in judging the potential of businesses and evaluating management capabilities.
- Warren Buffett, the most successful investor of our times, is the quintessential long-term investor with an exceptional ability in evaluating business "franchise."
- John Templeton had an unusual feel for bargain stocks and achieved remarkable success globally.
- Peter Lynch, perhaps the most widely read investment guru in recent years, performed unusually well, thanks to a rare degree of openness and flexibility in his approach.
- David Dreman, regarded by many as the 'dean' of contrarians, has an impressive record of investing in a disciplined way in out of favour stocks.
- Charles Ellis, a highly respected investment thinker, says that the investment game has turned from a Winner's game to a Loser's game. To win this game one must avoid mistakes and concentrate on defences.
- Joel Greenblatt recommends a magic Formula based on ROIC and P/E multiple.
- Mohnish Pabrai has developed the Dhandho framework for value investing based on nine principles.
- Anthony Bolton believes that the following twelve qualities make a good portfolio manager: 'the seeing eye,' temperament, organised, hunger for analysis, detailed

generalist, desire to win, flexible conviction, happy to go against the crowd, know yourself, experience, integrity, and common sense.

- In a book titled *India's Money Monarchs*, Chetan Parikh, Navin Agarwal, and Utpal Seth have tried to capture the strategies followed by some of India's leading investors.
- Joseph Piotrosky has proposed an approach to identify those value stocks (defined as stocks with low price to book ratios) which are likely to perform better.

DISCUSSION QUESTIONS

1. Discuss the following tenets or ideas: Mr. Market and Mr. Value, fractional ownership, margin of safety, and circle of competence.
2. Discuss the following tenets or ideas: mean reversion, concentrated portfolio, and focus on absolute return.
3. What is contrary thinking? How can one cultivate the contrary approach to investment?
4. Why is value investing demonstrably the most successful approach to investing from an empirical point of view.
5. "The prospects for value investing seem to be better than what many think." Why?
6. "Benjamin Graham was a quantitative navigator." Illustrate.
7. Explain the technique of Philip Fisher.
8. Discuss the key tenets of the Warren Buffett's strategy for investing.
9. Describe the Rules of Investment Success spelt out by John Templton.
10. Distill Peter Lynch's advice presented in his book *One Up on Wall Street*.
11. Expound the rules of contrarian investment strategy articulated by David Dreman.
12. What is the difference between a Winner's Game and a Loser's Game? How should the Loser's Game be played according to Charles D. Ellis?
13. Describe Joel Greenblatt's Magic Formula.
14. Discuss Mohnish Pabrai's principles of investing.
15. Discuss the twelve qualities of portfolio manager, according to Anthony Bolton.
16. Describe the strategies followed by some of India's leading investors.
17. Discuss the approach proposed by Joseph Piotrosky to identify value stocks which are likely to perform better than others.

MINI CASE

WARREN BUFFETT'S VALUE PICKS

Warren Buffett, Chairman and CEO of Berkshire Hathaway (Berkshire, hereafter), a holding company, is a quintessential value investor. Here is a sampling of his decisions.

- When the price of Coca Cola stock crashed in 1988 in response to a disastrous roll out of Diet Coke, Warren Buffett started buying up Coca Cola like an addict. Within a few months, Berkshire acquired 7 per cent of Coca Cola's stock for about $ 1 billion. Within three years, Berkshire's Coca Cola holding was worth more than the entire value of Berkshire when the investment was made. When Coca Cola's price was depressed, Buffett considered it as a compelling bargain for three reasons. First, consumers have a very strong brand preference for Coca Cola. Second, an average American, once he starts drinking Coca Cola, requires five bottles a day for the rest of his life. Third, 40 per cent of Coca Cola is just fizz.
- When the stock of China Petro was selling cheap Warren Buffett invested $ 488 million. Subsequently, he divested his holding for $ 4 billion.
- In 2002, the 6.875 per cent 2010 euro-denominated bonds of Amazon.com were selling at 57 per cent of par. These bonds were selling at a steep discount because they were priced as junk bonds, though they were anything but junk bonds. Perceiving them to be hugely underpriced Berkshire purchased $ 310 million Amazon.com bonds and later sold them at a gain of $ 246 million. He commented: "Yes, Virginia, you can occasionally find markets that're ridiculously inefficient - or at least you can find them everywhere except the finance department of leading business school."
- In 2002 Berkshire purchased Brazilian real which in Buffett's assessment was undervalued vis-a-vis the U.S. dollar. This position yielded a profit of $ 2.3 billion over a five year period.
- In 2007 Berkshire sold put options on four stock indices (the S&P 500 and three foreign indices). These puts had original maturities of 15 or 20 years and were struck at the market, meaning that they were exercisable at a price equal to what was prevailing in 2007. These contracts are *exercisable only* at their *expiration dates*, which occur between 2022 and 2027. This means that Berkshire will have to pay only if the index in question quotes at a level below the level that existed when the put was written. For writing these contracts Berkshire received premiums of $ 4.5 billion. Buffett believed that these contracts, in aggregate, will be profitable. Further, Berkshire would receive substantial income from its investment of the premiums over 15 to 20 years.

Discussion Question

1. Comment on Warren Buffett's value picks.

APPENDIX 11A

GURUS OF CHAOS

While a number of books have been written about value investors in the U.S., the literature about value investors and value investing in India is very sparse. In a pioneering book titled *Money Monarchs in India*, Chetan Parikh et al. have provided valuable insights. A more recent work is a fascinating book titled *Gurus of Chaos: Modern India's Money Monarchs* written by Saurabh Mukherjea, CEO of the Institutional Equities business at Ambit. In this book Mukerjea discusses the key principles of long-term investing and describes how some of the most successful long-term investors in India have done it. This appendix summarises Mukherjea's work.

11A.1 ✦ KEY PRINCIPLES OF LONG-TERM INVESTING

Successful long-term investing depends on:

- Relentless research
- Simple rules of thumb
- A reflective mind

• Relentless Research

Successful investors search more widely, dig deeper, and keep an open mind to all ideas. The four broad areas that professional investors focus their research efforts on are:

- Sustainable competitive advantage
- Quality of the financial statements
- Competence of promoters
- Integrity of promoters

• Simple Rules for Successful Investing

Successful long-term investors use a simple set of rules, which in Mukherjea's words are as follows:

Rule 1: Only buy a stock if you understand the business model.
Rule 2: Only invest in companies which can generate cash flows and high return on capital employed (ROCE) for long periods of time.
Rule 3: Buy the franchises identified by rule 2 when they are available at prices which build in a 'margin of safety.'

• Reflective Mind

To successfully invest for the long run, one must learn to control the 'reflexive brain.' As pointed out by Daniel Kahneman, human beings have a 'reflexive brain' that helps in dealing with external stimuli and reacting instinctively in the most effective manner possible and a 'reflective brain' that helps in thinking, analysing, and making intelligent decisions. While the reflexive brain has served us well for millions of

years, it leads us astray in the modern world, where life is full of complicated problems beyond just immediate physical threats.

In the world of investing, under the influence of reflexive brain which usually dominates the reflective brain investors can fall into the following traps: Trap 1: What you see all there is (WYSATI), Trap 2: Anchoring and priming, Trap 3: An aversion to the unfamiliar, Trap 4: Overweighting low probabilities.

Successful long-term investors train themselves to avoid these traps. They cultivate the reflective mind so that the investment decisions are not affected by the reflexive mind. More specifically, successful long-term investors display the following traits: skepticism, risk aversion, openness of mind, patience and preparedness, and, contrarianism.

Is it possible to cultivate the traits required for long-term investment success? Scientific research in neuroscience and psychology suggests that these traits can be acquired even in advanced stages of adulthood provided we are willing to put in the required effort.

11A.2 ✦ GURUSPEAK

Mukherjea interviewed several investment gurus who have achieved long-term investment success in India. Here are some observations by them.

Sanjoy Bhattacharya "The truly important lessons that I have learnt in the last couple of decades with regard to investing are above all stay patient, have true humility and always retain the zest to develop intellectually. The need to have an eclectic mindset, read extensively and have a genuinely multi-disciplinary perspective is absolutely vital. It is probably far more important to study psychology, statistics and sociology than economics and accounting!"

Alroy Lobo "We are focused on valuation, businesses and managements. We are not value investors in that we don't buy stocks just because they are very cheap. They have to be good businesses with good managements and available at good valuations. All three boxes have to be ticked."

Akash Prakash "Our view has always been that we need to invest in companies where we can trust in the people who are running the company. Trust, in turn, is driven by capital allocation. Where you get shafted by entrepreneurs, other than through theft and bad accounting by crooks, is capital allocation. In an environment like India, where you always have so many 'perceived good opportunities', if you invest in poor capital allocators, you will never get a return."

Sankaran Naren "I find the trailing PE a very useful multiple. Even in 2007, the trailing PE of any capital goods company was frightening because it was around 50. Given my experiences in the 1990s, whenever I see trailing PEs of more than 40, a big red light is switched on in my head. So in that sense spotting the infra bubble in 2007 was, in cricketing terms, a "sitter."

Sashi Reddy "There is a benchmark element because many clients require it. In our minds we don't worry about the benchmark. We start with a blank sheet of paper and own the 30-40 highest quality companies at reasonable valuations at any point in time. We believe if one delivers long-term performance using an absolute return mindset then the relative performance should be taken care of."

B.N. Manjunath "So gradually the lessons dawned on us that success is a matter of picking up good companies and not really worrying too much about the macro call. Since then the only two macro variables I have been concerned about are interest rates and the exchange rate."

Anonymous "I think people who run investment boutiques are in a better position in that they can sit back and take a long term call and I think they are less impacted by the day-to-day pressure. They have a smaller set of clients whom they know very well they can probably deliver better value to those clients. An individual investor can probably deliver better value than a portfolio manager. In fact, an individual who knows his risk appetite and his holding period I think has an edge over the professional investor."

APPENDIX 11B

EXPECTATIONS INVESTING PROCESS

Stock and bond prices are a gift from the market, a gift of information that reflects how investors are pricing these securities. Drawing upon modern finance theory, expectations investing identifies the market expectations embedded in the prevailing prices of securities. It then uses appropriate competitive strategy frameworks to guide investors in determining where and when revisions in expectations are likely to occur. This, in turn, serves as the basis for investment decisions. These steps are elaborated below:

Step 1: Estimate Price-Implied Expectations The long-term discounted cash flow model is the model used by the market for pricing stocks. Using this model, the expectations of the market may be inferred.

Step 2: Identify Expectations Opportunities Once the current market expectations are estimated, appropriate strategic and financial tools are applied to determine where and when expectations are likely to occur.

Step 3: Buy, Sell, or Hold? Based on where and when expectations are likely to occur, appropriate investment decisions (buy, hold, or sell) must be taken. While making these decisions, investors should ensure that: (a) prospective buys or sells must offer a clear-cut "margin of safety," and (b) decision-making pitfalls are avoided (behavioural finance insights are helpful in this regard).

APPENDIX 11C

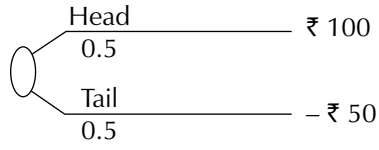
FEW BETS, BIG BETS

Skillful, long-term investors like Warren Buffett make few, well-considered, big bets. As his business partner, Charlie Munger says, "The wise ones bet heavily when the world offers them an opportunity. They bet big when they have the odds. And the rest of the time, they don't. It is just that simple."

John Larry Kelly Jr., a researcher, came up with a useful formula for calculating the optimal fraction of bankroll to be put on a favourable bet. The formula is:

$$\text{Optimal fraction to bet} = \frac{\text{Edge}}{\text{Odds}}$$

To understand what edge and odds mean, let us consider an example. Suppose that the payoffs from the toss of a balanced coin are as follows:



The edge is the expected payoff. In this case:

$$\text{Edge} = 0.5 \times 100 - 0.5 \times 50 = ₹25$$

The odds are what you win, if you win. In this case, the odds are ₹100.

So, the Kelly's formula suggests that the optimal fraction of bankroll to be bet is:

$$\frac{\text{Edge}}{\text{Odds}} = \frac{₹\ 25}{₹\ 100} = 0.25$$

Let us look at another example. The probability distribution of payoffs from a bet is as follows:

Probability	*Payoff*
0.80	21.0
0.10	7.5
0.10	–1.0

Given the above data, we get

Edge (or expected value) = $0.8 \times 21 + 0.1 \times 7.5 + 0.1 \times (-1.0) = 17.45$

Odds = 21

$$\text{Optimal fraction to be bankrolled} = \frac{17.45}{21.0} = 0.83$$

• Normalisation

We have looked at one bet at a time to calculate the optimal fraction. What happens if there are a number of bets and the sum of optimal fractions corresponding to these bets is more than 1 (or 100 per cent). In such a case we have to resort to normalisation, which simply means linearly scaling down all the fractions (percentages) so that their sum adds up to 1 (100 per cent). An example of such normalisation is shown below:

Bet	*Kelly Formula %*	*Normalised %*
1	80	20
2	70	17.5
3	60	15.0
4	55	13.75
5	45	11.25
6	35	8.75
7	30	7.50
8	25	6.25
	400	100

SOLVED PROBLEM

1. Sriram is considering four investment opportunities, P, Q, R and S. He has estimated the probability distribution of their payoffs as follows:

P		*Q*		*R*		*S*	
Payoff	*Probability*	*Payoff*	*Probability*	*Payoff*	*Probability*	*Payoff*	*Probability*
60	0.6	50	0.4	80	0.4	100	0.4
–20	0.5	5	0.6	–10	0.6	–20	0.6

What proportions of his wealth should Sriram bet on these four investment opportunities?

Solution

The edge, odds, and the edge-to-odds ratio for these opportunities are:

Opportunity	*Edge*	*Odds*	*Edge/ Odds*
P	$0.6 \times 60 - 20 \times 0.5 = 26$	60	26/60 = 0.43
Q	$0.4 \times 50 + 0.6 \times 5 = 23$	50	23/50 = 0.46
R	$0.4 \times 80 - 0.6 \times 10 = 26$	80	26/80 = 0.33
S	$0.4 \times 100 - 0.6 \times 20 = 28$	100	28/100 = 0.28

The normalised percentages for the four bets are:

Bet	*Kelly Formula (%)*	*Normalised (%)*
P	43	28.7%
Q	46	30.7%
R	33	22.0%
S	28	18.7%
	150	100.1%
	* Rounding off error.	

PROBLEM

1. Considering five investment opportunities, A, B, C, D, and E and estimate the probability distribution of their payoffs as follows:

A		*B*		*C*		*D*		*E*	
Payoff	*Probability*	*Payoff*	*Probability*	*Payoff*	*Probability*	*Payoff*	*Probability*	*Payoff*	Probability
40	0.3	80	0.2	20	0.8	60	0.4	15	0.8
20	0.5	40	0.5	10	0.1	30	0.3	10	0.1
–10	0.2	–30	0.3	2	0.1	–50	0.3	5	0.1

What proportions of your wealth will you bet on these five options?

■ ■

PART IV

Behavioural Corporate Finance

Chapter **12**

Behavioural Corporate Finance

Firms raise funds by issuing equity, selling bonds, borrowing from banks and financial institutions, issuing commercial paper, and generating operating cash flows. Firms deploy funds by investing in fixed assets (land, buildings, plant and machineries), engaging in mergers and acquisitions, building inventories, giving loans and advances, paying interest, taxes, and dividends, and repurchasing shares.

Virtually all of the above-mentioned decisions involve risk. The traditional approach to such decisions focuses on value maximisation using the discounted cash flow (DCF) analysis. In DCF analysis, the expected cash flows associated with a decision are discounted at a risk-adjusted discount rate to calculate the net present value. Decisions that have a positive net present value are taken as they enhance firm value.

The material taught in traditional corporate finance courses provides powerful techniques that in theory help managers in making decisions to maximise the value of their firms. In practice, however, psychological pitfalls hinder managers in applying these techniques correctly.

This chapter discusses various psychological pitfalls that affect corporate financial decisions and offers suggestions on how to mitigate the impact of these pitfalls. Before we examine in detail the behavioural aspects of corporate finance, let us broadly understand how corporate finance is viewed from rational and behavioural perspectives.

Corporate finance is primarily concerned with financial contracts and investment behaviour that emerges from the interaction of managers and investors. An explanation of financing and investment patterns calls for a correct understanding of the beliefs and preferences of managers and investors. The bulk of the research in corporate finance assumes that these beliefs and preferences are fully rational. Agents are expected to develop unbiased forecasts about future events and use these for making decisions that best further their own interests. From a practical point of view, it means that managers can assume that capital markets are efficient and hence prices rationally reflect public information about intrinsic values. Similarly, investors can assume that managers will act in their self-interest and respond rationally to incentives embedded in compensation contracts, the market for corporate control, and other governance structures.

Behavioural corporate finance replaces the traditional rationality assumptions with behavioural assumptions that are based on empirical evidence. There are two broad approaches

to behavioural corporate finance. The first approach may be called the "rational manager with irrational investors" approach. It assumes that while investors are irrational, managers are rational. The second approach may be called the "managerial heuristics and biases" approach. It assumes that managers are less than fully rational. The bulk of the research in the "managerial heuristics and biases" literature has focused on the illusions of optimism and overconfidence. Optimism means an overestimate of the mean ability or outcome and confidence implies an underestimate of the variance of an outcome. In practice, of course, there may be multiple channels of irrationality.

This chapter discusses these two approaches to behavioural corporate finance. It begins with the implications of 'irrational investors and managers approach' and then examines the consequences of managerial biases for various types of corporate finance decisions. It is divided into seven sections as follows:

- Rational managers with irrational investors approach
- Valuation
- Capital budgeting
- Capital structure
- Dividend policy
- Mergers and acquisition
- Agency conflicts and corporate governance

12.1 ✦ RATIONAL MANAGERS WITH IRRATIONAL INVESTORS APPROACH

This approach assumes that market inefficiencies or mispricings exist (thanks to irrational investors and limited arbitrage) and managers recognise these mispricings to make decisions that exploit or further encourage mispricing. The decisions that they take to maximise the short-term value of the firm, however, may lower the long-run value of the firm when prices converge to fundamental values.

It appears that managers balance three objectives: fundamental value, catering, and market timing. The first goal is to maximise the intrinsic (fundamental) value of the firm. This means choosing and financing investment projects meant to increase the rationally risk-adjusted present value of future cash flows.

The second goal is to maximise the current market value of the firm. In a perfect (efficient) capital market, the first two objectives are the same, since market efficiency implies that price equals fundamental value. However, when there is mispricing, managers try to "cater" to short-term investor demands by choosing investment projects or financing packages or other actions that maximise the appeal of the firm's securities to investors. Inter alia, catering may include:

- Investing in a particular technology that is currently hot.
- Adopting a conglomerate structure or a single-segment structure depending on what the market fancies.
- Changing the name of the company. For instance, during the Internet craze of the late 1990s, many companies changed their names to "dotcom" names.
- Managing earnings.

- Initiating dividends.
- Issuing bonus shares or splitting shares.
- Acquiring companies by paying with overvalued stocks.

The third goal is to exploit the current mispricing for furthering the interest of existing, long-term investors. This is done by resorting to a "market timing" financing policy. This involves selling securities that are temporarily overpriced and repurchasing securities that are temporarily underpriced. Such a policy transfers wealth from the new or the outgoing investors to the ongoing long run investors. The wealth so transferred is realised as mispricing corrects itself in the long run.

12.2 ✦ VALUATION

The standard valuation model for computing the intrinsic value of equity shares is $P_0 = D_1/(r - g)$ where D_1 is the dividend expected a year from now, r is the discount rate, and g is the constant growth rate applicable to dividends. The constant growth rate is obtained by multiplying the ploughback ratio (the proportion of earnings that is retained by the firm) and the return on equity.

There is an alternative approach to equity valuation that focuses on the growth opportunities of the firm. This involves decomposing equity value into two components. The first component represents the value of the firm when it pays its entire earnings as cash dividends. The second component represents the (net) present value of growth opportunities (PVGO or NPVGO). Under this approach, $P_0 = E_1/r$ + PVGO. In this equation, P_0 is the value per share, E_1 is the expected earnings per share over the next year, r is the discount rate, and PVGO is the NPV of growth opportunities.

• Valuation Heuristics

Surveys of valuation techniques used in practice suggest that financial executives and analysts use the traditional DCF approach as well as some non-DCF heuristics. *P/E* ratio, PEG ratio, and price-to-sales ratio appear to be the most commonly used non-DCF heuristics.

P/E Heuristic To value a company using the *P/E* ratio, you need two terms, a *P/E* ratio and an earnings estimate. The *P/E* ratio is usually a forward *P/E*, expressed as P_0/E_1, where P_0 is the current price per share and E_1 is the forecast of earnings per share for the following year.

The valuation identity used is: $P_0 = P_0/E_1 \times E_1$. This relationship is used to forecast the future price. P_1, the forecast of price a year hence, is estimated as: $P_1 = P_1/E_2 \times E_2$. Of course, arriving at sensible forecasts of P_1/E_2 and E_2 can be challenging.

PEG Heuristic A firm's PEG ratio is its *P/E* ratio divided by its expected earnings growth rate (actually expected earnings growth rate × 100). The PEG valuation heuristic is based on the premise that stocks of high-growth firms justify higher *P/E* ratios compared to stocks of low growth firms.

The valuation identity used is: $P_0 = \text{PEG} \times E_1 \times G$, where G is growth rate $\times 100$. Like the *P/E* heuristic, the PEG heuristic can be used to forecast P_1, the price a year hence. Of course, doing so requires the forecasts of the PEG ratio that will apply a year from now, earnings per share for year 2, and the growth rate over the forecast period.

Price-to-Sales Heuristic The structure of the price-to-sales heuristic is identical to that of the *P/E* heuristic, except that future earnings are replaced by future sales. The valuation identity used is $P_0 = P_0/S_1 \times S_1$, where S_1 represents sales.

• Biases

Excessive Optimism Financial executives and analysts tend to make overly optimistic forecasts of future earnings and *P/E* ratios.

The 1/*n* Heuristic Most analysts use the DCF method along with two to three valuation heuristics and assign the same weight to each method. In other words, they use the $1/n$ heuristic, a rule of thumb, that assumes that all the methods are equally valid. The $1/n$ heuristic makes sense, if the biases associated with the various methods tend to cancel out. There is no reason to assume that this will happen.

Agency Conflicts As agents of financial organisations that solicit business from firms being covered, analysts face conflict of interest. The managers of their client organisations would prefer a favourable valuation and they are likely to be nudged by their employers to oblige their clients. As a result, their objectivity is likely to be compromised.

Deficient Corporate Governance and Managerial Irrationality

Just the way *limited arbitrage* is a requirement for the market timing and catering approach, *deficient corporate governance* is a requirement for less-than-fully rational managers to have an impact-efficient corporate governance serves as a check on managerial irrationality, whereas deficient or limited corporate governance brooks managerial irrationality.

The assumption of limited corporate governance seems no less reasonable than the assumption of limited arbitrage. As Malcolm Baker and Jeffry Wurgler mentioned in their *Behavioral Corporate Finance—A Current Survey:* "Indeed, in the US, a significant element of managerial discretion is codified in the business judgment rule. Takeover battles and proxy fights are notoriously blunt tools. Boards may be more a part of the problem than the solution if they have their own biases or are pawns of management."

12.3 ✦ CAPITAL BUDGETING

The textbook approach to capital budgeting involves three major steps. First, estimate the post-tax incremental cash flows associated with the project. Second, compute the weighted average cost of capital (WACC). In calculating the WACC, calculate the cost of equity using

the capital asset pricing model and use market value weights. Third, determine the net present value (NPV) of the project and accept it only if its NPV is positive. The NPV of a project represents its contribution to the value of the firm. A close cousin of NPV is the internal rate of return (IRR) criterion. It is the discount rate at which the NPV is zero.

• Survey Evidence on Project Adoption Criteria

What criteria do financial managers use to guide their capital budgeting decisions? Several surveys have been done to answer this question. The survey evidence suggests that even though in theory NPV is superior to IRR, in practice IRR has an edge over NPV. Further, the payback criterion, historically the most important criterion, continues to be relevant.

What explains the sustained appeal of the payback criterion and why is IRR more popular than NPV? A comparison of NPV, IRR, and the payback criteria suggests that the payback criterion is the most intuitive whereas NPV is the least intuitive.

The payback rule is intuitively very appealing: how long does it take to recoup the initial investment. IRR comes next. The human mind is wonted to think in terms of rate of return. Intuitively, it is easy to grasp as we are all familiar with the interest rate on bank deposits. NPV, an absolute magnitude, is much less intuitive. Managers often don't fully comprehend its meaning. It seems that people are comfortable relying on criteria that are intuitively easy to understand.

• Biases

Capital budgeting decisions in practice are affected by various biases that stem from heuristics and framing as discussed below.

Affect Heuristic In addition to financial analysis, managers also rely on intuition, instinct, and gut feeling. They want the decision to feel right emotionally.

Overconfidence Often when managers supplant rigorous financial analysis with subjective judgment, they underestimate project risk.

Two factors are mainly responsible for overconfidence in capital budgeting. The first factor is perceived control. Psychologically, increased perceived control leads to lower perceived risk. The second factor is inadequate planning and risk management. People fail to engage in adequate risk planning because when it comes to risk, out of sight is typically out of mind.

Excessive Optimism Managers tend to be very optimistic about the forecasts of project cash flows. A dramatic example of excessively optimistic revenue forecasts is provided by the Channel Tunnel (the Anglo–French tunnel). The actual traffic in the opening year of the Channel Tunnel was a mere one-fifth of what the planners had forecast.

The psychological determinants of excessive optimism are: perceived control, familiarity and representativeness, desirability and wishful thinking, anchoring and adjustment (the conjunction fallacy).

- *Perceived Control* When managers perceive that they can exert control over the project they tend to be overconfident as well as excessively optimistic.

- *Familiarity and Representativeness* People tend to be overly optimistic when they are familiar with a situation and imagine themselves to be a successful person in that situation. For example, in the Iridium project (which turned out to be a monumental failure), managers of Motorala were quite familiar with wireless telecommunication and pictured themselves as representatives of winners in the telecommunication industry.
- *Desirability and Wishful Thinking* Instead of considering a case that lies between the most pessimistic case and the most optimistic case, planners often believe in the most optimistic case. It seems people indulge in wishful thinking: the more desirable the outcome is, the more optimistic people become.
- *Anchoring and Adjustment, the Conjunction Fallacy* A capital project is successful when a series of successful events occur in conjunction. Hence, to assess the probability of a project's success, you have to multiply a sequence of probabilities. In practice, people often multiply a few numbers and then extrapolate. This makes them susceptible to anchoring and adjustment bias. This means that they become anchored to the product of the first two or three numbers in the multiplication sequence and then make insufficient adjustment. As Hersh Shefrin put it, "In the case of a probability sequence, anchoring and adjustment leads to success probabilities being overestimated. The overestimation is an example of **conjunction** fallacy, in that it pertains to the probability of an event that occurs as the conjunction of several sub-events."

Apart from the psychological factors described above, agency conflicts also lead to excessive optimism. Since managers want to preside over a big empire, they are likely to exaggerate the merits of their favourite projects.

Confirmation Bias A number of publicised failures of wrong investments began to display serious symptoms during initial stages itself. However, the typical response was to downplay information pointing toward problems. This is a manifestation of confirmation bias.

• Reluctance to Terminate Losing Projects

A basic rule of capital budgeting says that investment decisions should be guided by the net present value criterion. Applied to a project 'continuation versus abandonment' decision, this rule says the project must be abandoned, if the net present value associated with abandonment is greater than the net present value associated with continuation. By the same logic, the project should be continued, if the net present value associated with continuation is greater than the net present value associated with abandonment.

Do managers follow the logic of net present value calculations in evaluating continuation versus abandonment decisions? It appears that they often overlook the logic. They have a tendency to get entrapped into losing projects and, in their attempts to rescue them, throw good money after bad. Why does this happen? While there can be several reasons, it happens mainly because sunk costs, which are irrelevant for economic accounting, are often not ignored in mental accounting.

To illustrate the difference between economic accounting and mental accounting, consider the example of a person who having already lost ₹20,000 in a business venture is confronted with a choice between two alternatives, A and B. Alternative A would yield a certain gain of ₹10,000 whereas alternative B, akin to a gamble, has two equiprobable payoffs, 0 and ₹20,000. If he employs the rules of economic accounting, he will form two accounts. The first contains a loss of ₹20,000 and it is closed. The second involves a choice between A and B in which he would obviously choose A (as the expected value of A is same as that of B, without the dispersion characterising the latter). Put differently, a person who employs "economic accounting" will ignore sunk costs.

If he is guided by "mental accounting" he sees only one account that is open with an existing loss of ₹20,000. Put in other words, he does not ignore sunk costs. Hence, he views alternatives A and B as follows:

A. Closing the account with a loss of ₹10,000. (The previous loss of ₹20,000 less the gain of ₹10,000.)
B. Closing the account with a loss of ₹20,000 (if the pay-off of the gamble is zero) or a loss of nil (if the payoff of the gamble is ₹20,000).

Kahneman and Tversky argue that people, confronted with a choice between a sure loss and a gamble which offers some prospect of reducing their loss to zero or so, tend to display risk-seeking behaviour.

A person who uses "mental accounting" does not adapt his asset position to losses and hence is likely to be entrapped in continuing the project. He distinguishes between unrealised 'paper losses' and 'realised losses' and adapts his asset position only after the losses are realised. Since realisation of losses induces regret, he is reluctant to realise them and resorts to procrastination as a way to defer the attendant pain. Of course, he may even deepen his commitment to the project further in the hope of finally emerging as a 'winner' and avoiding the ignominy of failure. In this context, note that commitment has a positive side as well as a negative side. On the positive side, it helps people to work harder, surmount obstacles, and scale great heights. On the negative side, it entraps people into negative NPV projects, induces them to throw good money after bad, and impairs their judgement.

• Informational Asymmetry and Capital Budgeting

The conventional 'textbook' approach to capital budgeting is starkly simple: accept projects which have a positive NPV. It does not make any difference whether the investment decision-making is centralised or decentralised; it is irrelevant whether the existing firm implements it or a newly set up firm executes it; it does not matter what mix of financing is employed.

The behaviour of firms, however, is not always in conformity with what has been said above. In the real world:

- Firms often ration capital and do not invest in all projects that have positive NPVs.
- A lot of attention is paid to the extent to which capital budgeting decisions are centralised.
- Often, new projects are organised as separate corporate entities.
- The mix of financing is considered to be very important.

Why does a discrepancy exist between what the conventional model says and how the real world firms behave? **Informational asymmetries** of various sorts seem to create such a hiatus. Informational asymmetry exists if the transacting parties have unequal information, *ex ante* or *ex post*.

We may classify informational asymmetry into three broad types:

- Informational asymmetry between shareholders and bondholders.
- Informational asymmetry between current shareholders and prospective shareholders.
- Informational asymmetry between managers and shareholders.

A brief discussion of the distorting effects of different types of informational asymmetries follows:[1]

Informational Asymmetry between Shareholders and Bondholders Informational asymmetry between shareholders and bondholders has two possible distorting consequences:

Asset substitution moral hazard :	Shareholders may prod management to substitute riskier assets for safer assets, at the expense of bondholders.
Underinvestment moral hazard :	In firms with risky debt, shareholders have an incentive to avoid investing in new projects that have a positive NPV, because they would not like the cash flows of new projects to be diverted for servicing existing risky debt.

Informational Asymmetry between Current Shareholders and Prospective Shareholders When there is informational asymmetry between current shareholders and prospective shareholders, the latter will not fully appreciate the future payoffs of various resource commitments. As the firm's stock price may not fully reflect the benefits of such resource commitments, the new shareholders will not fully share the cost of resource commitments even though they partake in the benefits arising from them. If the firm is interested in maximising the wealth of present shareholders, it may choose projects that are likely to be different from those that would be chosen in a symmetric information setting. The common distortions resulting from such informational asymmetry are:

- Preference for projects with shorter payback period.
- A greater degree of capital rationing.
- Centralisation of capital budgeting.
- Accumulation of liquidity despite the existence of positive NPV projects.

Informational Asymmetry between Managers and Shareholders Managers are interested in maintaining and building their reputation. Since, as compared to shareholders, they are typically better informed about the payoffs of projects, they can trade on the relative ignorance of the latter. This gives them latitude to choose investments aimed at building their reputation rather than enhancing the wealth of shareholders. As David Hirshleifer[2] has suggested,

[1] Anjan V. Thakor, "Corporate Investments and Finance," *Financial Management*, Summer 1993.

[2] David Hirshleifer, "Managerial Reputation and Corporate Investment Decisions," *Financial Management*, Summer 1993.

the concern for managerial reputation may lead to three kinds of distortions in investment decisions, namely:

Visibility Bias Managers seek to improve short-term indicators of performance.

Resolution Preference Managers attempt to advance the arrival of good news and delay the announcement of bad news.

Mimicry and Avoidance Managers try to imitate the actions of superior managers and avoid the actions of inferior managers.

These incentives may lead to the following investment biases:

- Squeezing of an investment to improve short-term cash flows.
- Premature liquidation of assets to show that they are worth a lot.
- Adoption of projects with earlier payoffs.
- Avoidance of worthwhile projects that carry risk of early failure to protect short-term reputation.
- Escalation of inferior projects to avoid admission of failure.
- Undertaking projects which are supposed to have benefits in the distant future to protect short-term reputation.
- Conformity with other managers to avoid the 'odd manager' label.
- Deviation from other managers to avoid seeming mediocre.

• Reverse Financial Engineering

Most organisations use reasonably well-defined quantitative indicators (such as IRR being more than 20 per cent or accounting rate of return being more than 25 per cent) for approving or rejecting project proposals. Since a project sponsor is keen to get his project included in the capital budget, he is likely to massage the numbers and dress up his project proposal to satisfy the organisational norms. It is fairly easy to do so, by merely tweaking some assumption or the other. In most cases there are 8 to 10 assumptions (such as investment outlay, cost of capital, market size, market share, selling price, raw material costs, project life, growth trajectory, and so on) underpinning the financial projections. Often, the desired financial numbers can be obtained by modifying a few of these assumptions by just 1 to 3 per cent. Thanks to informational asymmetry—project sponsors often know much more than project approvers—the project approver may not be able to detect the nature of financial manipulation.

Is there any way by which such financial manipulation can be checked? Rita Gunter McGrath and Ian MacMillan have suggested a process which they call **discovery-driven planning** that has the potential of improving the quality of analysis. Discovery-driven planning reverses the sequence of the steps in the stage-gate process. Its logic is fairly simple. Since the project sponsors know how good the numbers should be to get the project approved, why should they go through the farce of making and revising assumptions to get the desired set of numbers? Instead, start with the minimal acceptable revenue, income, and cash flow statement and then ask "what assumptions must be fulfilled to get these numbers?" The project sponsor is expected to develop an assumptions checklist—a list of assumptions that must be valid for the project to succeed. McGrath and MacMillan refer to this as the "reverse income statement."

If a critical assumption is not proved to be valid, the project sponsor must modify its strategy until all the underlying assumptions are valid. If no set of plausible assumptions supports the numbers, the project is rejected.

How is discovery-driven planning better than the traditional method of project planning? The traditional method focuses the spotlight on financial projections, while obfuscating the assumptions. But there is no need to shine the spotlight on the numbers as the desirability of attractive numbers has never been questioned. By contrast, discovery-driven planning focuses the spotlight on the assumptions that reflect the key uncertainties, a place where senior managers need illumination.

Championing the cause of discovery-driven planning, Christensen et. al argue in a January 2008 HBR article: "Today, processes like discovery-driven planning are more commonly used in entrepreneurial settings than in the large corporations that desperately need them. We hope that by recounting the strengths of such a system, we'll persuade established corporations to reassess how they make decisions about investment projects."

12.4 ✦ CAPITAL STRUCTURE

Modigliani–Miller tradeoff theory and Myers–Majluf pecking-oder theory are the two main approaches to capital structure.

The tradeoff theory considers the tradeoff between the tax shield provided by debt and the financial distress associated with debt. Since interest on debt is tax-deductible, capital structure has a bearing on the post-tax cash flows to the firm's investors. The value of the tax shield provided by debt is generally estimated as the product of the amount of debt and the corporate tax rate.

While debt provides tax shield, it imposes contractual obligations in the form of interest and principal repayment. When a firm is unable to meet these obligations, it results in financial distress that can potentially lead to bankruptcy. In a financially distressed firm managers become myopic and sacrifice long term value creation at the altar of short-term survival. Other stakeholders (customers, vendors, distributors, employees, investors, and so on) dilute their commitment to the firm and this has an adverse impact on sales, operating costs, and financing costs.

Thus, additional debt brings tax shield on the positive side, and increased personal taxes (at the individual level debt income is typically taxed at a higher rate compared to equity income), and higher expected costs of financial distress on the negative side. According to the tradeoff theory, the optimal debt-equity ratio for the firm is the point where this positive effect and the negative effects are equal at the margin.

According to the pecking order theory, there is a pecking order of financing which goes as follows:

- Internal finance (retained earnings)
- Debt finance
- External equity finance

A firm first taps retained earnings. Its primary attraction is that it comes out of profits and not much effort is required to get if. Further, the capital market ordinarily does not view the use of retained earnings negatively.

When the financing need of the firm exceeds its retained earnings, it seeks debt finance. As there is very little scope for debt to be mispriced, a debt issue does not ordinarily cause concern to investors. Also, a debt issue prevents dilution of control.

External equity appears to be the last choice. A great deal of effort may be required in obtaining external equity. More important, while retained earnings is not regarded by the capital market as a negative signal, external equity is often perceived as 'bad news.' Investors generally believe that a firm issues external equity when it considers its stock overpriced in relation to its future prospects.

Given the pecking order of financing, there is no well-defined target debt-equity ratio, as there are two kinds of equity, internal and external. While the internal equity (retained earnings) is at the top of the pecking order, the external equity is at the bottom. This explains why highly profitable firms generally use little debt. They borrow less as they don't need much external finance and not because they have a low target debt-equity ratio. On the other hand, less profitable firms borrow more because their financing needs exceed retained earnings and debt finance comes before external equity in the pecking order.

• Behavioural Considerations

In practice, the capital structure decisions of companies are based on traditional considerations as well as behavioural considerations. The principal behavioural factor relates to market timing, meaning that managers take advantage of perceived market inefficiencies. They issue equity when it is perceived to be overvalued; they repurchase equity when it is perceived to be undervalued. It must be emphasised that perceptions are the key and they may be sometimes unbiased and sometimes biased.

A series of interviews conducted with chief financial officers, corporate treasurers, consultants, and financiers revealed that practitioners find the theoretical capital structure models rather static. The interviewers pointed toward the volatility of their firms' future cash flows and uncertainties relating to investment opportunities and conditions in capital market. In view of this, firms want to have flexibility to take advantage of unexpected investment and acquisition opportunities and market mispricing.

12.5 ✦ DIVIDEND POLICY

Merton Miller and Franco Modigliani (MM, hereafter) provided the standard neoclassical treatment for dividend policy. The central premise of the MM framework is that the value of a firm depends solely on its earnings power and is not influenced by the manner in which its earnings are split between dividends and retained earnings.

The substance of MM argument may be stated as follows: If a company retains earnings instead of giving it out as dividends, the shareholders enjoy capital appreciation equal to the amount of earnings retained. If it distributes earnings by way of dividends instead of retaining it, the shareholders enjoy dividends equal in value to the amount by which his capital would have been appreciated had the company chosen to retain its earnings. Hence, the division of earnings between dividends and retained earnings is irrelevant from the point of view of the shareholders.

In essence, the basic premise of the MM theory is that investors are immune to framing effects. If a firm pays low dividends and investors want greater current income, they can sell some shares; likewise, if a firm pays high dividends and investors want lower current income, they can buy some shares.

The MM theory assumes a perfect capital market, wherein the following conditions are assumed:

- Information is freely available to everyone equally.
- There are no taxes.
- Floatation and transaction costs do not exist.
- There are no contracting or agency costs (these costs refer to the costs of managing conflicts of interest between holders of different securities or between management and holders of securities).
- No one exerts enough power in the market to influence the price of security. This means all participants are price-takers.
- Investment and financing decisions are independent.

The real world, however, is characterised by imperfections such as taxes on dividend income as well as capital appreciation (typically, dividend income is taxed more heavily than capital gains); floatation (or issuance) costs and transaction costs; informational asymmetry; and agency conflicts.

In the wake of these imperfection, there is no single traditional view about what constitutes appropriate dividend policy.

Why Companies Pay Dividends

Despite the tax disadvantage of dividends and the issuance costs associated with external equity, firms pay dividends and investors generally regard such payments positively. Why? There are several plausible reasons: investors' behavioural preference for dividends, information signalling, clientele effect, and agency costs.

Investor Preference for Dividends If taxes and transaction costs are ignored, dividends and capital receipts should be perfect substitutes. Yet, there appears to be a strong demand or preference for dividends. Why? Hersh Shefrin and Meir Statman offer explanations based on the behavioural principles of self-control and aversion for regret. In essence, their argument is that investors have a preference for dividends due to behavioural reasons. Hence, dividends and capital receipts are not perfectly substitutable.

Self-control and Dividends Individuals often lack self-control. So, they rely on rules and programmes which check their temptations. Smoking clinics, diet programmes, and the like exist because they help in disciplining individuals with weak determination. In the realm of personal financial management, individuals would like to protect their principal from their spendthrift tendencies. A simple way to do this is to limit their spending to the dividend income so that the capital amount is maintained in tact. Such a rule explains a preference for dividend by those who otherwise have difficulty in exercising self-control.

Aversion to Regret and Dividends Look at the following two cases:

- You receive ₹30,000 as dividend and use it to buy a television set.
- You sell a portion of your shares for ₹30,000 and buy a television set.

The price of the stock rises sharply subsequently. In which case would you experience more regret? Although dividends and capital receipts are perfectly substitutable, when taxes and transaction costs are abstracted away, empirical evidence suggests that most people feel more regret when they sell the stock because they can readily imagine the consequences of that action. Hence, Shefrin and Statman believe that persons who have an aversion to regret prefer dividend income to capital receipt, even though the two are perfect substitutes in finance theory. Hence, there is a demand for dividends.

Information Signalling Management often has significant information about the prospects of the firm that it cannot (or prefers not to) disclose to investors. The information gap between management and shareholders generally causes stock prices to be less than what they would be under conditions of information symmetry.

How can firms that have promising prospects convey information credibly to the market? According to signalling theory, these firms need to take actions that cannot be easily imitated by firms that do not have such promising projects. One such action is to pay more dividends. Increasing dividends suggests to the market that the firm is confident of its earning prospects that will enable it to maintain higher dividends in future as well. This is a positive signal for the market and it has a buoying effect on the stock prices.

By the same token, a decrease in dividends is perceived as a negative signal by the market because firms are reluctant to cut dividends. Consequently, such an action leads to a drop in stock prices.

By and large, the empirical evidence concerning market reaction to dividend increases and decreases is consistent with these stories.

Clientele Effect Investors have diverse preferences. Some want more dividend income; others want more capital gains; still others want a balanced mix of dividend income and capital gains. Over a period of time, investors naturally migrate to firms which have a dividend policy that matches their preferences. The concentration of investors in companies with dividend policies that are matched to their preferences is called the **clientele effect**. The existence of a clientele effect implies that (a) firms get the investors they deserve and (b) it will be difficult for a firm to change an established dividend policy.

Agency Costs If shareholders have complete faith in the integrity and rationality of management, there is no reason why a company that has profitable investment opportunities should pay any dividend. In reality, however, shareholders rarely consider management as a perfect agent. They are concerned that management may squander money over uneconomic projects. And, that is where the relevance of dividends lies. Several scholars have argued that dividends can mitigate agency costs. A firm that pays regular dividends can reduce managerial propensity to waste resources.

How Managers Think About Dividends

How do managers think about dividends? The classic answer to this question was provided by John Linter in 1956. Lintner's survey, a pioneering behavioural study, identified four stylised facts:

1. Firms set long-run payout ratios. Mature firms with fairly stable earnings have higher payout ratios whereas rapidly growing firms have lower payout ratios.
2. Managers are concerned more about the change in the dividend than the absolute level of dividend. Thus, paying a dividend of ₹10 per share, is very important if the previous years dividend per share was ₹5, but not a big deal if the previous years dividend was ₹10 per share.
3. Dividends tend to follow earnings, but dividends follow a smoother path than earnings. Transitory changes in earnings are not likely to have an impact on dividend payment.
4. Dividends are sticky in nature because managers are reluctant to effect dividend changes that may have to be reversed. They are particularly concerned about having to pull back an increase in dividend.

Lintner expressed corporate dividend behaviour in the form of the following model:

$$D_t = cr\ \text{EPS}_t + (1 - c)\ D_{t-1} \tag{12.1}$$

where D_t is the dividend per share for year t, c is the adjustment rate, r is the target payout ratio, EPS_t is the earnings per share for year t, and D_{t-1} is the dividend per share for year $t-1$.

Let us look at an example. Kinematics Ltd. has earnings per share of ₹4.00 for year t. Its dividend per share for year $t-1$ was ₹1.50. Assume that the target payout ratio and the adjustment rate for this firm are 0.6 and 0.5, respectively. What would be the dividend per share for Kinematics Ltd. for year t if the Lintner model applies to it?

Kinematics dividend per share for year t would be:

$$0.5 \times 0.6 \times ₹4.00 + 0.5 \times ₹1.5 = 1.95$$

The Lintner model shows that the current dividend depends partly on current earnings and partly on previous year's dividend. Likewise, the dividend for the previous year depends on the earnings of that year and the year preceding that year, so on and so forth. Thus, as per the Lintner model, dividends can be described in terms of a weighted average of past earnings.[3]

From Eq. (12.1), we may obtain the following equation which seeks to explain the change in dividend from year $t-1$ to year t.

$$D_t - D_{t-1} = c\ (r\ \text{EPS}_{t-1} - D_{t-1}) \tag{12.2}$$

[3] This may be proved as follows:

$$D_t = cr\ \text{EPS}_t + (1 - c)\ D_{t-1} \tag{1}$$

Similarly,

$$D_{t-1} = cr\ \text{EPS}_{t-1} + (1 - c)\ D_{t-2} \tag{2}$$

Substituting this value of D_{t-1} in (1) we get:

$$D_t = cr\ \text{EPS}_t + cr\ (1 - c)\ \text{EPS}_{t-1} + (1 - c)^2\ D_{t-2} \tag{3}$$

Making similar substitutions for D_{t-2}, D_{t-3}, etc., we finally obtain:

$$D_t = cr\ \text{EPS}_t + cr\ (1 - c)\ \text{EPS}_{t-1} + cr(1 - c)^2\ \text{EPS}_{t-2} + \ldots + cr(1 - c)^n\ \text{EPS}_{t-n} \tag{4}$$

The change in dividend, $D_t - D_{t-1}$, is equal to the product of the adjustment factor, c, and the difference between the target dividend, $r\text{EPS}_t$, and the previous dividend, D_{t-1}. The adjustment factor, c, is small when the firm is very conservative and large when the firm is very aggressive.

While the Lintner survey was done over a half century back, CFOs still seem to follow the heuristics identified by him. A recent survey by Alon Bravet et. al ("Payout Policy in the 21st Century," Working Paper, Duke University, 2004) wherein responses were obtained from 300 CFOs, supports the Lintner model. The authors of the survey concluded: "Due to the complexity and high dimensionality of the optimal decision-making process, executives tend to employ decision rules (rules of thumb) that are fairly straightforward, in response to a handful of widely held beliefs about how outsiders and stakeholders will react."

12.6 ✦ MERGERS AND ACQUISITIONS (M&A)

The traditional approach to M&A assumes that the market prices of both the acquiring firm and the target form reflect their intrinsic values, assuming that both remain as stand-alone firms. However, a merger of the two firms is expected to generate potential synergistic gains. If the acquiring company pays the target company the latter's current value plus a premium, the gains for the shareholders of the acquiring company and target company would be as follows:

Gain to the shareholders of the acquiring company = Synergistic gains – Premium paid

Gain to the shareholders of the target company = Premium paid

Clearly, the acquiring company will go forward with the acquisition only if the synergistic gains exceed the premium paid. Further, since all assets are priced correctly, the combination of cash and stock used to finance the acquisition does not matter.

• Behavioural Considerations

If markets are efficient and acquirers pay a premium which is less than the real synergistic gains, acquisitions should create value for the shareholders of both the acquiring company and the target company, regardless of the form (cash or stock) of compensation. Further, the level of acquisition activity should not be a function of the level of the stock market.

Empirical evidence, however, suggests the following:

- Acquirers usually pay too much. This benefits the shareholders of the target company, but hurts the shareholders of the acquiring company.
- CEOs fall in love with deals and don't walk away when they should.
- Mergers and acquisitions thrive during periods of stock market buoyancy.
- Acquirers who pay stock compensation are more likely to do value-reducing deals than acquirers who pay with cash or debt.

What explains this empirical evidence which is at variance with what the theory predicts? Several behavioural factors seem to explain the discrepancy. The important ones are:

- *Winner's Curse* In a competitive bidding situation, the participating companies are notoriously vulnerable to rising commitments. The desire to win overwhelms rationality. As Warren Buffett said, the thrill of the chase may blind the acquirer to the outcome thereof. Hence, the winner tends to overpay. In a way, the winner is an unfortunate winner. This is referred to as the "winner's curse" hypothesis.

- *Hubris* Out of misplaced confidence, the acquirer's management tends to overestimate the synergies that it hopes to realise. As Daniel Kahneman et al. put it: "Mergers tend to come in waves during periods of economic expansion. At such times, executives can over-attribute their company's strong performance to their own actions and abilities rather than to the buoyant economy. This can, in turn, lead them to an inflated belief in their own talents." They further added: "Consequently, many M&A decisions may be the result of hubris, as the executives evaluating an acquisition come to believe that with proper planning and superior management skills, they could make it more valuable. Research on post-merger performance suggests that on average, they are mistaken."

Warren Buffett explains why acquisitions tend to fail:

"The sad fact is that most major acquisitions display an egregious imbalance: They are a bonanza for the shareholders of the acquiree, they increase the income and status of the acquirer's management, and they are a honey pot for the investment bankers and other professionals on both sides."

He then adds:

"The acquisition problem is often compounded by a biological bias: Many CEOs attain their positions in part because they possess an abundance of animal spirits and ego. If an executive is heavily endowed with these qualities—which, it should be acknowledged, sometimes have their advantages—they won't disappear when he reaches the top."

William Vickrey's Solution

In competitive bidding situations, where the highest bidder pays the price he bids, the "winner's curse" phenomenon is common and it results in misallocation of resources. William Vickrey offered an ingenious solution to this problem in his paper "Counterspeculation, Auctions, and Competitive Sealed Tenders," *Journal of Finance,* March 1961. For this seminal contribution and other works, he was awarded the Nobel prize for economics in 1996. The Nobel citation said: "He showed that if the highest bidder does not have to pay the price he bids—but the price stated in the next highest bid – then he has a private interest in revealing his true willingness to pay. At the same time, the price paid reflects the social opportunity cost of the item being auctioned. This contributes to social efficiency."

Here are some more words of wisdom from Warren Buffett on the subject: "In the past, I've observed that many acquisition-hungry managers were apparently mesmerised by their childhood reading of the story about the frog-kissing princess. Remembering her success, they pay dearly for the right to kiss corporate toads, expecting wonderous transfigurations. Initially, disappointing results only deepen their desire to round up new toads ("Fanaticism," said Santayana, "consists of redoubling your effort when you've forgotten your aim.") Ultimately, even the most optimistic manager must face reality. Standing knee-deep in unresponsive toads, he then announces an enormous "restructuring" charge. In this equivalent of a Head Start program, the CEO receives the education but the stockholders pay the tuition."

12.7 ✦ AGENCY CONFLICTS AND CORPORATE GOVERNANCE

The public limited company, which is owned by a number of shareholders protected with limited liability, has been a major organisational innovation. It allows for efficient sharing of risk among many investors and enables professional managers to run the company.

However, the public limited company gives rise to possible conflicts between managers and shareholders due to the separation of ownership and control. Adam Smith had recognised, very perceptively, the agency problem in his classical work *The Wealth of Nations* published in 1776:

"Like the stewards of a rich man, they (managers) are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company."

Two centuries later, Michael Jensen and William Meckling provided a formal analysis of the 'agency problem' in their seminal paper titled "Theory of the Firm: Managerial Behaviour, Agency Costs, and Ownership Structure," published in the August 1976 issue of *The Journal of Financial Economics*.

The essence of agency problem is that self-interested managers may squander corporate resources over uneconomic, value-destroying projects and activities. This problem is more serious in companies that have substantial free cash flows (free cash flows represent the excess of internal accruals over what is required to undertake profitable NPV – positive projects). Free cash flows tend to be high in mature industries with limited growth projects. On the other hand, in high growth industries where internal accruals are less than what is needed for supporting profitable investment opportunities, managers are less likely to squander resources over uneconomic projects.

Agency costs are borne by the principals and the agents, perhaps more by the latter if the principals are smart. Hence, it is in the interest of the principals as well as the agents to find ways and means of minimising the agency costs.

• Divergence of Interest

As long as the firm is owned and managed by the same person, there is no room for conflict. As the stake of managers in the ownership of the firm diminishes the scope for agency problem increases. In a joint stock company, where managers have very little stake in ownership they are likely to act in ways that are incompatible with the interest of shareholders.

The forces leading to divergence between the goals of managers and shareholders have been referred to as the **institutional imperative** by Warren Buffett in his incisive and informative letter to the shareholders of the Berkshire Hathaway in its 1989 Annual Report. As he says:

"My most surprising discovery: the overwhelming importance in business of an unseen force that we might call the 'institutional imperative.' In business school, I was given no hint of the imperative's existence and I did not intuitively understand it when I entered the business world. I thought then that decent, intelligent, and experienced managers would automatically make rational decisions. But I learned over time that isn't so. Instead,

rationality frequently wilts when the institutional imperative comes into play. For example: (1) As if governed by Newton's First Law of Motion, an institution will resist any change in its current direction, (2) Just as work expands to fill available time, corporate projects or acquisitions will materialise to soak up available funds, (3) Any business craving of the leader, however foolish, will be quickly supported by detailed rate-of-return and strategic studies prepared by his troops, and (4) The behaviour of peer companies, whether they are expanding, acquiring, setting executive compensation, or whatever, will be mindlessly imitated. Institutional dynamics, not venality or stupidity, set businesses on these courses, which are too often misguided."

What are the consequences of this divergence? It often leads to adoption of different yardsticks and possible conflicts. The key differences, as suggested by Gordon Donaldson[4], are as shown in Exhibit 12.1.

Exhibit 12.1 Different Yardsticks

Types of Decisions	*Management's Yardstick*	*Shareholders' Yardstick*	*Areas of Possible Conflict*
Performance Measurement	Cash flow return	Shareholders' rate of return	Ranking of investment alternatives
Investment Proposals	Historical rate of return	Opportunity cost of capital	Hurdle rates
Financing Sources	Pecking order: a. retained earnings b. debt, and c. equity	Pecking order: a. debt b. retained earnings, and c. equity	Extent of financing
Risk Management	Firm risk	Portfolio risk	Degree of diversification

• Traditional Approach to Agency Conflicts

To deal with agency conflicts (arising out of informational asymmetries and inherent conflicts of interests), the traditional approach requires principals to offer contracts to agents that provides rewards and penalties with three goals in mind. The first goal is to induce the agent to participate by offering a contract that is at least as attractive as the best alternative available to the agent. This goal is called the **participant constraint** goal. The second goal is to motivate the agent to act in the interest of the principal, by appropriate rewards and penalties. This goal is known as the **incentive compatibility constraint** goal. The third goal is to ensure that the agent is not overly compensated. This is called **the no overpayment constraint**.

[4] Gordon Donaldson, "Financial Goals: Management vs. Stockholders," *Harvard Business Review*, May–June 1963.

• Pay for Performance in Practice

How well is the pay linked to performance in practice? Academic studies and other evidence on executive compensation suggest the following:

- The CEO pay does not vary sufficiently in relation to performance to be congruent with traditional theory.
- CEOs of poorly performing companies do not face a significant threat of dismissal.
- Despite their increased popularity, stock options are often not well designed. Although options can be appropriate in theory, in practice they tend to be capricious, inefficient, and very expensive.

• Behavioural Phenomena

Why is pay poorly linked to performance in practice? Two psychological factors seem to explain this phenomenon: overconfidence and prospect theory.

Overconfidence Due to overconfidence, directors are likely to underestimate the extent of agency conflicts and behavioural biases of executives that lead to such conflicts. Further, overconfident directors tend to think that they can address agency conflicts better than they actually do.

Prospect Theory People tend to overweight low probabilities associated with extreme events and underweight high probabilities attached to moderate events.

According to prospect theory, people are risk-averse, when they face the probability of only gains and risk-seeking when they face the prospect of only losses. The aversion to a sure loss can wreak havoc with the incentives commonly used to resolve agency costs. To see why this happens, let us look at auditing services.

In theory, auditors are appointed by shareholders but in practice the appointment as well as the compensation of auditors is determined by management. So, auditors can be influenced by unscrupulous managements to issue clear opinions.

Since audit firms are partnerships not corporations, the traditional view is that audit firms have a strong incentive to protect their reputation for integrity. Hence, it is in the best interest of auditors to issue honest assessment rather than clear opinions when the clients do not deserve them. Further, since a firm's choice of auditor is an important signal, a firm that wants to convey that its financial statements are really clean might engage an auditor with high reputation, whose fees is likely to be high.

But there can be circumstances when audit firms may compromise their integrity, as it happened at Arthur Anderson. Arthur Andersen, a hoary accounting firm, had two divisions, the consulting division (known as Andersen Consulting) and the auditing division. During 1980s, the consulting division had become very profitable whereas the auditing division was struggling. The compensation of people in the auditing division lagged behind people in Andersen consulting. In response, the auditing division began a separate consulting of its own, Arthur Andersen Consulting, to compete directly with the sister division Andersen Consulting. So, Andersen Consulting split-off to become Accenture. In the wake of this departure, Arthur Anderson introduced a policy called "2X," which required its partners to

get two dollars of non-auditing work (as it was more profitable) for every dollar of auditing firm. This prompted its partners to persuade clients to engage Arthur Anderson for both internal and external auditing services. This led to a dilution of the quality of audits, because it introduced a potential conflict of interest. The list of Arthur Andersen's audit clients included Enron, WorldCom, Waste Management Inc, Boston Market, and Sunbeam. A major scandal ensued at each of these firms.

The 2X policy of Arthur Andersen can be assessed in the context of prospect theory. The 2X policy amounted to a shift in the reference point. In the wake of the departure of the consulting division, Andersen's auditors perhaps perceived themselves to be in the domain of losses rather than the domain of gains. This may have caused a significant change in their risk attitude and made them imprudent in their behaviour.

SUMMARY

- Behavioural corporate finance replaces the traditional rationality assumptions with behavioural assumptions that are based on empirical evidence.
- There are two broad approaches to behavioural finance. The first approach may be called the "rational manager with irrational investors" approach. The second approach may be called the "managerial heuristics and biases" approach.
- The "rational manager with irrational investors" approach assumes that market inefficiencies or mispricings exist (thanks to irrational investors and limited arbitrage) and managers recognise these mispricings to make decisions that exploit or further encourage mispricings.
- The material taught in traditional corporate finance courses provides powerful techniques that in theory help managers in making decisions that maximise the value of their firms. In practice, however, psychological pitfalls hinder managers in applying these techniques correctly.
- Surveys of valuation techniques used in practice suggest that financial executives and analysts use the traditional DCF approach as well as some non-DCF heuristics. *P/E* ratio, PEG ratio, and price-to-sales ratio appear to be the most commonly used non-DCF heuristics.
- The common biases in valuation are: excessive optimism, the $1/n$ heuristic, and agency conflicts.
- What criteria do financial managers use to guide their capital budgeting decisions? Several surveys have been done to answer this question. The survey evidence suggests that even though in theory NPV is superior to IRR, in practice IRR has an edge over NPV. Further, the payback criterion, historically the most important criterion, continues to be relevant.
- Capital budgeting decisions in practice are affected by various biases such as affect heuristic, overconfidence, excessive optimism, and confirmation bias.

- A basic rule of capital budgeting says that investment decisions should be guided by the net present value criterion. Applied to a project 'continuation versus abandonment' decision, this rule says the project must be abandoned, if the net present value associated with abandonment is greater than the net present value associated with continuation. By the same logic, the project should be continued, if the net present value associated with continuation is greater than the net present value associated with abandonment.
- Do managers follow the logic of net present value calculations in evaluating continuation versus abandonment decisions? It appears that they often overlook the logic. They have a tendency to get entrapped into losing projects and, in their attempts to rescue them, throw good money after bad.
- The conventional 'textbook' approach to capital budgeting is starkly simple: accept projects which have a positive NPV. It does not make any difference whether the investment decision making is centralised or decentralised; it is irrelevant whether the existing firm implements it or a newly set-up firm executes it; it does not matter what mix of financing is employed.
- The behaviour of firms, however, is not always in conformity with what has been said above. In the real world:
  - Firms often ration capital and do not invest in all projects that have positive NPVs.
  - A lot of attention is paid to the extent to which capital budgeting decisions are centralised.
  - Often, new projects are organised as separate corporate entities.
  - The mix of financing is considered to be very important.
- Why does a discrepancy exist between what the conventional model says and how the real world firms behave? **Informational asymmetries** of various sorts seem to create such a hiatus. Informational asymmetry exists if the transacting parties have unequal information, *ex ante* or *ex post*.
- We may classify informational asymmetry into three broad types: Informational asymmetry between shareholders and bondholders; informational asymmetry between current shareholders and prospective shareholders; and informational asymmetry between managers and shareholders.
- The traditional method focuses the spotlight on financial projections, while obfuscating the assumptions. But there is no need to shine the spotlight on the numbers as the desirability of attractive numbers has never been questioned. By contrast, discovery-driven planning focuses the spotlight on the assumptions that reflect the key uncertainties, a place where senior managers need illumination.
- Modigliani–Miller tradeoff theory and Myers–Majluf pecking-oder theory are the two main approaches to capital structure.
- The tradeoff theory considers the tradeoff between the tax shield provided by debt and the financial distress associated with debt.

- According to the pecking order theory, there is a pecking order of financing which goes as follows:
  - Internal finance (retained earnings)
  - Debt finance
  - External equity finance
- In practice, the capital structure decisions of companies are based on traditional considerations as well as behavioural considerations. The principal behavioural factor relates to market timing, meaning that managers take advantage of perceived market inefficiencies.
- Merton Miller and Franco Modigliani (MM) provided the standard neoclassical treatment for dividend policy. The central premise of the MM framework is that the value of a firm depends solely on its earnings power and is not influenced by the manner in which its earnings are split between dividends and retained earnings.
- Despite the tax disadvantage of dividends and the issuance costs associated with external equity, firms pay dividends and investors generally regard such payments positively. Why? There are several reasons: investors' behavioural preference for dividends, information signalling, clientele effect, and agency costs.
- Lintner expressed corporate dividend behaviour in the form of the following model:

$$D_t = cr\ \text{EPS}_t + (1 - c)\ D_{t-1}$$

- Empirical evidence on mergers and acquisitions suggests the following:
  - Acquirers usually pay too much. This benefits the shareholders of the target company, but hurts the shareholders of the acquiring company.
  - CEOs fall in love with deals and don't walk away when they should.
  - Mergers and acquisitions thrive during periods of stock market buoyancy.
  - Acquirers who pay stock compensation are more likely to do value-reducing deals than acquirers who pay with cash or debt.
- What explains this empirical evidence which is at variance with what the theory predicts? Several behavioural factors seem to explain the discrepancy. The important ones are: winner's curse, and hubris.
- The essence of agency problem is that self-interested managers may squander corporate resources over uneconomic, value-destroying projects.
- The forces leading to divergence between the goals of managers and shareholders have been referred to as the '**institutional imperative**' by Warren Buffett.
- Why is pay poorly linked to performance in practice? Two psychological factors seem to explain this phenomenon: overconfidence and prospect theory.

DISCUSSION QUESTIONS

1. Describe the following valuation heuristics: P/E heuristic, PEG heuristics, price-to-sales heuristic.
2. Discuss the biases characterising valuation.
3. What is the survey evidence on project adoption criteria?
4. What biases affect capital budgeting decisions?
5. What are the psychological determinants of excessive optimism in capital budgeting?
6. Why is there a reluctance to terminate losing projects?
7. Discuss the types of informational asymmetry in capital budgeting.
8. What distortions are caused due to informational asymmetry between shareholders and bondholders?
9. What capital budgeting distortions are caused by informational asymmetry between current shareholders and prospective shareholders?
10. What capital budgeting distortions are caused by informational asymmetry between managers and shareholders?
11. What is reverse financial engineering?
12. What is discovery-driven planning and how can it check financial manipulation?
13. Discuss Modigliani–Miller tradeoff theory.
14. Discuss Myers–Majluf pecking order theory.
15. What is the essence of MM theory of dividends?
16. Why do companies pay dividends?
17. What are the four stylised facts about dividend according to John Linter?
18. What is the empirical evidence on acquisitions? What does it explain?
19. What is William Vickrey's solution to the problem of 'winner's curse'?
20. Describe the unseen force that Warren Buffett refers to as the 'institutional imperative'.
21. What are the consequences of divergence between the interests of managers and shareholders according to Gordon Donaldson?
22. How well is the pay linked to performance in practice?
23. Why is pay poorly linked to performance in practice?
24. Discuss the 'rational managers with irrational investors' approach.

MINI CASES

1. TATA STEEL CORUS DEAL

Background

Tata group, founded in the late 19th century by Jamsetji Tata, a great industrial visionary, is India's largest and most diversified business conglomerate. Jamsetji Tata established Tata Steel in 1907, though it started operations in the year 1912. A flagship company of Tata group, Tata Steel spawned a number of Tata companies. It has a special place in Indian business history because of its progressive policies.

While Tata Steel had been operating for nearly nine decades, it experienced an explosive growth in its turnover and profit only during the earlier years of this millennium as the following table shows.

₹ in crore

Year	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Revenues	7682.70	9843.66	12069.48	16053.48	17398.98	20196.24
Net Profit	204.90	1012.31	1746.22	3474.16	3506.38	4222.15

Tata Steel was recognised as the word's best quality steel producer in 2005.

Although it was very profitable, it had a miniscule capacity of 5 million tons in 2005. So it drew up an ambitious vision of becoming a truly global player by creating a 50 million tons steel capacity by 2015.

Apart from Tata Steel which flourished during this period, the Tata Group comprising of giants like TCS and Tata Motors, prospered immensely. During Ratan Tata's 21 years of leadership (1991-2012), the group registered a 13-fold growth, and its story paralleled the transformation of Indian economy after the reforms of 1991. Ratan Tata was hailed as a dynamic leader with a truly global vision.

Corus Deal

On January 31, 2007, Tata Steel Limited (Tata Steel) announced its acquisition of the Anglo Dutch steel company, Corus Group Plc (Corus) for US $ 12.90 billion. Prior to the acquisition, Corus had a capacity of 18.6 million tons whereas Tata Steel had a capacity of 5.3 millions. The operating profits of the two in the year 2006, however, were comparable – for Corus it was $ 860 million and for Tata Steel it was $ 840.

Corus Group Plc, formed on 6th October 1999, through the merger of two companies, British Steel of U.K. and Koninklijke Hoogovens of Netherlands, was headquartered in London. Corus Group was mired in losses for quite some time before it recovered in 2004 and 2005 largely due to a global upturn in the steel industry. The equity income of Corus Group Plc for the year 2000 through 2005 is shown below.

GBP in million

	12/31/00	12/31/01	12/31/02	12/31/03	12/31/04	12/31/05
Equity Income	–1,079	–419	–458	–305	446	452

From the above it is clear that Corus was plagued with problems – indeed, it was a penny stock in the early 2000s.

Commenting on the acquisition, Ratan Tata, chairman Tata & Sons, observed, "Together, we are a well balanced company, strategically well placed to compete at the leading edge of a rapidly changing global industry." He added "I believe this will be the first step in showing that Indian industry can in fact step outside the shores of India in an international marketplace and acquit itself as a global player."

Tata Steel had earlier offered to pay 455 pence per share of Corus on October 17, 2006, which was endorsed by Corus board. However, the Brazilian steel maker Companhia Siderurgica National (CSN) offered 475 pence per share of Corus on November 17, 2006. So, an auction was initiated on January 31, 2007. After nine rounds of bidding, Tata Steel finally clinched the deal with its bid of 608 pence, 34 per cent higher than the first bid of 455 pence per share of Corus. The deal was directed by Ratan Tata. Several years later, in a candid television interview, Rata Tata admitted that he was too 'stubborn' and didn't give up. This deal followed Mittal Steel's $ 31 billion acquisition of rival Arcelor in 2006, making Arcelor-Mittal the largest steel producer in the world.

The Context and Motivation

The following extracts from the 2006-2007 annual report of Tata Steel provide the context and motivation.

The year 2007 is one of the most important milestones in the history of the Company, for three main reasons. It has ushered in the centenary year of the Company when it enters hundred years of existence in the month of August 2007. The year 2006-07 has also seen the highest turnover and profits, continuing the trend of the past four years. Last but not the least, Tata Steel enhanced its presence on the international steel scene with the acquisition of the U.K. based company, Corus Group Plc.

Economic conditions during the year continued to be buoyant around the world. Even Japan, which was mired in a stagflationary situation for several years participated in the global growth momentum. Asia continued to be the prime mover of growth, with China once again dominating the world economic scene. India was not far behind. With the Indian economy growing at 9.4% in the year under review, it is expected that the current year as well will see India's GDP growing at around 9%.

Growth in steel consumption has accelerated in recent years. During the last five years, the world steel consumption has increased by approximately 338 million tonnes from 775 million tonnes in 2001 to 1,113 million tonnes in 2006. This represents an average compounded annual growth rate of around 7.5%, as compared to a modest 1% yearly growth in the previous three decades upto 2000. World steel production has also kept pace with an increase of 8.9% during 2006 over the previous year.

Tata Steel's investment in Corus Group Plc is consistent with the company's objective of growth and globalisation.

In keeping with its vision of becoming a truly global player and creating a 50 million tonnes steel capacity by 2015, through both organic and inorganic growth, the Company had been examining various opportunities. The process started with the acquisition of NatSteel Asia Pvt Ltd. (Singapore) in 2005, and Tata Steel (Thailand) Public Co. Ltd. (erstwhile Millenium Steel) in 2006, the planned brown field expansion in Jamshedpur and the long-term greenfield projects in Orissa, Chhattisgarh and Jharkhand.

With the Corus acquisition, the Company has emerged as the sixth largest steel manufacture in the world. Tata Steel is the lowest cost steel producer in the world, catering mainly to the domestic market. The company has competitive advantage of captive iron ore mines and collieries. On the other hand, Corus has state-of-the-art-plants located in the UK and Netherlands producing mainly high end

products, with strong R&D capabilities. The combination of these entities will give the Company access to highly developed and competitive markets of Europe, a strong product portfolio and state-of-the-art technology in manufacturing. The Company also sees a strong cultural fit with Corus, which is one of the key elements of successful integration. The Company believes that there are several areas where synergies are possible and is confident that these benefits will start accruing from the current year itself.

A Litany of Problems and Partial Sell Off

The Tata Corus deal was based on the premise that the global economic growth momentum would sustain and drive the growth of steel demand. Unfortunately, the global financial crisis of 2008 and the ensuing Great Recession buffeted the steel business in Europe in a manner that nobody could anticipate in 2007. This led to a dramatic decline in the performance of Corus (renamed Tata Steel Europe). This is evident from the following table which shows the standalone profit of Tata Steel and the consolidated profit of Tata Steel group.

₹ in crore

Year	Standalone PAT	Consolidated PAT
2007-08	4,687	12,350
2008-09	5,201	4,951
2009-10	5,046	–2,009
2010-11	6,866	8,982
2011-12	6,696	5,390
2012-13	5,063	–7,058
2013-14	6,412	3,595
2014-15	6,439	–3,926

To some extent, the problem was aggravated by a "hands off strategy" of Tata Steel-McKinsey & Co christened this as a new Asian style of integration. As Indrajit Gupta observed, "The Tatas earned tonnes of goodwill, as human folks who thought long-term and weren't cost-cutters. Except that the price of that approach showed up a decade later, when losses in UK exceeded a million pounds a day. No wonder that the Tatas had to sell its assets in April 2016 at a nominal value of £ 1, with all the debt still on its book."

Cyrus Mistry, the person who succeeded Ratan Tata, as chairman of Tata Sons (as well as Tata Steel) in December 2012, has persuaded the board of Tata Steel to sell its loss-making UK assets. He has been working closely with CEOs and management teams of companies, especially the ones such as Tata Steel and Tata Motors which have been facing challenging situations. Known for being pragmatic and tough minded, he is leading the group companies from the front.

Commented a Tata company MD requesting anonymity "Our group chairman does his homework. And in a sense he is really our group CFO; he is a solid numbers man. And that focus on numbers is backed by an ability to get on the ground, roll up his sleeves and get to the heart of the matter." Another Tata company MD said, "For the first time in the history of Tatas, after its founder J.N. Tata, an owner is the chairman of Tata Sons." (Cyrus Mistry's family firm Shapoorji Pallonjee has an 18 per cent equity

stake in Tata Sons, the group holding company. By the way nearly two-thirds of the equity of Tata Sons is held by Tata trusts).

Discussion Question

1. What are the key takeaways from this case?

2. AOL TIME WARNER DEAL

In January 2000, the Internet service provider America Online (AOL) announced that it would acquire the media conglomerate Time Warner for a record purchase consideration of $ 165 billion to be paid in AOL stock.

Rationale

The rationale for combining AOL and Time Warner was to create a distribution channel whereby the media products of Time Warner could be delivered via Internet broadband to millions of consumers.

Time Warner's strengths were its media products and a television cable network. Its products were known globally: CNN, HBO, Cartoon Network, *Time* magazine, *Fortune* magazine, *People* magazine, *Sports Illustrated*, *Entertainment Weekly*, Warner Brothers, Warner Music Group, and so on. In 2000, Time Warner magazines had 30 million subscribers and CNN was available to one billion television viewers.

AOL, as a leading Internet services provider, packaged Internet access with e-mail and other services. By 2000, it had over 20 million subscribers and its subscriber rolls were growing annually at 50 per cent. However, most of its subscribers accessed AOL using low-speed dial-up, not high-speed cable. For broadband delivery, high speed is essential and Time Warner operated the second largest cable television network in the U.S. with a subscriber base of 13 million.

Given their complementarities, a merger of the two offered potential synergies. This seemed obvious to Time Warner CEO Gerald Levin who was frustrated in his endeavour to give an Internet focus to Time Warner. It appeared equally obvious to AOL CEO Steve Case who was concerned that AOL's principal asset, its subscribers, was vulnerable to competitive encroachment from Microsoft.

Valuation

In January 2000, the market capitalisation of AOL was $ 185.3 billion more than twice the $ 83.7 billion market capitalisation of Time Warner: On the day the merger was announced, the value of the combined companies rose by $ 27.5 billion. However, Time Warner stock jumped up by $ 32 billion whereas AOL stock fell by $ 4.5 billion.

According to the terms of the deal 45 per cent of the combined AOL Time Warner stock was given to the shareholders of Time Warner shareholders. Steve Case would be the chairman of AOL Time Warner, while Gerald Levin would be its chief executive.

Steve Case considered dot.com stocks, including the AOL stock, to be overpriced, as indicated by AOL's internal memos. Since he expected Internet stocks to collapse in not too distant future, he strived to protect AOL shareholders by acquiring a more mature firm.

Gerald Levin, however, trusted market prices. During a press conference for announcing the deal, he said: "Something profound is taking place. I believe in the present valuations. Their future cash flow is so significant, that is how you justify it."

Dashed Hopes

The business of Time Warner (publishing, networks, and music) thrived. However, AOL's performance deteriorated. Its operating earnings fell, its advertising revenues declined (mainly because of the collapse of many dot.com firms, who were AOL's clients), and the growth rate of its subscription rolls fell from a compound annual growth rate of 50 per cent before the merger to a meagre 8 per cent in the second half of 2002.

In April 2002, AOL Time Warner wrote down $ 54 billion in goodwill, to reflect the decline in the value of the combined entity.

By December 2002, the market capitalisation of AOL Time Warner fell by roughly 80 per cent from its peak value in early 2000.

On September 18, 2003, AOL Time Warner even dropped "AOL" from its name. Announcing the name change, a press release of the company stated: "We believe that our new name better reflects the portfolio of our valuable businesses and ends any confusion between our corporate name and the American Online brand name for our investors, partners and the public."

The change in name elicited an interesting reaction from Henry Berghoef, director of research at Harries Funds which owned 42 million shares of AOL Time Warner stock: "I'm not going to buy more stock because of the change of name," but then continued: "As silly as it sounds, it is healthy psychologically."

Discussion Question

1. What lessons can we draw from this case?

APPENDIX 12A

LEFT BRAIN, RIGHT STUFF: HOW LEADERS MAKE WINNING DECISIONS

Rated as the Best Business Book of 2014, Phil Rosenzweig's classic *Left Brain, Right Stuff* (Published by Profile Books Ltd) takes us through the world of big, strategic decisions and compels us to rethink about them. Here is a summary of this seminal book.

• Features, Insights, and Limitations of Experiments

Since 1970s, we have learned a great deal about judgment and choice, thanks mainly to finely crafted experiments pioneered by cognitive psychologists like Daniel Kahneman and Amos Tversky and others.

These experiments examined how people make judgments under uncertainty, how people make choices under conditions of uncertainty, and how the choices of people are affected by the manner in which options are framed.

Most experiments have the following features:

- Participants can choose the option they want, but can't alter the options.
- Subjects are asked to make judgments about things they cannot influence.
- Participants are asked to make the decisions that are best for them, without considering anyone else.
- There is no competitive dimension and participants don't have to think about what someone else might do.
- Participants are asked to make decisions fairly quickly and the outcomes are known right away. This ensures that all participants face the same circumstances and their answers can be compared without worrying about intervening factors.
- Participants are asked to decide as individuals, not as members of a group. They don't have to worry about how others (subordinates, peers, superiors, and so on) perceive their decisions. They don't have to bother whether their current decisions are consistent with their previous decisions.

Insights and Limitations of Experiments Carefully designed experiments have provided valuable insights into the way people make judgments and choices. As psychologist Dan Ariely put it: "For social scientists, experiments are like microscopes or strobe lights, magnifying and illuminating the complex, multiple forces that simultaneously exert their influences on us. They help us show human behavior to a frame-by-frame narration of events, isolate individual factors, and examine them carefully and in more detail."

The insights provided by such experiments have enriched our understanding in many fields. For example, in finance we have learned a great deal about the way people invest, in marketing we have a better understanding of how consumers make purchasing decisions, and in public policy we have a better idea about how people respond to various policy measures.

Although we know a lot about such decisions, we know less about decisions:

- Where the decision maker can alter the options and even influence the outcomes.
- That have a competitive dimension, implying that the decision maker not only seeks to do well, but do better than the rivals.
- That take a long time before the results are known, suggesting that the feedback is slow and imperfect.
- That are made by leaders of organisation who are concerned with perception and credibility.

To sum up, while experiments have added immensely to our understanding of the processes of judgment and choice, their findings cannot be applied to the complex decisions in the real world. As Philip Tetlock put it, "Much mischief can be wrought by transplanting this hypothesis-testing logic, which flourishes in controlled lab settings, into the hurly-burly of real-world settings where ceteris paribus never is, and never can be, satisfied." While we have learned a great deal about decisions in many fields such as financial investments, consumer choice, and public policy, we know much less about complex decisions in the real world.

The Key to Great Decisions: Left Brain, Right Stuff

In his book *Thinking, Fast and Slow*, Daniel Kahneman describes two systems of thinking. System 1 is intuitive and rapid. It is often effective but frequently erroneous. System 2 is reflective, deliberate, and slow. As Kahneman says: "The way to block errors that originate in System 1 is simple in principle: recognize the signs that you are in a cognitive minefield, slow down, and ask for reinforcement from System 2."

To implement the advice of Kahneman, we need to know the right kinds of reinforcement from System 2. Phil Rosenzweig describes what some of these reinforcements might look like. He identifies specific ways we should think about complex real-world decisions—not the kinds of judgments and choices studied in laboratory experiments. According to him, wining decisions combine two very different skills that he calls *left brain, right stuff*.

Left brain is a shorthand for a deliberate, logical, and analytic approach to problem solving. (Of course, it is an oversimplified description because both of the brain's hemispheres are used in most of the tasks). According to Rosenzweig, using the left brain means:

- Knowing the difference between what is controllable and what is not.
- Knowing when absolute performance matters and when relative performance matters.
- Sensing whether it's better to err on the side of action or on the side of inaction.
- Determining whether the action is being taken by a lone individual or a leader in an organizational setting (who is supposed to inspire others).

While these factors are important, they are not enough. Rosenzweig explains, "Great decisions also demand a willingness to take risks, to push boundaries and to go beyond what has been done before. They call for something we call the right stuff."

The right stuff is concerned with the intelligent management of risk. As Rosenzweig puts it:

"Having the right stuff means: summoning high levels of confidence, even levels that might seem excessive, but that are useful to achieve high performance going beyond past performance and pushing the envelope to seek levels that are unprecedented; instilling in others the willingness to take appropriate risks."

The message of *Left Brain, Right Stuff* is that all great decisions call for an ability for considered and careful reasoning along with a willingness to take huge risks.

What We Can Control and What We Cannot

There is a need to distinguish between what we can control and what we cannot. This is stated eloquently in the Serenity Prayer: "God grant me the serenity to accept the things that I cannot change, courage to change the things I can, and the wisdom always to know the difference." People do not always overestimate their level of control, as some cognitive psychologists claim. When control is low, they tend to overestimate. However, when control is high they tend to underestimate. Thus, people can and do err in both directions.

Often we don't know the difference between what we can change and what we cannot. When we are not sure, should we overestimate our control or underestimate our control. To think about this question, Rosenzeig presents the following matrix.

Control, Belief, and Reality

BELIEF		REALITY: We Cannot Control	REALITY: We Can Control
	We Can Control	**TYPE 1 ERROR** Overestimate our control	**CORRECT**
	We Cannot Control	**CORRECT**	**TYPE 2 ERROR** Underestimate our control

Type 1 Error: False Positive—Error of Commission

Type 2 Error: False Negative—Error of Omission

Rosenzweig's advice is: "As a rule of thumb, it's better to err on the side of thinking we can get things done rather than assuming we cannot. The upside is greater and the downside less."

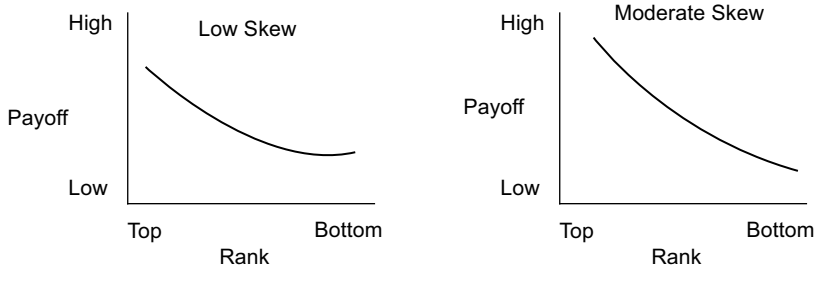
• Absolute Performance vs. Relative Performance

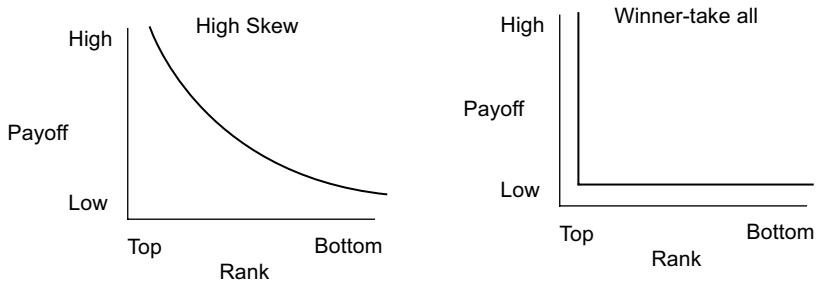
To make great decisions one must know whether one has to do well in absolute terms or relative terms. For example, in personal investment management the focus should be on doing well in absolute terms. The standard recipe for this is to select the right asset allocation, invest regularly, choose passive investments (like index funds), avoid market timing, ignore short-term fluctuations, periodically rebalance, and have a long-term orientation.

In business situations that involve competition, the focus should be on doing well in relative terms. Avinash Dixit and Barry Nalebuff have defined strategic thinking as "the art of outdoing an adversary, knowing that the adversary is trying to do the same to you."

Distribution of Payoffs In a situation involving competition, the distribution of payoffs among top, middle, and bottom performers depends on how skewed is the distribution of outcomes. This is illustrated by the following diagram drawn from Rosenzweig's book:

Distribution of Payoffs and Examples of Skew





Sporting events, elections, and game shows have highly skewed payoffs (winner-take all) and clear end points. In other kinds of competition, such as business, even if performance is relative, it is rarely a winner-take all. Further, competition in business is typically ongoing and open-ended.

Aspiration Point and Survival Point To devise a successful business strategy, one must understand the distribution of payoffs and decide how much risk to take. Since managers are uncertain about the intensity of competition and the degree of skewness of payoffs, they often use a rule of thumb that relies on two points: the *aspiration point* and the *survival point*. As Rosenzweig explains: "The aspiration point asks: What's the best I can do? Is it worth making a risky bet that could bring great benefits? The survival point asks: What's the least I need to do in order to stay alive? What must I do to avoid being eliminated, so that at a minimum I can live to fight another day?" Managers hope to reach the aspiration point but at least make sure that they pass the survival point.

Payoff, Belief, and Reality When performance is relative, the appropriate action depends on how skewed the payoff is. The relationship between belief, reality, and payoff is as follows:

Payoff, Belief, and Reality

BELIEF \ REALITY	Low Skew	High Skew
High Skew	**TYPE 1 ERROR** Overestimate Skew	**CORRECT**
Low Skew	**CORRECT**	**TYPE 2 ERROR** Underestimate Skew

Bias for Action In a situation where the decision maker has the ability to exert control as well as the need to outperform rivals, bias for action is often necessary. As Andy Grove said, "In times of change, managers almost always know which direction they should go in, but usually act too late and do too little. Correct for this tendency: Advance the pace of your actions and increase their magnitude. You will find that you are more likely to be close to right."

According to Robert Sutton, one of the rules for innovation is to "reward success and failure, punish inactions." The title of Richard Branson's book *Screw It, Let's Do It* emphasises the need for action. In their book *A Bias for Action*, Heike Brunch and Sumantra Ghosal extended this idea further:

"While experimentation and flexibility are important for companies, in our observation the most critical challenge for companies is exactly the opposite: determined, persistent, and relentless action-taking to achieve a purpose, against all odds."

It must be emphasised that a bias for action here means a preference for action over inaction and not cognitive bias (which is studied in decision research) that needs to be avoided.

When it comes to control, the more serious error may be the type 2 error arising from a failure to understand the extent of control you have and when it comes from understanding performance too the more serious error may be the type 2 error arising from a failure to recognise how much payoffs are skewed. The implications of this are expressed by Rosenzweig as follows: "Putting them together, not only can we improve outcomes by taking action, but given the nature of competitive forces we're much better off erring on the side of action."

Confidence … and Overconfidence

Of all the errors and biases that impair our judgment, overconfidence is cited most frequently. Here is a sampling of some influential voices:

- Behavioural economist Richard Thaler: "Perhaps the most robust finding in the psychology of judgment and choice is that people are overconfident."
- Psychologist Scott Plous: "No problem in judgment and decision making is more potentially catastrophic than overconfidence."
- Pulitzer Prize-winning business journalist Joseph Hallinan: "[M]ost of us tend to be overconfident, and overconfidence is a leading cause of human error."
- *New York Times* columnist David Brooks: "The human mind is an overconfidence machine."
- Nate Silver: "[O]f the various cognitive biases that investors suffer from, overconfidence is the most pernicious. Perhaps the central finding of behavioral economics is that most of us are overconfident when we make predictions."

Given the ubiquity of overconfidence, we are advised to acknowledge it as our natural tendency and beware of it.

Prima facie its seems good advice. Yet, just the way positive illusions can improve performance, can a high degree of confidence could also do good. When performance is relative, a high degree of confidence may be useful and even necessary to outrival the competitors. As Rosenzweig asks, "We need to ask: If *overconfident* means too confident, *too confident* compared to what? If *overconfidence* means *greater confidence than circumstances warrant*, which circumstances are we talking about? Very soon, what seems like a simple idea becomes much more complicated."

In an essay titled "Politics and the English Language," George Orwell cautioned us about the ill-effects of slovenly language. He wrote: "A man may take to drink because he feels himself to be a failure, and then fail all the more completely because he drinks. It is rather the same thing that is happening to English language. It becomes ugly and inaccurate because our thoughts are foolish, but the slovenliness of our language makes it easier for us to have foolish thoughts." This seems to be a good summary of the current state of affairs about overconfidence.

In an article titled, "The Trouble with Overconfidence," Don Moore and Paul J. Healy said that the word overconfidence has been used to mean three very different things, which they call overprecision, overestimation, and overplacement. **Overprecision** is the tendency to be too certain about the accuracy of one's judgment. Example: Stock market forecasters are usually 90 percent confident that the stock

index will be in a narrow band. **Overestimation** is the belief that a person can perform at a level beyond what is objectively warranted. Example: We often believe that we can complete a task in a period shorter than we can. Overestimation reflects an absolute evaluation; it depends on an assessment of ourselves without reference to anyone. **Overplacement** is a belief that we can perform better in comparison to others. It is a relative assessment, not an absolute assessment. Example: 90 percent of American drivers believe they are better than average.

What is the empirical evidence for these three kinds of overconfidence. There is strong evidence for overprecision. The evidence for overestimation is not as strong as the evidence for overprecision. For ordinary tasks there is good evidence of overestimation but for difficult tasks the evidence is mixed. The evidence for overplacement is even weaker. For routine tasks like driving there is strong evidence for overplacement. But for non-routine tasks like drawing or difficult tasks like juggling, most people think they're below average, not realising that almost everyone else has the same view.

Thus, once we break down overconfidence into its different parts and examine them closely, it is clear that we are not overconfidence machines. As Rosenzweig put it: "Responses depend on the specific skill in question and on the information we have. Rather than claim that people are biased, it might be more accurate to say they're myopic. They see themselves clearly, but have less information about others, and generally make sensible inferences accordingly."

Far from being "overconfidence machines" most people seem to lack confidence. The vast number of books meant to instill confidence in readers seem to suggest that most people want more confidence, not less. Mark Twain famously remarked: "All you need in this life is ignorance and confidence; then success is sure."

• Base Rate Bias

When people make judgments under uncertainty, they tend to focus on the case at hand ('case rate') overlooking the nature of the broader population ('base rate'). They rely on *representativeness heuristic*. As Kahneman and Tversky observed: "The base-rate frequencies of these categories, which are either known to the subjects from their daily experience or stated explicitly in the question, were largely neglected."

Kahneman and Tversky identified the base rate bias in the early 1970s. To illustrate this bias, suppose a taxicab hits a pedestrian and speeds away during the evening rush hour at a busy intersection. A witness identifies it as a Blue Cab. In that city 15 percent of taxis are Blue Cabs and the other 85 percent are Green Cabs. The vision test of the witness establishes that he can identify the colour of a taxicab correctly 80 percent of the time. If the witness testifies that the car was blue what is the probability that it really was a Blue Cab?

Most people estimated the probability of the Blue Cab to be greater than 50 percent and many believed it was close to 80 percent.

What is the correct probability that the car is blue given that it is identified as blue? Such conditional probability can be calculated by Bayes's theorem, which says.

$$P(B/IB) = P(IB/B) \times \frac{P(B)}{P(IB)}$$

where P(B/IB) is the probability that the car is blue when it is identified as blue, P(IB/B) is the probability that the car is identified blue when it is blue, P(B) is the probability that the car is blue, and P(IB) is the probability that the car is identified as blue.

From the information given, we know that P(IB/B) = 0.8 and P(B) = 0.15

What is P (IB)? P(IB) is equal to:

$$P(IB) = (PB) \times P(IB/B) + P(NB) \times P(IB/NB)$$
$$= 0.15 \times 0.8 + 0.85 \times 0.2 = 0.29$$

In this equation P (IB/NB) is the probability that the car is identified as blue when it is not blue.

So, we get

$$P(B/IB) = 0.8 \times \frac{0.15}{0.29} = 0.414$$

This experiment illustrates the *base rate bias*. Kahneman and Tversky observed: "The base-rate frequencies of these categories, which were either known to the subjects from their daily experience or stated explicitly in the question, were largely neglected."

Base rate bias is considered as one of the common errors in our thinking and people are counseled to stepback and consider the broader population.

While this is a step in the right direction, further probing is required. In the cab experiment, the following questions may be asked: How many Blue and Green Cabs were in operation on that particular evening? Better still, how many of each colour were in operation that particular evening in the area where the accident occurred? How accurate is the vision of the witness in the evening?

The point of this complication is to emphasize that Bayes's theorem is not of much help, if we don't know the relevant base rate. In the real world, however, base rates are not given. As Nassim Taleb wrote in *The Black Swan*: "The casino is the only venture I know where the probabilities are known… In real life you do not know the odds; you need to discover them, and the sources of uncertainty are not defined." A further problem is that base rates may change over time.

• How Useful Is Deliberate Practice

As we have seen great decisions come from understanding whether outcomes can be influenced and whether performance is relative or absolute. Another important ingredient is learning and improvement over time. *Deliberate practice*—practice in which there is a well-defined process of action, feedback, and action again-improves performance.

Earlier we learned that when we can influence outcomes, positive thinking can enhance performance. Given the benefit of deliberate practice, we may say that positive thinking is effective when it is combined with objective feedback and adjustment. The combination results in what the psychologist Martin Seligman calls learned optimism. Here a static view, which assumes a single mindset at all time, is replaced with a dynamic view, which allows for a shift between mindsets.

In recent years, many books such as *Outliers* by Malcolm Gladwell, *Talent Is Overrated* by Geoff Colvin, and *Moonwalking with Einstein* by Joshua Foer have touted the virtues of deliberate practice as the key to outstanding performance. Anders Ericsson even said that "outstanding performance is the product of years of deliberate practice and coaching, not of any innate talent or skill."

One should be wary of such claims because deliberate practice is hardly the cure-all that some suggest for at least two reasons. First, there is a growing body of evidence that talent matters a great deal. Second, one can pick examples after the fact and attribute success to deliberate practice. In *Outliers*, Gladwell chooses the examples of Bill Gates and The Beatles, to illustrate the value of sustained deliberate practice, whether programming computers or playing music. However, he did not consider the legions of people who practiced assiduously but did not achieve great heights of success. Psychologist Steven

Pinker was irked by Gladwell's argument: "The reasoning in *Outliers*, which consists of cherry-picked anecdotes, post-hoc sophistry and false dichotomies had me gnawing on my Kindle."

It appears that deliberate practice is very useful for some activities but less useful for others. According to Rosenzweig, the following table shows its usefulness or otherwise.

When Is Deliberate Practice Useful?

	Useful	**Less Useful**
Duration	Short	Long
Feedback	Immediate	Slow
Order	Sequential	Concurrent
Performance	Absolute	Relative

Decisions of a Leader

So far we focused on decisions made by individuals, such as investors or consumers. The vast majority of decision research has studied such decisions.

Now we look at decisions made by a leader, such as the CEO or the manager of a team. The task of a leader is to mobilise people to achieve a purpose. As Jack Welch put it: "As a leader, your job is to steer and inspire."

A leader must be perceived as authentic, genuine, and trust worthy. Otherwise, people will not follow him.

Leaders mobilise others to achieve a purpose and leaders often make decisions that are more complex and consequential compared to routine decisions which are more amenable to deliberate practice.

To make winning decisions, leaders must bear in mind the following:

1. They have to instill in others a level of confidence that may appear exaggerated, but necessary to induce high performance.
2. Leaders often get only one chance to make truly strategic decisions. So they have to deliberate wisely, taking into account the implications of Type 1 and Type 2 errors.
3. Since it is difficult to evaluate complex and long-term decisions with precision, leaders must have an eye on how they are supposed to behave. They should be seen as persistent, decisive, and courageous.

Usefulness of Models

Decision models have made enormous contributions to a wide variety of fields. They avoid some of the common biases that undermine our judgments. So their use has surged in recent years, thanks to growing access to large databases.

Decision models are very useful in a variety of contexts such as credit rating, clinical prediction, political forecasting, weather prediction, and even predicting the quality of wine. A shared characteristic of such situations is that the thing that is being predicted is not amenable to influence. For example, a credit rating model can predict whether a loan will be repaid, but can't change the probability that a given loan will be repaid on time.

Thus, for things we cannot directly influence, decision models must be embraced. However, when we can directly influence the outcome, the task is not to predict what will happen, but to make it happen. In such a situation, positive thinking is conducive to achieving success.

While decision models are often a way to be smart, they must be used wisely. The growing popularity of quantitatively sophisticated models has an unfortunate side effect: people tend to think less about what the numbers actually mean. As Rosenzweig put it: "When we use models without a clear understanding of when they are appropriate, we are not going to make great decisions—no matter how big the data set or how sophisticated the model appears to be."

• Winning Decisions

Making a High-Stakes Competitive Bid Competitive bids have been studied intensively in decision research and a lot of attention has been paid to the phenomenon of winner's curse. Winner's curse refers to the tendency of winners, in a competitive auction, to overpay. It is not a cognitive bias that stems from an error of cognition. Rather, it arises from the bidding process itself. In a competitive bidding situation, the participants are notoriously vulnerable to rising commitments. As Warren Buffett said, the thrill of the chase may blind the acquirer to the outcome thereof.

A variety of experiments have studied winner's curse. In one experiment, Max Bazerman and William Samuelson filled a glass jar with nickels and asked a group of students to closely inspect the jar and make a sealed bid for the contents of the jar. Not known to the students, the jar contained 160 nickels, worth $8. The average of the highest bid, in several such auctions, was $10.01. Thus, on average, the winner paid 25 percent more than the worth of the jar's contents. Behavioural finance literature cautions investors to beware of the winner's curse and to avoid its perils.

A moment of reflection will show that the nickel auction and the purchase of a stock have one thing in common. In both cases, the buyer cannot exert control over the value of the asset. They are examples of a *common value auction*, implying that the item on offer has the same value for all bidders.

Another kind of auction is a *private value auction* in which the value for two persons may not be the same. The difference may be due to entirely subjective reasons, as in the case of a rare painting (Beauty, as they say, lies in the eyes of the beholder). Or, it may be due to commercial reasons, because different potential buyers may have different abilities to generate cash flows from the same asset. So, in the case of a *private value auctions* paying more than other bidders may make sense, if the successful bidder can extract more value from the asset. As Rosenzweig put it: "When we can influence outcomes and drive gains, especially when the time horizon is long, we can and should bid beyond what is currently justified. And where competitive dynamics are crucial, it may be essential to do so." He added: "We must consider not only the dangers of paying too much—a Type 1 error—but also the consequences of failing to push aggressively—a type 2 error." Wisdom represents a combination of clear and detached thinking (properties of the left brain) and the willingness to take bold action (the hall mark of the right stuff.

Starting a New Venture The vast majority of new ventures fail. Hardly one-fifths of the new ventures survive beyond seven years.

Given the high failure rate of new ventures, why do people start them? Economic theory offers few explanations. First, the spectacular success of a few new ventures suggests that starting new ventures, on

the whole, has a *positive expected value*. Second, entrepreneurs enjoy the thrill of starting a new venture and derive satisfaction from being their own boss. These nonfinancial benefits offset financial losses.

Decision research offers an explanation in terms of judgmental biases, in particular overconfidence and base rate bias.

Despite all the fuss about new venture failure, the vibrant culture for entrepreneurship in the U.S. is hailed and other countries strive to emulate it. Why? Perhaps it is believed that even if most new ventures fail there is a spillover benefit for the economy at large. Entrepreneurs are regarded as "optimistic martyrs." While overconfidence is harmful at the individual level, it serves as the engine of capitalism that is beneficial to the economy.

The view that society at large benefits from the reckless ambition and arrogance of entrepreneurs is appealing but contains an error. Even though many new ventures close down, most entrepreneurs successfully manage risks to limit their losses. They shift directions and exploit the upside while limiting their losses. As Saras Saraswathy put it, "Entrepreneurs can mold, shape, transform and reconstitute current realities, including their own resources, into new opportunities."

The elements for a winning decision relating to starting a new venture are an ability to distinguish between what one can control and what one cannot, a realisation of the importance of relative performance, an appreciation of the temporal dimension of the decisions, and an awareness of the social context of the decisions in which leaders have to motivate others to do seemingly impossible things.

The Stuff of Winning Decisions Dan Lavallo and Olivier Sibony argue that very few corporate strategists making important decisions consciously consider the cognitive biases revealed by behavioural economics and hence urge managers to make a conscious effort to apply the lessons of behavioural research. However, their advice has not been heeded by managers because strategic decisions are, as we have learnt, very different from the kinds of decisions studied in behavioural research.

While an awareness of common errors and biases is a good starting point, we should pose incisive second-order questions. According to Rosenzweig, the following questions should be asked.

- Is the decision about something that is amenable to one's control or beyond one's control?
- Is the decision concerned with absolute performance or relative performance?
- Does the decision lend itself to rapid feedback so that adjustment can be made in the next round?
- Is the decision being made as an individual or as a leader in a social setting?
- Is there clarity about what is meant by overconfidence?
- Has careful thought been given to relevant base rates?
- Is their sufficient appreciation of the limits as well strengths of decision models?
- Is it better to commit Type 1 error or Type 2 error?

Success is never guaranteed in a competitive arena like business. However, a better understanding of decision making and the role of analysis and action can improve the odds of success.

■ ■

Chapter **13**

Building a Smart Organisation[1]

Human psychology has both positive and negative aspects. People who are optimistic and confident aim higher, take risks, work harder, and achieve great things. Optimism and confidence are generally considered as good attributes. However, you can have too much of a good thing that may prove adversarial. Unrealistic optimism and overconfidence are "behavioural biases" that predispose people to make mistakes. These traits are especially important in the context of planning. People tend to under-estimate the time and resources required for a task. Psychologists call this phenomenon the **planning fallacy**.

Overconfidence is fed by other psychological traits such as **confirmation bias** (people tend to overlook information that is contrary to their views in favour of information that confirms their views) and **illusion of control** (in general, people have an inflated view of how much control they have over future outcomes).

Is overconfidence not likely to get corrected in the wake of failures? It does not happen as much as it should. Why? People perhaps remain overconfident, despite failures, because they remember their successes and forget their failures, Harvard psychologist Langer describes this phenomenon as "head I win, tail it's chance." Referred to as **self-attribution bias**, it means that people tend to ascribe their success to their skill and their failure to bad luck. Another reason for persistent overconfidence and optimism is the human tendency to focus on future plans rather than on past experience.

Here are some examples of bad decisions caused by psychological biases.

- The acquisition of Time Warner by AOL destroyed about $200 billion in shareholder value. In July 2006, on a television programme AOL's CEO Charlie Rose admitted his mistake, saying "I'm sorry, I did it."
- In his book *State of Denial*, published in 2006, Robert Woodward describes the serious mistakes President George W. Bush and secretary of defence, Ronald Rumsfeld, made in managing the war in Iraq. They remained in a state of denial, ignoring evidence that did not confirm with their beliefs.
- A lot of smart people have underestimated the threat of global warming because of psychological bias. Environmental activist Al Gore, a former U.S. vice-president and Nobel prize winner, created a successful film and associated book titled *An Inconvenient*

[1] This chapter draws heavily on Hersh Shefrin, *Ending the Management Illusion*, McGraw Hill, 2008.

Truth to stir public consciousness. The concept of inconvenient truth is essentially psychological. As Hersh Shefrin explains, "Confirmation bias looms large. Its cousin, **cognitive bias**, looms large. The dissonance in cognitive dissonance involves a conflict between what people think they should do and what they want to do."

This chapter discusses what may be done to build a psychologically smart organisation. It is organised into seven sections:

- Challenges in building a psychologically smart organisation
- Accounting
- Financial planning
- Incentives
- Information sharing
- Group processes
- Improving organisational decision-making

13.1 ✦ CHALLENGES IN BUILDING A PSYCHOLOGICALLY SMART ORGANISATION

There are four key challenges in building a psychologically smart organisation. These involve developing bias-free processes for accounting, planning, incentives, and information sharing.

You may argue that most companies already do these things. Yes, they do if you ignore the phrase "bias-free." In practice, biases impair the quality of these processes. Let's see how.

• Accounting

Thanks to Sarbanes–Oxley Act, financial controls have been strengthened in public companies. However, having good financial controls does not always mean that managers understand how well they are doing in relation to goals and targets.

Outside accounting and finance, most business people have an aversion for accounting. This is unfortunate because accounting keeps the score of how well a company is doing. Unless you are familiar with the score, you will not know whether you are succeeding or failing. In the absence of a proper scorecard, it is easy to suffer from management illusions. If you want to lose weight, you should not be reluctant to stand on the scale.

• Planning

Most people have difficulty in planning properly. They are prone to planning fallacy. For example, Michael Zafirovsky, CEO of Nortel Networks, was unrealistically optimistic in his plans for the turnaround of his company, relying heavily on its global reach and intellectual properties. He overlooked the company's junk bond rating, inefficient bureaucracy, and weak internal controls.

• Incentives

A major challenge for any company is to align the interest of its managers with those of its shareholders. To meet this challenge, employees must have the right incentives—incentives that make them think, feel, and act like owners.

Designing good incentive schemes is very difficult, as most who have attempted to do so will vouch for. Many companies operated on the illusion that stock options granted to board members and executives would align their interests with those of owners. This myth was exploded in 2006 when hundreds of companies engaged in backdating the options. This means that they retroactively changed the option grant date to increase the value of options, leading to a transfer of wealth from shareholders to managers.

• Information Sharing

Often, corporate organisational structures do not promote effective sharing of information. There are several reasons for this. Some stem from self-interest; others involve group dynamics. For example, when Airbus was developing A 380, the company experienced many difficulties, some stemming from the failure of employees to share information with each other.

Managers nurture the illusion that they are running psychologically smart companies when they don't. As Hersh Shefrin, put it: "The management illusion is that managers believe they can run a company successfully with a financially illiterate workforce that engages in ineffective planning, has little incentive to succeed, and doesn't get enough meaningful information."

Debiasing: An Illustration

Some executives recognise their gremlins and try to debias them. Andry Grove, the legendary CEO of Intel for many years, gave an excellent example of this in his book *Only the Paranoid Survive*. Grove asked his Intel colleague, Gordon Moore, famous for the Moore's Law, what would happen if Intel's board replaced him with a new CEO? Moore replied that the new CEO would terminate Intel's memory chip business. He then said, okay I will fire myself figuratively and do what my replacement would do. Literally, he moved Intel out of the intensely competitive low-margin memory chip business and shifted into the less competitive high-margin micro-processor business.

13.2 ✦ ACCOUNTING

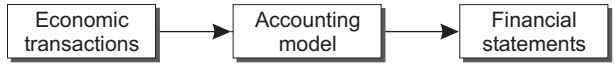
Everyone in a company does better when he or she can understand the language of accounting and finance, assess the financial performance of the company, and evaluate the consequences of various actions in financial terms – put simply, when he or she possesses **financial intelligence**. Greater financial intelligence helps people feel more involved and makes them more committed. They understand better how the business works, what the firm is trying to achieve, and how they can contribute to the same.

Financial intelligence is not some innate ability that you either have or don't have. True, some people are more skillful with numbers and a few legendary personalities like Warren Buffett have an exceptionally intuitive grasp of finance that eludes others. But that is not what we are referring to here. For most business persons, financial intelligence is a set of skills that can be learned. Financial literacy contributes to behavioural intelligence. A financially literate workforce is able to contribute effectively in developing financial plans that are focused on key accounting measures, is rewarded on the basis of how well the company performs in terms of those measures, and engages in continuous dialogue about current performance in terms of those measures.

Some people think that finance is too specialised and not relevant to needs of general managers. This is a wrong notion. Financial literacy is required for everyone who is in business because accounting is the language of business. "Almost everything in business eventually boils down to the rupee sign," so the adage goes. Hence, irrespective of his primary area of work every manager needs a basic grounding in accounting. This section provides a brief primer on accounting.

A business firm engages in a number of economic transactions. It raises capital, it invests in different kinds of assets, it buys raw materials on credit or cash, it transforms raw materials into finished goods by applying labour and machinery, it sells finished goods on credit, it collects its receivables, it pays interest and taxes, it depreciates its machineries, it repays borrowed money, so and so forth.

The financial accounting model processes the economic transactions to produce a set of financial statements as shown in below.



The financial accounting model is based on several concepts (also referred to as postulates, conventions and principles) which have received widespread, though not universal, acceptance by accountants. The financial accounting model generates two primary financial statements, viz., the balance sheet and the profit and loss statement, and a supplementary statement the cash flow statement. We will discuss the primary statements and the key financial metrics that managers need to understand.

• Balance Sheet

The balance sheet shows the financial condition of a firm at a given point of time, usually at the end of the month, or the quarter, or the fiscal year. In effect, the balance sheet shows what the firm *owns* (in the form of various assets) and what the form *owes* (to shareholders and creditors). It reflects the following accounting equation:

$$\text{Asset} = \text{Equity} + \text{Liabilities}$$

A specimen balance sheet is shown in Exhibit 13.1. It should be noted that this is an abridged version of the actual balance sheet format which has considerably greater details like long-term borrowings, fixed assets, etc. A word about various items in the balance sheet is in order.

Shareholders' Funds represent the contribution made by the shareholders in some form or the other. It consists of share capital and reserves and surplus. **Share capital** includes equity (or ordinary) capital and preference capital. Equity capital represents the contribution of equity shareholders who are the owners of the firm.

Exhibit 13.1 **Balance Sheet of Horizon Limited as on March 31, 20X1**

	₹ *in crore*	
	20X1	*20X0*
Equity and Liabilities		
• Shareholders' Funds	500	450
• Paid-up capital	100*	100
• Reserves and surplus	400	350
• Non-current Liabilities	300	270
• Current Liabilities	200	180
Total	1000	900
Assets		
• Non-current Assets	600	550
• Current Assets	400	350
Total	1000	900
*10 crore shares of ₹10 par		

Equity capital, being the risk capital, carries no fixed rate of dividend. Preference capital represents the contribution of preference shareholders and the dividend rate payable on them is generally fixed. **Reserves and surplus**, often the most significant item on the balance sheet, represents retained earnings as well as non-earnings items like share premium. Reserves and surplus consist of capital reserves, capital redemption reserve, securities premium, debenture redemption reserve, general reserve, and so on.

Non-current Liabilities are liabilities which are expected to be settled after one year of the reporting date. They include long-term borrowing, deferred tax liabilities, and long-term provisions.

Current Liabilities are liabilities which are due to be settled within twelve months after the reporting date. They include short-term borrowings, trade payables, other current liabilities and short-term provisions.

Non-current Assets are relatively long-lived assets. They consist of fixed assets (such as land, buildings, plant and equipment, goodwill, brands, and so on), non-current investments, long-term loans and advances, and other non-current assets.

Current Assets are assets which get ordinarily converted into cash during the operating cycle of the firm. They include current investments, inventories, trade receivables, cash and cash equivalents, short-term loans, advances, and other current assets.

• Statement of Profit and Loss

The statement of profit and loss reflects the results of operations over a specified period. While the balance sheet is a snapshot of a firm's financial condition at *a point in time,* the profit and loss statement shows the results of business operations *over a period of time*—typically over a month, or quarter, or year.

As in the case of the balance sheet, the contents of the statements of profit and loss can be represented with a simple equation:

Revenues – Expenses = Profit (or Loss)

A specimen statement of profit and loss is shown in Exhibit 13.2. A word about various items in the statement of profit and loss is in order.

Exhibit 13.2 **Statement of Profit and Loss for Horizon Limited for the Year Ended March 31, 20X1**

	₹ *in crore*	
	Current Period	*Previous Period*
A. Revenues from operations	1200	1100
B. Other income	100	80
C. Total revenues	1300	1180
D. Total expenses	1120	1020
E. Profit before exceptional and extraordinary items	180	160
F. Exceptional and extraordinary items	–	–
G. Profit before tax	180	160
H. Tax expense	50	40
I. Profit (Loss) for the period	130	120
J. Earnings per share		
• Basic	₹13	
• Diluted	₹13	

Revenues from Operations represents revenues from

- sale of products and services less excise duties, and
- operating income such as export benefits and other operating income. For a finance company, revenues from operations consist of revenues from interest and other financial services.

Other Income consists of the following

- interest income (in case of a company other than a finance company),
- dividend income,
- net gain/ loss on sale of investments, and
- other non-operating income (net of expenses directly attributable to such income).

Total Expenses comprise of material expenses, employee benefit expenses, finance costs, depreciation and amortisation expenses, and other expenses. *Material expenses* equal costs of materials consumed plus purchase of stock-in-trade minus (plus) increase (decrease) in inventories of finished goods, work-in-progress, and stock-in-trade. *Employee benefit expenses* are classified as salaries and wages, contribution to provident and other funds, expense on employee stock option plan (ESOP) and employee stock purchase plan (ESPS), and staff welfare expense. *Finance costs* are classified as interest expenses, other borrowing costs, and applicable net gain/loss on foreign currency transactions and translation. *Depreciation* represents the allocation of the costs of tangible fixed assets to various accounting periods that benefit from their use; likewise, amortisation represents the allocation of the cost of intangible fixed assets to various accounting periods that benefit from their use.

Exceptional Items are material items which are infrequent, but not unusual (Example: disposal of fixed assets) and **extraordinary items** are material items which are infrequent as well as unusual (Example: discontinuation of a business).

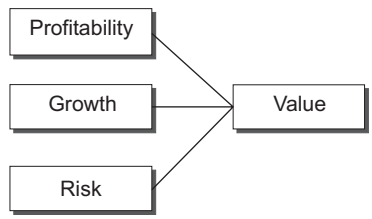
Tax Expenses consist of current tax and deferred tax. *Current tax* is computed by multiplying the taxable income, as reported to the tax authorities, by the appropriate tax rate. *Deferred tax*, also called future income tax, is an accounting concept that arises on account of temporary difference (also called timing difference) caused by items which are included for calculating taxable income and accounting profit, but in a different manner over time.

Earnings per Share (Basic) is net profit or loss (less preference dividend, if any) divided by the number of outstanding equity shares. To calculate the **earnings per share (diluted),** the net profit or loss and the number of outstanding equity shares is adjusted for the potential dilution arising from conversion of debt into equity, exercise of stock options, and so on.

• Key Facets of Business Performance

The primary goal of managers is to enhance the value of the firm. Value is a function of profitability, growth, and risk, as shown in Exhibit 13.3.

Exhibit 13.3 Value of the firm



• Profitability

Among various measures of profitability, **return on equity** seems to matter the most for equity shareholders. Return on equity is defined as:

$$\frac{\text{Net profit}}{\text{Equity}}$$

The numerator of this ratio is equal to profit after tax less preference dividends. The denominator includes all contributions made by equity shareholders (paid-up capital + reserves and surplus). This ratio is also called the **return on net worth**.

Horizon's return on equity for 20X1 is:

$$\frac{130}{500} = 0.26 \text{ or } 26.0 \text{ per cent}$$

The return on equity measures the profitability of equity funds invested in the firm. It is regarded as a very important measure because it reflects the productivity of the ownership (or risk) capital employed in the firm.

Drivers of Return on Equity The return on equity may be expressed as follows:

$$\frac{\text{Net profit}}{\text{Equity}} = \frac{\text{Net profit}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

The first term on the right hand side is called the **net profit margin**. The net profit margin for Horizon Limited for the year 20X1 is:

$$\frac{130}{1200} = 0.180 \text{ or } 10.8 \text{ per cent}$$

This ratio shows the earnings left for shareholders (both equity and preference) as a percentage of net sales. It measures the overall efficiency of production, administration, selling, financing, pricing, and tax management.

The second term on the right hand side is called the **total asset turnover**. The total asset turnover for Horizon Limited for the year 20X1 is:

$$\frac{1200}{1000} = 1.2$$

Akin to the output–capital ratio in economics, the total asset turnover ratio measures how efficiently assets are employed, overall. It reflects the revenue generated per rupee of asset employed in the business.

The third term on the right hand side is called the **leverage multiplier factor**. The leverage multiplier factor for Horizon Limited for the year 20X1 is:

$$\frac{1000}{500} = 2$$

This ratio reflects the extent to which the asset base of the firm is magnified on account of financial leverage. Thus, a ratio of 2 means that one rupee of equity means an asset base of 2. Put differently, one rupee of equity is complemented by one rupee of debt.

The three financial drivers of return on equity throw light on the three important facets of performance.

Net profit margin: How much profit is generated per rupee of revenues?

Total asset turnover: How much revenue is produced per rupee of asset?

Leverage multiplier: How much asset is created per rupee of equity because of the financial leverage factor?

Growth

The growth in dividends depends on the growth of profits which, in turn, are derived from revenues. So, to get a handle on growth in dividends, one may look at the CAGR (compound annual growth rate) of revenues and profits over a period of five years or so. In addition, one may look at the sustainable growth rate.

CAGR in Revenue and Profit To understand how CAGR is calculated, let us look at the revenue and net profit figures for Modern Chemicals as shown below:

	Year 1	*Year 6*
Revenue	1000	2000
Net profit	80	180

The CAGR for revenue is the value of g in the equation:

$$(1 + g)^5 = \frac{2000}{1000} = 2.00$$

$$(1 + g) = (2.00)^{1/5} = 1.149$$

$$g = 0.149 \text{ or } 14.9 \text{ per cent}$$

The CAGR for profit is the value of g in the equation:

$$(1 + g)^5 = \frac{180}{80} = 2.25$$

$$(1 + g) = (2.25)^{1/5} = 1.176$$

$$g = 0.176 \text{ or } 17.6 \text{ per cent}$$

Sustainable Growth Rate Another growth indicator that is commonly calculated is the sustainable growth rate (or SGR). SGR is the rate of growth that can be sustained with internally available equity. Its relevance stems from the disinclination of most companies to issue additional external equity capital that may dilute the shareholding stake of the promoters. This means that they prefer to rely on internal equity (retained earnings) supported by debt in line with the debt–equity policy of the firm.

The SGR is simply: Return on equity × Retention ratio

Retention ratio is the ratio of retained earnings to net profits. Put differently, it is: 1 – dividend payout ratio.

• Risk

Risk is a multi-faceted phenomenon and there are several measures meant to capture various dimensions of risk. In general, investors look at the following ratios which can be calculated fairly easily:

- Debt–equity ratio
- Price volatility
- Beta

Debt–equity Ratio The debt–equity ratio shows the relative contributions of creditors and owners. It is defined as:

$$\frac{\text{Debt}}{\text{Equity}}$$

The numerator of this ratio consists of all debt, short-term as well as long-term, and the denominator consists of net worth plus preference capital plus deferred tax liability (Deferred tax liability may be treated as quasi-equity).

Horizon's debt–equity ratio for the 20X1 year-end is:

$$\frac{500}{500} = 1$$

In general, the lower the debt–equity ratio, the higher the degree of protection enjoyed by the creditors.

Price Volatility A simple measure of price volatility is:

$$\frac{\text{Yearly High}}{\text{Yearly Low}}$$

Suppose the yearly high and yearly low prices of Horizon's equity shares are ₹250 and ₹150. So, the price volatility works out to:

$$\frac{250}{150} = 1.67$$

Beta The sensitivity of a stock to general market movements is called beta. It reflects the slope of the linear regression relationship between the return on the stock and the return on the market portfolio.

• Valuation

Valuation ratios indicate how the equity stock is assessed in the capital market. The most commonly used valuation ratios are price-earnings multiple and price-book multiple.

Price–Earnings (P/E) Multiple A widely used valuation ratio, the P/E multiple is commonly defined as follows:

$$\text{P/E} = \frac{\text{Market price per share}}{\text{Earnings per share}}$$

While the numerator of this multiple is the current market price per share, the denominator of this multiple may be the earnings per share (EPS) for the previous financial year or the EPS for the trailing 12 months or the expected EPS for the current year or the expected EPS for the following year. In its most common version, it is measured as the expected EPS for the current year. So, the price-earnings multiple may be expressed as:

$$\frac{P_0}{E_1}$$

where P_0 is the current market price per share and E_1 is the expected earnings per share a year from now.

Price–Book (P/B) Multiple Like the P/E multiple, the price to book value (P/B) multiple has been used for a long time by investment analysts. In the P/E multiple, the denominator (EPS) is a flow measure coming from income statement. By contrast, in the P/B multiple, the denominator (book value per share, *B*) is a stock measure, coming from the balance sheet. The book value per share (*B*) is:

$$\frac{\text{Shareholders' funds} - \text{Preference capital}}{\text{Number of outstanding equity shares}}$$

Note that in the numerator of this multiple we have deducted preference capital because we are interested in finding the book value per equity share.

13.3 ✦ FINANCIAL PLANNING

Since a business firm has a lot of moving parts, business planning is incredibly important. It requires a lot of forethought to ensure that the various parts of a business work in a coordinated manner in a dynamic business environment.

While planning is important, it is notoriously difficult, partly because it is hard to predict the future and partly because of planning biases.

• Planning Fallacy

People tend to under-estimate the time and resources required for a task. Psychologists call this phenomenon the **planning fallacy**. People who succumb to the planning fallacy get anchored to a story and don't appreciate the vast number of ways in which the future might unravel. When people plan they seem to be preoccupied with the narratives of their stories. As Hersh Shefrin put it, "If you like, they overweight the series of steps associated with their plans. After all, the steps associated with planned scenarios should terminate in success. Naturally, having a planned scenario terminate successfully in quite reasonable. Some might call this having a vision." The problem is that while the steps in the successful plan are psychologically salient, the competing unsuccessful scenarios appear to be less salient.

What can be done to mitigate the planning fallacy? Here are some approaches that may be helpful.

1. The first approach calls for keeping good records so that the past planning history becomes more salient. The limitation of this approach is that people tend to brush aside their past planning failures. They tend to say, "Yes, but this time things will be different."
2. The second approach involves developing explicit failure scenarios to go along with successful scenarios. The limitation of this approach is that people tend to be so unrealistically optimistic about their successful scenarios that even after the failure scenarios are included, the mix remains unrealistically optimistic.
3. The third approach calls for following a process that explicitly considers past planning biases. It forces planners to incorporate their past histories. Though it is heavy handed, it works reasonably well because it compels a person to step outside him or herself and take the position of an outside observer. According to psychologists the term "inside view" refers to procedures that focus only on details specific to the forecasting task at hand. In contrast, the term "outside view" refers to procedures in which planners adjust their forecasts in the light of biases in past forecasting tasks. Alternatively, it refers to procedures in which outcomes of similar projects or initiatives are used to inject greater objectivity in the forecasting exercise.

A Procedure for Taking the Outside View

In a 1979 article that appeared in TIMS *Studies in Management Science*, Daniel Kahneman and Amos Tversky suggest a five-step procedure for taking the outside view.

1. *Select a reference class*. Identify a reference class of similar past initiatives. This, of course, is not easy. As Kahneman and Tversky put it: "Identifying the right reference class involves both art and science. You usually have to weigh similarities and differences on many variables and determine which are the most meaningful in judging how your own initiative will play out."
2. *Assess the distribution of outcomes*. Document the outcomes of the projects in the reference class and arrange them as a distribution. Determine the average outcome as well as a measure of variability.
3. *Intuitively predict your project's position in the distribution*. Based on how you intuitively feel that the project compares with the projects in the reference class, predict where it will fall in the distribution.
4. *Assess the reliability of your prediction*. If there is information on how your past predictions compared with the actual outcomes, the correlation between the two is a reasonable indicator of the reliability of your prediction. In the absence of such information, you may have to subjectively assess the reliability of your predictions.
5. *Correct the intuitive estimate.* Since your intuitive estimate made in step 3 is likely to be optimistic—deviating significantly from the average outcome of the reference class—you have to adjust it toward the average taking into account the reliability of your prediction. The less reliable is the prediction, the more the intuitive estimate has to be regressed toward the mean.

13.4 ✦ INCENTIVES

People respond to incentives. Absence of proper incentives encourages "social loafing." Psychologically smart companies incorporate incentives in compensation systems to harness the power of a financially literate workforce.

• Components of Executive Compensation

The key elements of executive compensation in India are salary, benefits, and incentive compensation. The salary component in India was traditionally subject to certain restrictions imposed by the government which have now been withdrawn. Benefits comprise of items like furnished accommodation, pension and gratuity benefits, chauffer driven car, medical reimbursement, club membership, leave travel allowance, and so on. Incentive compensation is typically in the form of an annual bonus which is linked to performance measured commonly in terms of certain accounting numbers. Occasionally, it is in the form of stock options or award of shares.

• Objectives for Executive Compensation Policy

Stephen O'Bryne has identified four basic objectives for a firm's compensation policy.

Alignment Managers should have incentive to choose strategies, investments, and actions that maximise shareholder value.

Leverage Managers should receive adequate incentive compensation that motivates them to work harder, take risks, and do unpleasant things, like closing a plant or retrenching people, aimed at maximising shareholder value.

Retention The total compensation to managers should be sufficient to retain them, particularly during periods of poor performance caused by market and industry factors.

Shareholder Wealth The cost of management compensation should be limited to a level where shareholder wealth is maximised.

• Designing an Incentive Compensation Plan

A well conceived incentive compensation plan goes a long way in aligning the interests of managers and shareholders. Bear in mind the following guidelines while designing the incentive compensation plan of your company.

Use Objective Criteria As far as possible the incentive compensation plan must be based on criteria that are easily observable by all concerned parties and not amenable to manipulation. Use of objective criteria imparts credibility to the incentive plan and reduces subjectivity.

Select the Right Set of Performance Measures The incentive compensation plan must be linked to performance measures which are consistent with the responsibilities of the executives. Alfred Rappaport recommends the following hierarchy of performance measures (Exhibit 13.5).

Exhibit 13.5 Hierarchical performance measures

Level	*Measure*
CEO and corporate level executives	Total returns to shareholders
Operating unit executives	Shareholder value added
Frontline employees and managers	Leading indicators of value like time to market new products and customer retention ratio

Reward Relative Performance Incentive compensation should be based on performance relative to that of some peer group rather than absolute performance. This ensures that the general market influences or industry-specific influences are abstracted from the performance measure, thereby providing a better measure of the distinctive contribution made by the executive(s) to the wealth or profitability of the firm.

John C. Bogle too endorses the idea of rewarding relative performance. As he puts it: "The whole stock option process, moreover, based as it largely is on simple price appreciation, needs serious reconsideration. Why shouldn't options be related to the extent to which the corporation earns returns in excess of its cost of capital, or to its performance relative to its peers, or even to the performance of its shares relative to the stock market as a whole? Targets that are too easy to hit result in the disproportionate sharing of corporate value between the corporation's management and its shareholders, and distort our financial system."

Discourage Parochial Behaviour Most companies comprise of somewhat related businesses that profit by working cooperatively. Further, each individual business unit comprises of inter-dependent functions. Where interactions are important, incentives based on the performance of individual businesses and functions may not be optimal from the overall firm point of view.

One solution to this problem is to link incentive compensation to total firm performance. This, however, dilutes the incentives and creates the "free rider problem"—managers have an incentive to shirk in the hope of riding on the performance of others.

What is the way out? Joint incentives, based on the performance of individual businesses and functions as well as the performance of the firm as a whole, may work. The objective should be to motivate managers to perform well in their respective businesses and functions and yet refrain from parochial behaviour that has a detrimental effect on the firm as a whole.

Lengthen the Decision Making Horizon of the Executives One possible solution to mitigate the short-term decision-making horizon of executives is to adopt 'performance plans' which provide deferred compensation when certain "long-term" (ranging, say, over a period of 3 to 7 years) goals are achieved.

Employ Stock Options Judiciously Stock options may be a good way to (i) prevent the management from enjoying excessive perquisites and shirking efforts, (ii) check myopic tendencies on the part of management, and (iii) induce management to think like shareholders while assessing risks. Stock option plans, however, have to be designed judiciously as they have limitations.

13.5 ✦ INFORMATION SHARING

Information-hoarding is a major obstacle for a company in becoming psychologically smart. Middle managers are likely to torpedo a company's attempt to develop an open book culture. Why?

Middle managers serve as information links between top management and line workers. So, information is power for them. Hence, middle managers worry that excessive information sharing will render their functions somewhat redundant. Moreover, financial managers are disinclined to share financial information, particularly in companies whose stocks are listed.

Group dynamics reinforce information hoarding gremlins. Groups are vulnerable to collective confirmation bias. The same dynamic leads to information hoarding. More specifically, managers share information that supports a proposal made by their leader, but withhold information that does not support that proposal.

• Psychology, Relationships, and Information Sharing

To address the problems caused by groupthink and information hoarding you have to appreciate the emotions that cause them. As Hersh Shefrin explains. "These emotions involve the nature of our relationships with others. Most of us want to be liked. We like others to hold us in high esteem, to respect us. We seek to advance in social position." So, we do not disagree with leaders for fear of being disliked. Thus, information hoarding and groupthink are driven by emotions relating to group acceptance, loyalty, and social bonding.

Incidentally, leaders also are wary of sharing negative information because they fear being regarded as ineffective. Further, they are concerned that the bad news may demoralise the workforce.

• Dealing with Information Hoarding and Groupthink

Thoughtful leadership is required to deal with information hoarding and groupthink. Leaders must know how people relate to each other at an emotional level and to manage the way people relate to each other.

Leadership must be especially attentive to the gains, losses, and emotion subtext of how people communicate with each other in the organisation. Leaders must understand that communication styles are important—when people communicate ideas, they often relay emotional messages as well.

Here are some examples of companies that improved information-sharing.

Ford Motor Corporation Ford Motor Company, an excellent performer in the mid-1990s, performed dismally for about a decade thereafter. Its share in the U.S. market declined from 25 to 16 per cent, as it posted a loss of nearly $13 billion for 2006. To revive the company, Ford brought in Alan Mulally as its new CEO.

Mulally, who had the reputation of turning around Boeing, took charge of the ailing Ford Motor Company in September 2006. He brought in some of the techniques he had successfully used at Boeing. An important one was a regular Thursday meeting with senior managers to share information and focus on business plans.

He asked each business head to discuss his or her business plan and financial forecast with the group. He encouraged them to share information and did not penalise them for delivering bad news. Instead, he applauded them for their candour and focused them on taking corrective action.

In short, he instituted an 'open book' management culture and created an emotional climate in which people felt comfortable in sharing negative information. This contributed significantly to the recovery of Ford Motor Corporation.

SRC Holdings SRC Holdings (formerly Springfield Remanufacturing Corporation), a small privately held firm in Springfield, Missouri, that rebuilds diesel engines, has been a pioneer of "open book management." Since late 1980s, SRC has put into practice the information-sharing processes that Alan Mulally introduced at Ford.

At the heart of information sharing at SRC is a weekly meeting called "huddle." It takes place on Wednesdays at 9.00 am. Its focal point is SRC's financial plan. People report on particular line items whose values they can influence and provide best forecasts of how close the company will perform in relation to the plan during the current month. Based on this, the CFO updates the pro forma financials.

13.6 ✦ GROUP PROCESSES

Major investment and financing decisions take place in group settings, such as executive management meetings and board meetings.

In theory, a group decision is supposed to exploit the synergies arising from bringing together people with diverse skills, perspectives, and values. A constructive use of individual differences among group members is expected to produce process gains.

Many groups, however, are unable to achieve process gains. On the contrary, they experience process loss due to psychological reasons. Behavioural research has identified three important features of group behaviour.

- *Accuracy* In intellectual tasks, groups tend to outperform individuals – an intellectual task is a problem that has a correct answer which once identified is readily accepted by all group members as being correct. However, in judgmental tasks groups may tend to underperform individuals.
- *Polarisation* Groups tend to become polarised in respect to risk tolerance. Group discussions generally magnify risk-seeking behaviour.

- *Unwarranted Acceptance* As a result of group discussion, group members tend to readily accept a decision. Such acceptance, often unwarranted, creates an **illusion of effectiveness**, a kind of collective overconfidence.

• Reasons for Group Errors

Groupthink, poor information sharing, and inadequate motivation are the three main reasons for group errors.

Groupthink Just as an individual tends to overweight evidence that confirms a view and underweight evidence that disconfirms that view, groups are characterised by a collective form of confirmation bias called **groupthink.**

Groupthink is a classic example of dysfunctional group dynamics. Groupthink happens because group members strongly support a proposal put on the table by the leader. This is because (a) people want to ingratiate themselves with the group leader, and (b) people inherently love harmony and want to avoid discord.

Suppose the leader of a group has a forceful personality and has a greater disposition to take risks compared to other members of the group. What will be the risk disposition of the group? The group will tend to be even more aggressive toward risk. Psychologists call this phenomenon as **polarisation.**

Polarisation occurs because group members reinforce their leader rather than challenge his above-average propensity for risk. One more thing. After the group has made the decision, people tend to feel comfortable with it. This tendency is called "the illusion of effectiveness."

According to Hersh Shefrin, the following conditions are especially conducive for the emergence of groupthink:

- Group members have a strong, opinionated leader.
- The group dynamics is there.
- Group members function under stress.
- Group members have a strong desire for social conformity.
- There is no well-defined procedure for decision-making.

Poor Information Sharing People often do not share relevant information with others in their group, even when the members of the group have a common goal.

Inadequate Motivation Some members of a group may not work hard and rely on others to produce group benefits. This leads to a free-rider agency conflict, called **social loafing**.

• Symptoms of Groupthink

Groupthink occurs when a group makes faulty decisions as group pressures result in a deterioration of "mental efficiency, reality testing, and moral judgment."[2]

In his insightful book *Groupthink* (published by Houghton Mifflin in 1972), I. Janis identified the following symptoms of groupthink.

[2] I. Janis, *Groupthink*, New York: Houghton Mifflin, 1972

1. *An illusion of invulnerability* A belief in the invulnerability of the group results in excessive optimism and extreme risk taking.
2. *Collective rationalisation* Members of a group ignore warnings and fail to re-examine their assumptions.
3. *Belief in inherent morality* Convinced about the rightness of their cause, members of the group do not consider the ethical or moral implications of their decisions.
4. *Stereotyped views of out-groups* A poor opinion of "enemies" or "outsiders" persuades them not to respond to contrary views. For example, during the dot-com bubble, people like Warren Buffett were dismissed as simply not getting it.
5. *Direct pressure on dissenters* There is pressure on members not to argue against the views of the group.
6. *Self-censorship* Members refrain from expressing doubts against the perceived consensus of the group.
7. *"Mind guards"* are appointed. Members protect the leader and the group from information that challenges the group's views and cohesiveness.

Even the fiercely independent intellectual giant Robert Shiller struggled with conformity and groupthink. In a *New York Times* article that appeared in late 2008, he wrote, "While I warned about the bubbles I believed were developing in the stock and housing markets, I did so gently, and felt vulnerable expressing such quirky views. Deviating too far from consensus leaves one feeling potentially ostracised from the group, with the risk that one may be terminated." In a similar vein, Warren Buffett observed, "Failing conventionally is the route to go; as a group, lemmings may have a rotten image, but no individual lemming has ever received bad press."

Echoing Shiller's dilemma, Montier ponders over the possibility that academic finance is an example of groupthink at work. As he put it, "the obsession with the neat elegance of mathematical models and the love of the efficient markets hypothesis that dominates economics and finance departments strikers me as the result of a classic example of groupthink." He further added, "those who challenge the orthodoxy are shunned, and young professors hoping for tenure are discouraged from expressing doubts and concerns. The journals and their editors act as mind guards for the community, suppressing views that might contradict the conventional wisdom."

Countering Groupthink

Groupthink occurs because a desire for conformity leads to collective confirmation bias and group members are reluctant to share information or challenge proposals made by others.

According to Hersh Shefrin, groupthink can be checked by

- Asking group members to refrain from stating their positions at the beginning of the discussion.
- Explicitly encouraging debate, disagreement, and information sharing.
- Designating one member of the group to be a devil's advocate for each major proposal.
- Regularly inviting outside experts to attend meetings, with the charge that they challenge the group to refrain from meek conformism.

• Using Premortem

People prefer harmony over conflict. This leads to social biases like groupthink and **sunflower management**. Groupthink involves striving for consensus at the expense of a realistic evaluation of alternatives. Sunflower management is the tendency for groups to align with the opinions of their leaders.

Thanks to these social biases, people do not express their reservations candidly and forcefully. They do not want to disrupt harmony by trying to highlight, potential problems. As a result, an objective and balanced appraisal of decision alternatives is compromised.

How can people be encouraged to express contrary views freely? Psychologist Gary Klein suggests the use of the **premortem** technique. It is a sneaky way to get to motivate people to serve as a devil's advocate without encountering resistance. If a project turns sour, some lessons will be learned about why the project failed and what went wrong as in the case of a medical postmortem. Why don't we invert the process? Before the project starts, someone should say, "We have a crystal ball that can predict the future. Our crystal ball says that the project has failed. It has been a fiasco. Now everyone should take few minutes and write down all the reasons why he thinks the project failed." This will encourage people to think of insightful reasons why this project might fail. There will be an interesting competition among people to come up with potential problems that others many have overlooked. The entire dynamics would change. Instead of avoiding things that might disrupt harmony, people will try to surface potential problems.

Kahneman regards premortem as a great idea. He says "My guess is that, in general, doing a premortem on a plan that is about to be adopted won't cause it to be abandoned. But it will probably be tweaked in ways that everybody will recognise as beneficial. So, the premortem is a low-cost, high-pay off kind of thing."

13.7 ✦ IMPROVING ORGANISATIONAL DECISION-MAKING PROCESS[3]

Awareness of the existence and effects of biases does precious little to improve the quality of individual decision making. Why? As Kahneman et. al. explain, "Because System One is so good at making up contextual stories and we're not aware of its operations, it can lead us astray. We almost never catch ourselves in the act of making intuitive errors. Experience doesn't help us recognise them."

Fortunately, things look better at the organisational level. As Kahneman et al. put it, "There is reason for hope, however, when we move from the individual to the collective, from the decision-maker to the decision-making process, and from the executive to the organisation." While we may not be able to control our intuition, we can detect others' biases. Put differently, we can use our System Two thinking to identify System One errors in others' recommendations.

This is what executives are supposed to do when they review recommendations before making a final call. However, often they apply a crude adjustment such as lowering the

[3] Adapted from Daniel Kahneman, Dan Lovallo, and Olivier Sibony, "Before You Make That Big Decision," *Harvard Business Review*, June 2011, 51–60.

revenue projection by 25 per cent to deal with the perceived bias. Further, they focus mainly on the *content* of the recommendation and not the *process* underlying the recommendation.

Kahneman et al argue that a thorough process review can mitigate the effects of bias. A recent McKinsey study of over 1,000 major business decisions found that when organisations worked to mitigate the effect of bias in their decision-making processes, they achieved significant gains in returns.

• Questions to Assess the Quality of Recommendations

Kahneman et. al. pose 12 questions to help executives assess the quality of decisions and think through the contents and the process of recommendations. They are as follows:

- **Self-interest Bias** Is the team making the recommendations likely to be motivated by self-interest? If so, the proposal has to be reviewed with extra care and especially checked for over-optimism.
- **Affect Heuristic** Has the team making the recommendation fallen in love with its proposal? If so, rigorously apply all the quality controls.
- **Groupthink** Did some members of the team express dissenting opinion? Were these sufficiently explored? If not, solicit dissenting views in a discreet manner, if necessary.
- **Saliency Bias** Was the analysis of the situation overly influenced by an analogy to a memorable success? If so, seek additional analogies and rigorously examine their similarity to the current situation.
- **Confirmation Bias** Does the recommendation include credible alternatives? If not, seek additional options.
- **Availability Bias** If this decision had to be made again within a year, what more information would you require, and can you get it now? Use comprehensive checklists of the data required for each kind of decision.
- **Anchoring Bias** Are you aware as to where the numbers came from and do you know the rationale for using a certain anchor? Use anchors generated by other models or benchmarks and rework the analysis.
- **Halo Effect** Is the team making specific inferences on the basis of a general impression? Refrain from the tendency to make easy attributions based on company performance and make decisions based on valid data.
- **Sunk Cost Fallacy, Endowment Effect** Are the recommendations overly based on the decisions taken in the past? Look at the situation from the point of view of a new CEO brought from outside.
- **Overconfidence, Planning Fallacy, Optimistic Bias, Competitor Neglect** Is the base case unduly optimistic? Ask the team to build a case taking the "outside" view.
- **Disaster Neglect** Is the worst case bad enough? Ask the team to do a pre-mortem which involves imagining that the worst has happened and developing a story about its causes.
- **Loss Aversion** Is the recommending team excessively conservative? Provide assurances and explicitly share responsibility for the risk.

Implementing Quality Control Over Decisions

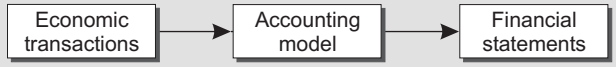
The above questions are helpful in assessing and improving the quality of decisions. But there is a time and place to ask and there are ways to integrate them in the organisation's decision-making process. Here are some suggestions in this respect:

- *Use the checklist selectively* Checklists are helpful for decisions that are both important and recurring and hence justify a formal process.
- *Ensure that the team making the recommendations is independent* Often the decision-maker picks team members whose opinions are known in advance and overtly or covertly influences the team's recommendations. In such a case, the decision-maker becomes a de facto member of the recommendations team. How can he then judge the quality of the proposal?
- *Enforce discipline* Executives must be prepared to be systematic and disciplined, something that is not fully appreciated by all corporate cultures. The benefits of discipline are manifest. For example, doctors who adopt World Health Organization's Surgical Safety Checklist, achieve spectacular reduction in complication and mortality. Partial adherence may result in failure.
- *Do not use time or cost as an excuse* Quality control exercise involves time and cost. Executives in a hurry may not want to delay action and often organisations are not prepared to devote special resources required for quality control.

The concern over time and cost, however, seems misplaced. As Kahneman et al. put it, "The real challenge for executives who want to implement decision quality control is not time or costs. It is the need to build awareness that even highly experienced, superbly competent, and well-intentioned mangers are fallible." They added, "Organisations need to realise that a disciplined decision-making process, not individual genius, is the key to a sound strategy. And they will have to create a culture of open debate in which such processes flourish."

SUMMARY

- People tend to under-estimate the time and resources required for a task. Psychologists call this phenomenon the **planning fallacy**.
- There are four key challenges in building a psychologically smart organisation. These involve developing bias-free processes for accounting, planning, incentives, and information sharing.
- Everyone in a company does better when he or she can understand the language of accounting and finance, assess the financial performance of the company, and evaluate the consequences of various actions in financial terms.
- The financial accounting model processes the economic transactions to produce a set of financial statements as shown in below.



- The financial accounting model generates two primary financial statements, viz., the balance sheet and the profit and loss statement, and a supplementary statement the cash flow statement.
- The statement of profit and loss reflects the results of operations over a specified period. While the balance sheet is a snapshot of a firm's financial condition at *a point in time,* the profit and loss statement shows the results of business operations *over a period of time*—typically over a month, or quarter, or year.
- The primary goal of managers is to enhance the value of the firm. Value is a function of profitability, growth, and risk.
- The return on equity may be expressed as follows:

$$\frac{\text{Net profit}}{\text{Equity}} = \frac{\text{Net profit}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Equity}}$$

- Risk is a multi-faceted phenomenon and there are several measures meant to capture various dimensions of risk.
- Valuation ratios indicate how the equity stock is assessed in the capital market. The most commonly used valuation ratios are price-earnings multiple and price book multiple.
- People who succumb to the planning fallacy get anchored to a story and don't appreciate the vast number of ways in which the future might unravel.
- People respond to incentives. Absence of proper incentives encourages "social loafing." Psychologically smart companies incorporate incentives in compensation systems to harness the power of a financially literate workforce.
- Information-hoarding is a major obstacle for a company in becoming psychologically smart. Middle managers are likely to torpedo a company's attempt to develop an open book culture.
- Most of us want to be liked. We like others to hold us in high esteem, to respect us. We seek to advance in social position. So, we do not disagree with leaders for fear of being disliked. Thus, information hoarding and groupthink are driven by emotions relating to group acceptance, loyalty, and social bonding.
- Incidentally, leaders also are wary of sharing negative information because they fear being regarded as ineffective. Further, they are concerned that the bad news may demoralise the workforce.
- Thoughtful leadership is required to deal with information hoarding and groupthink. Leaders must know how people relate to each other at an emotional level and to manage the way people relate to each other.
- How can people be encouraged to express contrary views freely? Psychologist Gary Klein suggests the use of the **premortem** technique. It is a sneaky way to get to motivate people to serve as a devil's advocate without encountering resistance.
- A thorough process review can mitigate the effects of bias in organisational decision-making.

DISCUSSION QUESTIONS

1. Give some examples of bad decisions caused by psychological biases.
2. Discuss the four key challenges in building a psychologically smart organisation.
3. What is a balance sheet? What are its contents?
4. What is a statement of profit and loss? Discuss its contents.
5. Discuss the following facets of business performance: profitability, growth, and risk.
6. What are the drivers of return on equity?
7. Discuss the important measures of growth.
8. Discuss the important measures of risk.
9. Discuss the important measures of value.
10. What are percentage financial statements? What kinds of questions do they help in answering?
11. What is planning fallacy? What can be done to mitigate planning fallacy?
12. What are the objectives of executive compensation policy, according to Stephen O' Bryne?
13. Discuss the guidelines for designing a good incentive compensation plan.
14. What are the reasons for group errors?
15. How can groupthink be countered?
16. Discuss the technique of premortem.
17. What questions should be asked to assess the quality of recommendations, according to Daniel Kahneman, Dan Lovallo, and Oliver Sibony?
18. Discuss the suggestions for improving the quality of decisions.

MINI CASE

ENRON

Rated by *Fortune* magazine as 'The Most Innovative Company in America' for six consecutive years, from 1995 to 2000, Enron was the darling of investors in the 1990s. From December 1990 through December 2000, Enron's market capitalisation grew 25 times when S&P 500 advanced only 5 times. A year later, to the shock of its investors and others, Enron filed for bankruptcy and its market capitalisation was decimated.

Buoyed by its success in the natural gas business in the early 1990s, Enron management sought to replicate that performance in markets where it lacked expertise, such as broadband, retail energy, water, steel mills, and electric power generation. It invested over $10 billion in several ventures that generated a near-zero return.

To improve its earnings, Enron's management presented to the board the use of special-purpose entities organised as partnerships. Masterminded by Enron's CFO Andrew Fastow, these partnerships were artificial devices to boost earnings. By the way one of these partnerships was set up by Fastow and he named it LJM2, after the initials corresponding to the first name of his wife and two sons. LJM2 was meant to enrich Fastow and his aide Michael Kopper. In 2002, Fastow and Kopper pleaded guilty. Fastow was sentenced to a 10-year prison charge.

Enron sold assets at inflated prices to these entities (many of them being fictitious entities created by Enron's CFO Andrew Fastow), along with a promise to repurchase those assets at a higher price in future. While Enron recorded the profits from the sale of those assets, it cleverly hid the promises to buy them back in various ways. Much of Enron's growth in revenues and profits in the late 1990s stemmed from such manipulation. For example, in 2000, 96 per cent of reported earnings were the result of accounting jugglery.

Enron's Board

Enron's board approved the creation of partnerships as they were presented as a tool for improving Enron's earnings. It even waived Enron's code of ethics for Fastow.

Enron's directors asked very few questions and readily accepted the answers provided by the management. They did not cast any dissenting views. Nor did they examine the partnership prospectus material to identify the conflict of interest.

All this was surprising because the majority of Enron's board was made up of independent directors and the board had an independent nominations committee.

Moreover, the audit committee of the board was headed by Robert Jaedicke, a professor of accounting and former Dean of the Stanford Business School. Notwithstanding Jaedicke's expertise, Enron's board and managers were seemingly focused on earnings rather than cash flow.

Discussion Question

1. Identify the reasons for the collapse of Enron.

■ ■

PART V

Other Insights

Chapter **14**

Wisdom from Other Sources

Since most of the occupations encourage a degree of specialisation, we often end up with pretty narrow slices of knowledge. To be a better investor, executive, parent, friend, or person, we should approach problems from a multi-disciplinary perspective. Put differently, we should learn to find wisdom from diverse sources.

This chapter nudges you in that direction by giving glimpses of wisdom from varied sources. It is organised into twelve sections as follows:

- Wisdom of crowds
- Fooled by randomness
- Power laws
- Noise and performance in the stock market
- Stock market as a complex adaptive system
- Evolutionary analogy
- Animal spirits
- From homo economicus to homo sapiens
- Halo effect
- Flaws of finance
- The clash of cultures
- Zurich wisdom

14.1 ✦ WISDOM OF CROWDS

In his book *The Wisdom of Crowds,* James Surowiecki argues that the aggregation of information in groups results in decisions that are often better than what could have been made by any single person in the group. Michael Mauboussin gives an interesting example of this phenomenon. He passed a jar containing 1116 jellybeans to 73 students asking them to guess the number of jellybeans in the jar. The consensus estimate (the average of all the individual estimates) was 1151 (off by about 3 per cent). Importantly, only 2 out of 73 students fared better than the consensus estimate.

In his book *The Difference,* Scott Page addresses the "why" of the wisdom of crowds. One of his core ideas is the **diversity prediction theorem**. According to this theorem:

Collective error = Individual error (the ability of the individual)

– Diversity of prediction (cognitive diversity)

The diversity prediction theorem has the following implications:

1. The collective is always smarter than the average person within the collective.
2. Diversity contributes significantly to collective accuracy.
3. Often the collective may be better than even the best of the individuals.

The following conditions have to be satisfied for the expression of wisdom of crowd:

- There must be *cognitive diversity* in terms of perspectives, rules of thumb, interpretations, and so on.
- There has to be an aggregation mechanism—the most familiar *aggregation mechanisms* are financial markets.
- Incentives must exist in the form of rewards for being right and penalties for being wrong. The most common incentives are monetary incentives.

14.2 ✦ FOOLED BY RANDOMNESS

Naseem Taleb's seminal book *Fooled by Randomness*[1] is about luck disguised and perceived as skill and, more generally, randomness disguised and perceived as determinism. The central distinctions presented in the book are summarised in Exhibit 14.1.

Exhibit 14.1 Table of Confusion

Luck	Skills
Randomness	Determinism
Probability	Certainty
Belief, conjecture	Knowledge, certitude
Theory	Reality
Anecdote, coincidence	Causality, law
Forecast	Prophecy
Lucky idiot	Skilled investor
Survivorship bias	Market outperformance
Volatility	Return
Stochastic variable	Deterministic variable
Noise	Signal

14.3 ✦ POWER LAWS

If you take any text, say James Joyce's *Ulysses*, you will find that a few words are used very frequently and many words are used relatively rarely. If the word distribution is expressed on

[1] Nassim Nicholas Taleb, *Fooled by Randomness, The Hidden Role of Chance in Life and in the Markets*, Random House, 2005.

a proportional log scale, it will be a straight line from the upper left hand of the chart to the bottom right hand of the chart.

George K. Zipf, a Harvard linguist, observed this relationship in a number of systems and wrote about them in his famous book *Human Behavior and the Principle of Least Effort.*

Zipf's law, as scientists call it, is an example of a "power law." Zipf mistakenly believed that his law was applicable only to social science, not physical sciences. However, his power laws have been discovered in many areas, including physical and biological systems. For example, power laws explain relationships between frequency and magnitude of earthquakes, frequency and size of avalanches, the mass and the metabolic rate of animals. Power laws are applicable to social phenomena such as income distribution (Pareto's law), Internet traffic, stock price changes, city size, and company size. Many people understand power laws through the colloquial "80/20 rule."

Why should investors bother about power laws?

1. Power laws distribution implies periodic, albeit infrequent, price movements that are much larger than what the standard finance theory predicts. The fat-tail phenomenon has important implications for portfolio construction and leverage.
2. The existence of power laws means that there is some underlying order in self-organising systems. We don't have full explanation for the mechanisms that lead to power laws in social systems. But there is enough evidence of the existence of power laws to make some predictions about what the systems will look like in the future.
3. Power laws are not easily explained by standard economic theory. Neoclassical economic theory, for example, assumes that individuals are fully informed, rational, and interact with one another indirectly (through markets) and focus on equilibrium outcomes that result from such behaviour. In the real world, these assumptions are not fulfilled. As Mauboussin puts it, "In the real world, people are adaptive and not fully informed, and deal directly with one another. So ideally we should seek to explain the empirical findings with an approach that fits how people really act."

To express his law, Zipf specified a very simple equation:

$$\text{Rank} \times \text{Size} = \text{Constant}$$

According to this equation, we can obtain a sequence by multiplying the constant by 1, 1/2, 1/3, and so on. For example, the population of the top three cities in Spain corresponds to the Zipf law:

Rank	*Size*
Madrid 1	3 million
Barcelona 2	1.5 million
Valencia 3	1.0 million

While the Zipf's law describes some systems well, it is too restrictive to describe the variety of systems that exhibit power laws. Benoit Mandelbrot has suggested two modifications to the Zipf's law to obtain a more general power law.

1. Add a constant to the rank. Doing so changes the sequence to:

$$1/(1 + \text{constant}),\ 1/(2+ \text{constant}),\ldots..$$

2. Add a constant to the power of 1 in the denominator. This results in:

$$1/(1+\text{constant})^{1+\text{constant}}, 1/(2+\text{constant})^{1+\text{constant}}, \ldots\ldots$$

Zipf's law is the special case where both the constants are zero.

Even after incorporating two parameters, the power laws remain fairly simple. It is a wonder that such an elementary equation describes such diverse phenomena. More so, when we have no unified explanation of how these power laws came into being.

Perhaps the best known model that explains power laws is the **self-organised criticality** model, popularised by Per Bak, a theoretical physicist. He suggests a scene at a beach where a child is trickling sand into a pile. Initially, the grains remain fairly close to where they fall and the pile is relatively flat.

As the child continues to trickle more sand grains, the pile becomes steeper and there are periodic sand slides. After a while, the sand slides will be as big as the pile itself. The system seems to be in a "critical" state—between steady state and randomness.

Once the pile reaches a "critical" state, additional grains produce sand slides of varying magnitudes. The size distribution of sand slides conforms to a power law.

Paul Krugman, a Nobel laureate in economics, believes that the principle of "self-organised criticality" can be usefully applied to economics. In his book *The Self-Organizing Economy* (Blackwell Publishing, 1996), he wrote.

> "In the last few years, the concept of self-organising systems of complex systems in which randomness and chaos seem spontaneously to evolve into unexpected order, has become an increasingly influential idea that links together researchers in many fields, from artificial intelligence to chemistry, from evolution to geology." He added, "For whatever reason, however, this movement has so far largely passed economic theory by." "It is time to see how the new ideas can usefully be applied to that immensely complex, but indisputably self-organising, system we call the economy."

14.4 ✦ NOISE AND PERFORMANCE IN STOCK MARKET

In general, if returns are independent over time (which means that they behave like a random walk), the standard deviation of the average return over n years is $\sigma/\sqrt{n}$, where σ is the standard deviation of one-year return and n is the length of investment horizon. This means that as the investment horizon elongates the standard deviation of average return decreases and as the investment horizon contracts the standard deviation of average return increases. For example, if equities earn an average annual return of 15 per cent with a standard deviation of 10 per cent, the standard deviation of average return will be as follows for different investment horizons:

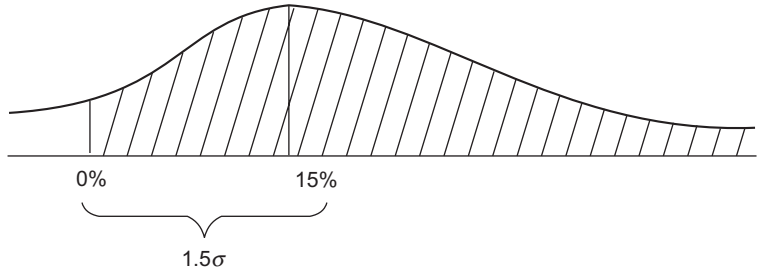
Investment Horizon	Standard Deviation of Average Return
2 years	$10/\sqrt{2}$ = 7.07 per cent
1 year	$10/\sqrt{1}$ = 10.00 per cent
3 months	$10/\sqrt{0.25}$ = 20.00 per cent

Note that while the average annual return remains the same, viz., 15 per cent, the standard deviation of average return varies inversely with the investment horizon. This means that as the observation period shortens, noise (volatility) dominates performance (average return) and vice versa. To appreciate the significance of this, let us assume that equities provide an average annual return of 15 per cent with a standard deviation of 10 per cent and answer two questions:

- What is the probability of success (defined as a positive return) for different observation periods?
- How much of noise and how much of performance do we see over different observation periods?

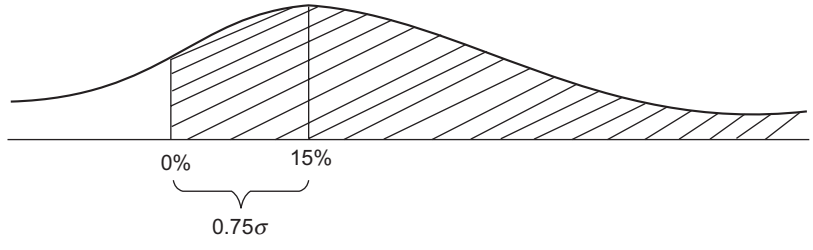
Probability of Success

What would be the probability of success (defined as a positive return) in any given year? Since the standard deviation of average return over a one-year period is 10 per cent and the average return is 15 per cent, 0 per cent (which separates success from failure) is 1.5σ to the left of the mean (15 per cent). So, the probability of success is equal to the shaded area in the following distribution:



Consulting the table of standard normal distribution, we find that the probability of the shaded area is 0.93 or 93 per cent.

What would be the probability of success over a quarter (0.25 years)? The standard deviation of return when the period is 0.25 is: $10\%/\sqrt{0.25} = 20$ per cent. Now, given a mean return of 15 per cent and a standard deviation of 20 per cent, 0 per cent is 0.75σ to the left of the mean. So, the probability of success is equal to the shaded area in the following distribution.



From the standard normal distribution table, we find that the probability of the shaded area is 0.77 or 77 per cent.

Thus, we find that when the time scale is 1 year, the probability of success is 93 per cent and when the time scale is a quarter, the probability of success is 77 per cent. As the time scale reduces the probability of success falls as shown below:

Scale	*Probability of Success*
1 year	93%
1 quarter	77%
1 month	67%
1 day	54%
1 hour	51.3%
1 minute	50.17%
1 second	50.02%

From the above, it is clear that as the observation period shortens noise dominates performance.

• Proportions of Performance and Noise Over Different Observation Periods

Average return represents performance and standard deviation (volatility) represents noise. If equities earn an average annual return of 15 per cent with a standard deviation of 10 per cent, then the performance and noise for various observation periods are as given in Exhibit 14.2.

Exhibit 14.2 Performance and Noise over Different Observation Periods

Observation Period	*Performance (Average Return)*	*Noise (Standard Deviation)*
2 years	15 per cent	7.07 per cent
1 year	15 per cent	10.00 per cent
3 months	15 per cent	20.00 per cent
1 month	15 per cent	34.64 per cent
1 week	15 per cent	72.11 per cent
1 day	15 per cent	191.10 per cent

Thus, over 2 years, we observe 0.47 parts noise for one part performance; over 1 year, we observe 0.67 parts noise for one part performance; over one-quarter, we observe 1.33 parts noise for one part performance; over one month, we observe 2.31 parts noise for one part performance; over one week, we observe 4.81 parts noise for one part performance; and over 1 day, we observe 12.74 parts noise for one part performance. As the observation period contracts, noise dominates performance.

14.5 ✦ STOCK MARKET AS A COMPLEX ADAPTIVE SYSTEM[2]

The classical capital market theory, like the bulk of economics, is based on the equilibrium system articulated so well by Alfred Marshall, the father of modern economics, in 1890s. This view is based on the idea that economics is like Newtonian physics, with well defined cause-effect relationships.

The irony is that while economists still subscribe to the deterministic model of Newtonian physics, quantum theory and other advances in physics emphasise "indeterminancy." It appears that most systems, in nature as well as in business, are in constant flux and not in equilibrium.

The classical capital market theory assumes that investors are rational and the market is efficient. Based on these assumptions, it derives the following results.

- Stock market returns are normal.
- Prices behave like a random walk.
- Risk and return are linearly related.

Empirical evidence suggests that the classical theory falls short in the following ways:

1. The distribution of stock market returns exhibits a high degree of kurtosis. This means that the "tails" of the distribution are "fatter" and the "mean" of the distribution is higher than what is predicted by a normal distribution. In simple words, this means that periods of relatively modest changes are interspersed with periods of booms and busts.
2. Financial returns are predictable to some extent.
3. Risk and reward are not related in a linear manner.
4. Investors are prone to make systematic errors in their judgment and trade excessively.

• Capital Market as a Complex Adaptive System

Despite these limitations, the classical capital market theory has substantially advanced our understanding of capital markets. However, since it is approaching the limit of its usefulness, a new model that has higher explanatory power is required. Michael J. Mauboussin has suggested that the capital market may be regarded as a complex adaptive system. "Complex" means that there is a lot of interaction, "adaptive" means that the agents change and evolve, and "system" implies that the whole is greater than the sum of the parts. This model appears to be more consistent with what is known in disciplines like physics and biology.

To understand what a complex adaptive system is let us begin with a simple situation where two people are put in a room and asked to trade a commodity. What happens? Hardly anything. If a few more people are added, the activity picks up, but the interactions remain somewhat subdued. The system remains static and lifeless compared to what we see in the capital markets. As more and more people are added to the system, something remarkable happens: it acquires lifelike characteristics. As Mauboussin put it: "In a tangible way, the

[2] Adapted from Michael J. Mauboussin, "Revisiting Market Efficiency: The Stock Market as an Adaptive System,"*Journal of Applied Corporate Finance*, Winter 2002.

system becomes more complex than the pieces that it comprises. Importantly, the transition—often called 'self-organised criticality'—occurs without design or help from outside agent. Rather, it is a direct function of the dynamic interactions among the agents in the system."

The central characteristics and properties of a complex adaptive system are as follows:

Aggregation The collective interactions of many less-complex agents produces complex, large-scale behaviour.

Adaptive Decision Rules Agents in the system take information from the environment and develop decision rules. The competition between various decision rules ensures that eventually the most effective decision rules survive.

Non-Linearity Unlike a linear system, wherein the value of the whole is equal to the sum of its parts, a non-linear system is one wherein the aggregate behaviour is very complex because of interaction effects.

Feedback Loops In a system that has feedback loops the output of one interaction becomes the input of the next. A positive feedback can magnify an effect, whereas a negative feedback can dampen an effect.

• How Does the New Model Compare with the Classical Capital Market Theory

The complex adaptive expectations model seems to conform to reality better than the classical capital market theory. The following evidence bears this out:

1. The high kurtosis ("fat tails") in return distribution suggests that periods of stability are interspersed by rapid change.
2. The price behaviour in a complex adaptive system would not be very different from a classic random walk. However, the new model explains better the observed persistence in returns, to the extent that the same exists.
3. Under most circumstances, the aggregation of the heterogeneous expectations of investors would yield prices that are similar to intrinsic values. However, if certain decision rules become pervasive, the resulting homogeneity of views may lead to self-reinforcing trends, leading to booms and crashes.
4. The poor performance of active portfolio managers is consistent with the classical market theory as well as the complex adaptive model. Still, it is possible that some investors would do well. As Mauboussin put it: "That point made, it remains possible under theory that certain investors Warren Buffett and Bill Miller, e.g. – may be 'hard-wired' to be successful investors. In this sense, 'hard-wired' suggest innate mental processes, fortified with practice, that allow for systematically superior security selection."

Implications of the New Model The important implications of the new model for investors and corporate practitioners are as follows:

1. While the CAPM still provides probably the best available estimate of risk for most corporate investment decisions, managers must recognise that their stock price may fluctuate more than what the standard theory suggests.
2. The market is usually smarter than the individual. Hence, managers should weight the evidence of the market over the evidence of experts.

3. Markets function well when participants pursue diverse decision rules and their errors are independent. Markets, however, can become very fragile when participants display herd-like behaviour, imitating one another.
4. It may be futile to identify the cause of a crash or boom because in a non-linear system small things can cause large-scale changes.
5. The discounted cash flow model provides an excellent framework for valuation. Indeed, it is the best model for figuring out the expectations embedded in stock prices.

Mauboussin summed up the implications of the new model as follows: "From a practical standpoint, managers who subscribe to standard capital market theory and operate on the premise of stock market efficiency will probably not go too far astray. However, complex adaptive systems may provide a useful perspective in areas like risk management and investor communication."

The stock market is a complex adaptive system where the links between cause and effect are elusive. Yet, we have a deeply ingrained desire to find cause-effect relationship. So, we make up stories to explain cause and effect relations.

Investors who actively search for understanding the causes for market movement risk one of two pitfalls.

- They confuse correlation with causality.
- They anchor on the first number or piece of evidence they hear to explain an event.

An appreciation of our need for explanation, however spurious they may be, can be a good inoculation against such pitfalls. As Mauboussin said, "Read the morning paper explaining yesterday's action for entertainment, not education."

Complex adaptive systems are non-linear and have critical points. The mathematics for such systems are messier, implying that there may be no solution or multiple equilibria. Since hard scientists are drawn to equilibrium equations that can be solved with probability calculus, they are drawn to modern portfolio theory, which definitely represents a quantum leap in our understanding over what we knew in 1940s. Eventually, however, as we develop more powerful tools of analysis, CAPM and beta, the central ideas of modern portfolio theory, will be supplanted.

Here, one can draw an analogy from the field of physics. The Newtonian physics is helpful in explaining planetary motions and gravitation. However, to explain what is going on in the world, you have to bring in ideas of quantum physics and Einstein's theory of relativity.

In a similar vein, we may argue that the CAPM is a stop-gap solution. While it is an elegant theory which is reasonably practical, it just doesn't work all the time in the real world.

14.6 ✦ EVOLUTIONARY ANALOGY[3]

People think that financial evolution involves consolidation and the emergence of few giants or behemoths. Niall Ferguson, however, argues that it is a lot like natural selection. He draws the following parallels (Exhibit 14.3).

[3] Adapted from Niall Ferguson's lecture on 'Globalisation' which was the capstone event of the centennial year celebration of Harvard Business School in 2008.

Exhibit 14.3 Parallels in the Nature and the World of Finance

Nature	*Finance*
Genes	Institutional memories of business practices
Spontaneous mutation	Innovation
Competition for finite resources	Competition for customers, market share, and profit
Mechanism of natural selection	Market allocation of capital and human resources and the possibility of death in case of under-performance (differential selection)

Due to these similarities, there is scope for speciation and diversity as well as scope for species extinction in the world of finance as in nature.

For a quarter of century, beginning in early 1980s, finance enjoyed its golden age. As an *Economist* article put it: "As financial globalisation spread capital more widely, markets evolved, businesses were able to finance new ventures, and ordinary people had unprecedented access to borrowing and foreign exchange. Modern finance improved countless lives."

During this period, we witnessed an incredible proliferation of instruments, institutions, and markets. Just as bio-diversity thrives when natural environment is benign, financial diversity flourishes when the economic conditions are conducive.

• Critical Differences Between Natural Evolution and Financial Evolution

Niall Ferguson says that there are three critical differences between natural evolution and financial evolution.

1. In the natural world, mutation is random whereas in the financial world innovation (or mutation) is conscious and deliberate.
2. In the natural world, **exogenous** shocks such as asteroids hitting the earth or ice ages cause changes in the natural environment that may significantly alter the advantages or disadvantages of certain traits. In the financial world, however, disruptions are **endogenous** not exogenous. The Great Depression of the 1930s, the Great Inflation of the 1970s, and the Great Recession of the 2000s are conspicuous examples of endogenously caused disruptions.
3. According to the Darwinian theory, in the natural world there is no such thing as an intelligent design or a divine regulator. Evolution is a random process with no moral outlook on the outcome. In contrast, in the financial world, there is supposed to be an intelligent design. Regulators are supposed to be in charge of that design. Of course, it is a different matter that regulators often don't succeed because regulations are nearly always improvised by national legislations in response to a crisis. Such regulations are meant to avoid the crisis that has just happed from happening again, but are ineffective in dealing with the next crisis as it would be very different in nature. Niall Ferguson argues that regulators are tempted to interfere with the process of natural selection that he believes is essential to financial evolution.

Joseph Schumpeter on the Process of Creative Destruction

This evolutionary character is not merely due to the fact that economic life goes on in a social and natural environment which changes, nor is this evolutionary character due to quasi-autonomous increases in population and capital or to the vagaries of monetary systems. The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers goods, the new methods of production or transportation, the new markets and the new forms of industrial organisation capitalist enterprise creates. The opening of the new markets, foreign or domestic, and the oraganisational developments from the craft shop and factories to such concerns as the U.S. Steel illustrate the same process of industrial mutation that incessantly revolutionises the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of creative destruction is the essential fact about capitalism.*

*Joseph Schumpter, *Capitalism, Socialism, and Democracy*, Floyd, Virginia: Impact Books, 1942.

14.7 ✦ ANIMAL SPIRITS

George A. Akerlof and Robert A. Shiller, both Nobel laureates in economics, have authored a path-breaking book titled *Animal Spirits* (published by Princeton University Press in 2009), which explains how human psychology drives the economy. Says Robert M. Solow, another Nobel laureate in economics, "This book is a sorely needed corrective. *Animal Spirits* is an important, may be even a decisive contribution at a difficult juncture in macroeconomic theory."

In the midst of the Great Depression of the 1930s, John Maynard Keynes published his magnum opus *The General Theory of Employment, Interest and Money.* While Keynes acknowledged that most economic activity results from rational economic motivations, he also argued that much economic activity is governed by 'animal spirits' a phrase coined by him to describe a range of emotions, human impulses, enthusiasms, and misperceptions. Just as Adam Smith's invisible hand is the cornerstone of classical economics, Keynes' animal spirits are the cornerstone of a different view of the economy that explains the inherent instability of capitalism. Keynes argued that the proper role of the government was to countervail the excesses caused by our animal spirits.

In 1950s and 1960s *The General Theory* gained widespread acceptance and its adherents rooted out most of the animal spirits that led to the Great Depression. As Akerlof and Shiller note: "They left just enough animal spirits to yield a Least-Common-Denominator theory that minimised the intellectual distance between *The General Theory* and the standard classical economics of the day. In this standard economic theory there are no animal spirits."

During the 1970s, a new generation of economists, mainly from the University of Chicago, developed the neo-classical economics. Downplaying the significance of animal spirits, they championed the cause of free markets and argued that governments should not interfere with people's pursuit of their self-interest. This belief shaped national policies across the globe. It

took the form of Thatcherism in England and Reaganism an America and it spread to other countries.

Akerlof and Shiller argue that the recent global financial crisis has unmistakably highlighted the role of psychological forces. This book stresses the need for active government role in taming animal spirits. It draws on the emerging field of behavioural economics to explain how the economy really works and the role of animal spirits.

According to Akerlof and Shiller, the five different aspects of animal spirits are: confidence, fairness, corruption and antisocial behaviour, money illusion, and stories.

- **Confidence** Standard economic theory suggests that people make rational investment decisions by considering all the options available to them, evaluating the possible outcomes of these options, and assessing the probabilities of these outcomes.

  In the real world, it is difficult to define the outcomes and probabilities of many business, as well as personal, decisions. So, they are made much more on the basis of whether or not the decision-maker has confidence. These decisions are made because the decision-maker "feels right." As Jack Welch, one of the world's most successful executives, claims that such decisions are made "straight from the gut."

  Business confidence and the feedback between it and the economy magnifies disturbance. Akerlof and Shiller say: "But at the level of the macroeconomy, in the aggregate, confidence comes and goes. Sometimes it is justified. Sometimes it is not. It is not just a rational prediction. It is the first and most crucial of our animal spirits."
- **Fairness** In general, classical economics has an ambivalent view of fairness. Although there is an extensive literature on fairness, there is a tradition that considerations of fairness should be regarded as secondary in explaining economic events. In the real world, however, fairness is an important consideration in many economic decisions. For example, phenomena such as the existence of involuntary unemployment can be readily explained when fairness is taken into account.
- **Corruption and Anti-social Behaviour** To understand the functioning of the economy, we must also know its sinister side, the tendency of people to behave in a corrupt and anti-social manner. As Akerlof and Shiller say: "Some economic fluctuations may be traced to changes over time in the prominence, and acceptability, of outright corruption. Even more significantly, there are changes over time in the prevalence of bad faith economic activity that, while technically legal, has sinister motives."
- **Money Illusion** The classical economics assumes that people are rational and their decisions would we guided only by the 'real purchasing power' of nominal dollars (or rupees or whatever). In reality, people suffer from money illusion. They are confused by the effects of inflation or deflation and do not reason through its effects.
- **Stories** Economists generally consider it unprofessional to base their analyses on stories. They are supposed to stick to facts (just the facts, ma'am) and a theory based on optimisation of economic variables. But as Akerlof and Shiller say " Our sense of reality, of who we are and what we are doing, is intertwined with the story of our lives and of the lives of others. The aggregate of such *stories* is a national or international story, which itself plays an important role in the economy."

• Human Element in Economics

The financial crisis exposed the limitations of scientific economics because the standard models could not anticipate a crisis of such magnitude. This was mainly because the economics profession did not fully account for the human element, an element that is not easily amenable to mathematical analysis.

Of course, there were some professional economists who warned of the impending crisis. Robert Shiller, a leading behavioural economist, was one of them. According to him, these professional economists brought to bear more personal judgment which he describes as "intuitive comparisons with past historical episodes; conclusions about speculative trading, price bubbles, and the stability of confidence; evaluations of the moral purposes of economic actors; and the impressions that complacency had set in, putting watchdogs to sleep." He further adds, "These were judgments made by economists who were familiar with our business leadership, their inspirations, beliefs, subterfuges, and rationalisations." However, such views can never be submitted to a scholarly journal and their validity cannot be proved by an established scientific procedure.

Economics is, indeed, in many ways a science and the work of scholars and their models has led to significant advances. But as Edwin R.A. Seligman, an economist, put it, "Economics is a social science, i.e., it is an ethical, and therefore, not an exact or purely abstract science."

14.8 ✦ FROM HOMO ECONOMICUS TO HOMO SAPIENS[4]

Richard H. Thaler, a leading behavioural economist, made the following six bold predictions about how economics will develop over the next couple of decades.

Acutely aware that his forecasts are likely to be affected by biases such as optimism (and wishful thinking), overconfidence, the false consensus effect (people tend to think others are just like them), and the curse of knowledge (once you know something, you can't imagine ever thinking otherwise), he offers these forecasts with trepidation.

1. **Home Economicus will Begin Losing IQ, Reversing a 50-year Trend** In the first half of the 20th century, economics was much more of a social science. Eminent economists like Irving Fisher and John Maynard Keynes emphasised psychological factors to explain economic behaviour. With the mathematisation of economics that began in the 1940s with the likes of John Hicks and Paul Samuelson, economic agents were assumed to resort to optimisation and with the domination of the rational expectations hypothesis of John Muth, Robert Lucas, and so on, economic models came to include agents that critics called "hyper rational."

   This tendency is likely to be reversed in favour of an approach in which the degree of rationality bestowed on economic agents will depend on the context being studied.
2. **Homo Economicus will Become a Slower Learner** Most economic models assume that agents can solve the relevant problem correctly in the first attempt. Even when learning is explicitly considered, Homo Economicus (HE, hereafter, with no gender

[4] Adapted from Richard H. Thaler "Home Economicus to Homo Sapiens," *Journal of Economic Perspectives*, Winter 2000, 133–141.

connotation) is expected to learn quickly. If HE errs, HE quickly corrects. The truth is that even at the best universities of the world, students are a little slower on the uptake.

Many economic models of learning seem to be constructed for a very static environment. However, life is dynamic and most important decisions of life, such as choosing a profession or spouse, offer very few opportunities for learning. Economic models of learning will incorporate these realities. As Thaler put it, "I predict that economic models of learning will become more sophisticated by making their agents less sophisticated and giving greater weight to the role of economic factors, such as the difficulty of the task and the frequency of feedback, in determining the speed of learning."

3. **The Species Populating Economics Models will Become More Heterogeneous** Even though most economists admit that they know many quasi-rational people (colleagues, spouses, managers, students, and so on), the economic models that they develop base exclusively on rational representative agents. To justify their position, they offer some kind of evolution plus markets reasoning. Their argument runs as follows. Suppose there are some less-than-fully rational agents, referred to as quasi-rationals by Thaler. When the quasi-rationals interact with rationals, the latter would quickly take all their money. After that, the quasi-rationals would quickly learn and turn rational or become economically irrelevant. This reasoning is flawed. As De Long et. al have shown that in financial markets, it is possible for quasi-rationals (called "noise traders") to outperform their rational counterparts by inadvertently assuming more risk.

   Thaler argues that the economic models of future will have more heterogeneous participants. As he put it, "After all, analysis of market interactions between agents of various types is exactly what differentiates economics from other social sciences. Psychologists, sociologists, and anthropologists might help us improve our characterisations of economic behaviour, but economists are the only social scientists with the tools to analyse what happens in the market contexts."

4. **Economists will Study Human Cognition** There will be an attempt to characterise economic agents more richly on the basis of a better understanding of human cognition. "Prospect theory" of Daniel Kahneman and Amos Tversky is a shining example of this kind of research. A positive theory of decision-making under uncertainty, the prospect theory captures a considerable amount of insight in its S-shaped "value function." This theory reflects three important psychological concepts: (a) Humans adapt themselves to their environment and react only to perceived changes. (b) Humans display diminishing marginal sensitivity to both gains and losses. (c) The loss function is steeper compared to the gain function (this property is called loss aversion). These three psychological concepts explain diverse phenomena such as consumer reaction to price changes and behaviour of taxi drivers.

   There are various ways in which a better understanding of human cognition can improve economics. Here are two examples. First, prospect theory tells us that the manner in which a problem is framed has a bearing on choice, but does not tell us how people actually frame the problem. A better understanding of problem-framing will improve economic models. Second, though the implications of bounded rationality

have been studied, not much effort has gone into studying the impact of bounded memories.

5. **Economists will Distinguish Between Normative and Descriptive Theories** Psychologists distinguish clearly between normative theories and descriptive theories. While normative theories characterise rational choice (such as the axioms of expected utility theory and Bayes' rule), descriptive theories characterise how people actually make choices. Prospect theory is an eminent example of a descriptive theory.

   Traditionally, economists have used one theory to serve the normative as well as the descriptive purposes. For example, expected utility theory is a rational (normative) model that is used also as a descriptive model. Occasionally, economists have proposed explicitly descriptive models. For example, William Baumol proposed a theory of the firm in which managers seek to maximise sales, subject to a profit constraint. However, such descriptive theories received lukewarm acceptance.

6. **Homo Economicus will Become More Emotional** The standard assumption in economic models is that human beings are rational individuals who focus on maximising their self-interest. Our common sense tells us that human beings are influenced by a variety of emotions such as anger, envy, greed, fear, contempt, revenge, compassion, disgust, and love.

   In future, economists will pay more attention to the role of emotions in influencing behaviour. How can emotions be incorporated in economic analysis? A simple example of this is the ultimatum game in which, in general, responders reject very low offers out of indignation.

Saving Economics from the Economists*

Ronald Coase, a Nobel laureate in economics, is very critical of economics as it is currently taught in textbooks and classrooms. As he put it, "Economics as currently practiced in textbooks and classrooms does not have much to do with business management, and still less with entrepreneurship. The degree to which economics is isolated from the ordinary business of life is extraordinary and unfortunate."

This was not so when modern economics was founded by Adam Smith who envisioned it as a study of the "nature and causes of the wealth of nations." The academic community at that time was small and economics addressed a broad audience. Even till the turn of the 20th century, economics had relevance to industrialists. Alfred Marshall kept economics as "Both a study of wealth and a branch of the study of man."

As the profession of economics consolidated in the 20th century, economists enjoyed the freedom to write to each other in a very abstract manner using a hypotheco-deductive system based on unrealistic assumptions. So, they did not provide any real guidance to managers and entrepreneurs in their endeavour to bring new products and services to customers in a rapidly changing environment. As a result, managers and entrepreneurs depend on their personal judgment, business acumen, and rules of thumb for decision-making. As Ronald Coase lamented, "Today, production is marginalised in economics, and the paradigmatic question is rather static one of resource allocation."

Given the institutions—intensive character of a modern market economy (an intricate web of social institutions is required for coordinating the working of markets and firms across various boundaries), reducing economics to price theory is somewhat disturbing. As Ronald Coase put it, "It is suicidal for the field to slide into a hard science of choice, ignoring the influences of society, history, culture, and politics on the working of the economy. It is time to re-engage the severely improverished field of economics with the economy."

*Ronald Coase, "Saving Economics from the Economists," *Harvard Business Review*, December 2012.

14.9 ✦ HALO EFFECT AND COMPANY PERFORMANCE[5]

In the late 1990s when Cisco Systems was enjoying expanding sales, rising profits, and soaring market capitalisation, it was extolled for its brilliant strategy, acquisition skills, and sharp customer focus. However, when the tech bubble burst, Cisco Systems was suddenly criticised for its flawed strategy, poor acquisition management, and sloppy customer relationships. While Cisco systems had hardly changed, a decline in its performance significantly altered the perception of people about the company. A similar thing happened to IBM and ABB—they were highly admired when performance was strong but severely criticised when performance declined, with very meagre evidence of meaningful changes in their strategies/policies.

The above examples reflect errors that people commonly make in explaining company performance. The main cause for such errors is what psychologist Edward Thorndike called the 'halo effect.' The halo effect refers to the human tendency to make specific inferences on the basis of a general impression. Thus, when a company is doing well financially, observers conclude that it has an innovative strategy, a visionary CEO, a motivated workforce, a vibrant culture, superb customer orientation, and so on. When the company's performance falls, people are quick to infer that it has a flawed strategy, a confused CEO, a complacent workforce, a stifling culture, an apathy toward customers, and so on.

Why do people tend to make such attributions? Because many concepts in business like leadership, corporate culture, core competencies, and customer orientation are vague and not easily definable in objective terms. So, our perceptions about them are often shaped by things that appear more concrete, tangible, and quantitative, namely financial performance. As Phil Rosenzweig put it aptly: "When financial performance is strong, people tend to have broadly favourable opinions of other things that are less tangible; and when performance falters, they make the opposite judgments. As a result, many of the things we commonly believe *drive* company performance are better understood as the *result of* performance."

• Some Popular Studies of Company Performance

While many researchers take care to ensure the validity of their data, some of the most popular studies seem to have relied on contaminated data. Let us look at two prominent works:

[5] Phil Rosenzweig, "Misunderstanding the Nature of Company Performance: The Halo Effect and other Business Delusions," *California Management Review,* Summer 2007.

In Search of Excellence: Lessons from America's Best-Run Companies In 1982, Tom Peters and Robert Waterman published their study *In Search of Excellence: Lessons from America's Best Run Companies* which turned out to be blockbuster. In this work they asked a basic question, 'Why are some companies more successful than others?'

They started by identifying 43 excellent companies based on six measures of long-term financial performance computed over the period 1961–1980: compound asset growth, compound equity growth, average market value to book value ratio, average return on total capital, average return on equity, and average return on sales. Then they gathered data from archival sources, press reports, and interviews. Based on their analysis of these data, they identified eight attributes of excellent companies: a bias toward action, close relations with customers, autonomy and entrepreneurship, productivity through people, hands-on and value driven, stick to the knitting, simple form, lean staff, and simultaneous loose-tight properties.

Interestingly, the financial performance of these companies, as measured by the same six ratios employed by Peters and Waterman, deteriorated more or less across the board over the five-year period (1981–1985) after the study. If we believe that Peter and Waterman were successful in identifying the drivers of high performance, the deterioration in the performance of these companies appears puzzling. Yet the regression in the performance of these companies is entirely plausible, given two errors in the methodology adopted by Peters and Waterman. First, they looked at only companies that had performed well, based on financial outcomes. Second, their data came by and large from sources that are generally biased by the halo effect.

Built to Last: Successful Habits of Visionary Companies In their best-selling work *Built to Last: Successful Habits of Visionary Companies*, Jim Collins and Jerry Porras reported the most influential study of company performance in the 1990s. They sought to find the "underlying timeless, *fundamental principles* and patterns that might apply across eras."

They identified 200 leading companies across a wide range of industries and then narrowed it to a list of eighteen truly outstanding, enduring, visionary companies, the "best of the best." The list included companies such as IBM, Hewlett Packard, Motorola, Citicrop, American Express, Johnson & Johnson, Merck, Boeing, General Electric, and Disney.

For each of their *visionary companies*, they identified a *comparison* company from the same industry, that had the same vintage and performed reasonably well. For example, Citicorp was paired with Chase Manhattan, Hewlett Packard with Texas Instruments, Procter & Gamble with Colgate-Palmolive, and so on.

They reviewed more than 3000 documents from varied sources such as magazine articles, company publications, company histories, autobiographies, and business school case studies. Based on their analysis, they distilled "timeless principles" that distinguished the 18 *visionary* companies: a strong corporate culture, audacious goals, home grown management, spirit of experimentation and risk taking, and drive for excellence.

Despite all their claims for rigorous research, Collins and Porras did not address the issue of data independence. Much of the data they collected came from sources that are known to be undermined by the halo effect. As Phil Rozenzweig put it: "Did Collins and Porras successfully identify practices that led to high performance, or did high performing companies tend to be described as having these practices? Given what we know about the pervasive nature of the halo effect, the latter explanation is at least as likely to be as former."

Interestingly, in the five year period after the study ended, the performance of the 18 visionary companies in terms of total shareholder return and operating income as a percentage of total assets, in general, declined. Perhaps the "master blueprint of long-term prosperity" turned out to be illusory.

• Misunderstanding Company Performance

At best, studies of the kind cited above suggest some basic principles, such as staying focused, listening to customers, having strong values, and caring about people, that managers may find helpful. They also narrate success stories that may inspire managers. However, these principles and stories cannot explain performance as the studies claim, because they are characterised by certain misconceptions:

- The first misconception is the notion that there is a formula or blueprint for achieving superior performance. For example, Jim Collins claimed his findings in his blockbuster work *Good to Great* constitute "immutable laws of organisational performance." He has argued that his findings may be likened to the law of physics in terms of their accuracy and predictive power. His findings, however, are vitiated by circular logic—much of the data used to arrive at conclusions about high performance were indeed influenced by the performance they were supposed to explain.

  It must be emphasised that formulas can never explain business success as accurately as the law of physics for a fundamental reason: performance in business is inherently relative, not absolute. If you put fifty beakers filled with water on fifty stoves, you will find that the water in all of them boils at 100 degrees. The performance of one beaker does not affect another. However, in the world of business, where companies compete for resources and customers, the performance of one company is affected by the performance of others. While a company can get better in absolute terms, it may still fall behind its rivals in relative terms.
- The second misconception is linked to the first one. If you mistakenly believe that firm performance is absolute, not relative, you may erroneously infer that performance is driven entirely by internal factors such as value system and quality of people. However, once you recognise that performance is inherently relative, you will realise that competition is central to performance. Hence strategic choices that reflect an assessment of not only your organisation's resources and capabilities but also of your competitors, present and potential, are critical. Strategic choices are made under conditions of uncertainty. Hence, even good strategic decisions may turn out badly, yet the fact that they produced bad outcomes does not necessarily imply that they were mistaken. While it is tempting to make positive attributions when performance is strong and easy to pass negative comments when performance is weak, this view is overly simplistic. As Phil Rosenzweig put it: "The business world involves a series of choices, made under uncertainty, that aim to produce a relative advantage. In a competitive market economy, there is no such thing as a formula for success, nor a guarantee of high performance." He added: "There is meagre evidence that high performers in one time period will sustain in the next. Although claims to contrary have appeal, they are often based on flawed reasoning."

• Thinking Clearly About Company Performance

Here are some suggestions to think more clearly about your company's performance.

- Beware of the halo effect. Refrain from the tendency to make easy attributions based on company performance and make decisions based on valid data.
- Eschew the search for formulas and blueprints of success. Instead, think of making strategic choices under uncertainty, that enhance the possibility of success in a competitive world, while realising that success can never be guaranteed. As Phil Rosenzweig put it: "The business world is not a place of clear causal relationships, where a given set of factors lead to predictable results, but one that is more tenuous and uncertain." He added "The task facing executives is to gather appropriate information, evaluate it thoughtfully, and make choices that provide the best chances for the company to succeed."

14.10 ✦ FLAWS OF FINANCE

In his keynote address at the CFA Institute Annual Meeting 2012, James Montier identified four flaws of finance.

- Bad models
- Bad policies
- Bad incentives
- Bad behaviour

He argued that these flaws, combined together, have proved to be a toxic mix for the modern financial system and precipitated the global financial crisis of 2008.

Bad Models The simplifying assumptions underlying models such as VAR and CAPM render them fallible in practice. As Montier put it, "While models are alluring, 'finance does not equal physics' and 'market participants are not inert,' but active. Finance is a social science and the simplifying assumptions of many models render them helpful in only a theoretical way, since they repeatedly fail in practice."

Montier argues that risk represents the permanent impairment of capital and it is silly to equate it with just volatility as the CAPM does. He is even more critical of VAR (Value at Risk). As he says, "Using VAR is like buying a car with an airbag that is guaranteed to fail just when you need it, or relying on body armour that you know keeps out 95% of the bullets. VAR cuts off the very part of the distribution of returns we should be worried about, the tails."

Bad Policies Policy makers were convinced of the usefulness of VAR by the very banks that developed it. Montier described this as "the world's best example of regulatory capture."

Bad Incentives To worsen the matters, bad incentives permeated the financial system, in particular the U.S. financial system. Given their asymmetric payoffs, these incentives encouraged short-termism, induced excessive risk-taking, and provided no serious penalties for aberrant behaviour.

Bad Behaviour We are impressed by the elegance of our models, so too are our clients. As Montier says, "We have a habit of liking complexity, because complexity impresses. It allows people to charge high fees. It keeps outsiders out." Complexity helps us to baffle and bamboozle our clients when what they really need is to understand how uncertain and murky the markets are.

14.11 ✦ THE CLASH OF CULTURES

In his recent book *The Clash of Cultures* (published by John Wiley & Sons, 2012), John C. Bogle, a doyen in the field of investments, laments the supersession of the culture of long-term investing by the culture of short-term speculation in the past several decades. While these two very different cultures have existed throughout the history of capitalism, today's model of capitalism has become seriously lopsided. To illustrate, in recent years the annual trading in stocks has averaged about $33 trillion, but capital formation averaged just about $250 billion. Put differently, speculation accounted for about 99.2 per cent of activities in the equity market system and capital formation accounted for a mere 0.8 per cent.

This shift has benefited the financial sector at the expense of their clients. As Bogle, put it "..the tension between investments and speculation is at the very heart of the great challenges we now face in Investment America and Corporate America, challenges that could ultimately undermine the functioning of our financial markets and threaten the ability of our individual investors/citizens to build their wealth."

According to Bogle, the proximate cause of the various deficiencies of capitalism is what he calls the double-agency system. As he put it, "….the 'Dual-Agency Society,' in which our giant corporate managers/agents interact with our giant investor managers/agents in a symbiotic 'Happy Conspiracy' to focus on the momentary fluctuations of evanescent stock prices rather than the building of long-term intrinsic value."

The gatekeepers (the judiciary, the legislature, the regulators, the rating agencies, the public accountants, the corporate directors, and even the shareholders) have largely been derelict in discharging their responsibilities and failed to stem what was going on before their eyes. According to Bogle, "The wild and risky 'innovative' securities of the era, financial shenanigans by some of our largest corporations, and Congressional sanctioning of excessive mortgage debt by ill-qualified homebuyers are but a few of the myriad examples."

14.12 ✦ THE ZURICH AXIOMS: THE SWISS WISDOM

Despite meagre natural resources, the Swiss are a wealthy lot. To a great extent their affluence is due to their skill in investment and risk-taking. Max Gunther refers to the Swiss as "the world's cleverest investors, speculators and gamblers."

A club of Swiss stock and commodity speculators who gathered around Wall Street after the Second World War began to articulate the principles that guided their investment decisions. Over time, a list of rules evolved gradually. They were referred to as "Zurich Axioms." In a fascinating book entitled *The Zurich Axioms* (published by Souvenir, 1992), Max Gunther presents the Swiss wisdom in terms of 12 major axioms. They are described below:

Major Axiom 1 ON RISK *Worry is not a sickness but a sign of health. If you are not worried, you are not risking enough.*

Life should be an adventure in which you face jeopardies. When you tackle or face a jeopardy you are naturally likely to worry. Hence, regard worry as a normal and healthy response to an adventurous life in which you deliberately choose risks, rather than shun risk.

Major Axiom 2 ON GREED *Always take your profit.*

Moderate acquisitiveness is a virtue whereas uncontrolled acquisitiveness, which is nothing but greed, is a vice. If you are motivated by greed you are likely to forego the profits that you would have otherwise enjoyed. An old saw says: "If they wanted less, they would go home with more". This is because winning streaks often tend to be short.

Major Axiom 3 ON HOPE *When the ship starts to sink, don't pray. Jump.*

Learn how to get out of a bad situation. Everyone makes mistakes. A good speculator, however, knows how to get out of a bad situation. He has the courage to admit his error and cut short his losses. This is a rare skill because typically an investor hangs on to a loser because he can't admit his mistake easily and fears that a loser will, after he has gone away, turn into a winner. As Max Gunther says: "Refusing to be wrong is the wrongest response to them all."

Major Axiom 4 ON FORECASTS *Human behaviour cannot be predicted. Distrust anyone who claims to know the future, however dimly.*

Human behaviour is inherently unpredictable. So, beware of those who claim that they can divine the future. As Max Gunther says: "In the world of money, which is the world shaped by human behaviour, nobody has the foggiest notion of what will happen in future. Mark that word Nobody." Notwithstanding this difficulty of forecasting, economists, market pundits, and self-styled oracles forecast often as they know that if they forecast often, some forecasts will turn out to be true, thanks to the chance factor. Since forecasts are often not scrutinised carefully, failures often go unnoticed. As Theodore Levitt, an eminent economist, once said: "It's easy to be a prophet. You make twenty-five predictions and the ones what come true are the ones you talk about."

Major Axiom 5 ON PATTERNS *Chaos is not dangerous until it begins to look orderly.*

In the world of finance there are no patterns or orderly designs. As Max Gunther says: "The truth is that the world of money is a world of patternless disorder, utter chaos. Patterns seem to appear in it from time to time, as do patterns in a cloudy sky or in the froth at the edge of the ocean. But they are ephemeral."

Major Axiom 6 ON MOBILITY *Avoid putting down roots. They impede motion.*

Preserve your mobility. Don't allow sentiments like loyalty and nostalgia to come in the way of revising your decisions. Don't get trapped in a souring venture. Do not hesitate to switch to more attractive options as they emerge. Of course, you should avoid bouncing from one speculation to another in a restless manner. As Max Gunther says: "All your moves should be made only after careful assessments of the odds for and against, and no move should be made for trivial reasons. But when a venture is clearly souring, or when something clearly more promising comes into view, then you must sever those roots and go."

Major Axiom 7 ON INTUITION *A hunch can be trusted if it can be explained.*

When you have a hunch you feel that you know something but you may not be fully confident of it. A hunch or intuition feels something like knowledge but is not fully trustworthy. People seem to adopt three distinct approaches towards this phenomenon:

1. They ignore it as it is imperfectly understood.
2. They have indiscriminate faith in it as it is psychologically appealing.
3. They use it discriminately.

The Swiss wisdom calls for using hunches discriminately which implies trusting hunches provided you can explain it. As Max Gunther says: "If you are hit by a strong hunch trust it only if you can explain it, that is, only if you can identify within your mind a stored body of information out of which that hunch might reasonably be supposed to have arisen."

Major Axiom 8 ON RELIGION AND THE OCCULT *It is unlikely that God's plan for the universe includes making you rich.*

Money and the supernatural have nothing to do with each other. Religious faith, superstitious belief, or occult practice do not bring good financial results consistently. While investors may attribute their occasional good performance to divine intervention, the reality is that it represents a chance occurrence. Do not expect help from God or some occult power to improve your investment results. It is not only useless but dangerous as well. As Max Gunther says: "It can lull you into an unworried state, which as we have seen, is not a good state for a speculator to be in. In handling your money, assume you are entirely on your own. Lean on nothing but your own good wits."

Major Axiom 9 ON OPTIMISM AND PESSIMISM *Optimism means expecting the best, but confidence means knowing how you will handle the worst. Never make a move if you are merely optimistic.*

Optimism is a human quality. Without it, life perhaps would be impossible. Speculation, too, would be impossible in the absence of optimism. Here is where the paradox of investment seems to lie. While optimism feels so good and is perhaps necessary, it can lead to financial disaster, if it gets out of control. As Max Gunther says: "Optimism can be a speculator's enemy. It feels good and is dangerous for that very reason. It produces a general clouding of judgment. It can lead you into ventures with no exits. And even when there is an exit, optimism can persuade you not to use it."

Don't make a move just because you are optimistic. Before investing in a venture think clearly about how you will save yourself if things turn sour. If you have a clear and coherent plan to do so, you have confidence—not just optimism.

Major Axiom 10 ON CONSENSUS *Disregard the majority view. It is probably wrong.*

More often than not the majority tends to be wrong. As Rene Descartes, the great philosopher and mathematician, said over three hundred years ago: "And it would avail nothing to count votes…for in the matter of a difficult question, it is more likely that the truth should have been discovered by few than by many."

In matters of investment, guard yourself against betting unthinkingly with the majority. Think independently before investing your money. As Max Gunther says: "The greatest pressure on you, and the most frequently felt, will be those that push you into betting with the

majority…The strongest line of resistance against these pressures is a keen awareness of their existence and insidious power."

Major Axiom 11 ON STUBBORNNESS *If it doesn't pay off the first time, forget it.*

Perseverance is regarded as a virtue in many walks of life. However, in the field of speculation, it is not an unmixed blessing. At times it helps at other times it hurts. Avoid the trap of perseverance in a bid to make every speculative activity profitable. As Max Gunther says: "Don't chase an investment in a spirit of stubbornness. Reject any thought that a given investment 'owes' you something. And don't buy the alluring, but fallacious idea, that you can improve a bad situation by averaging down."

Major Axiom 12 ON PLANNING *Long-range plans engender the dangerous belief that the future is under control. It is important never to take your own long-range plans, or other people's, seriously.*

The future is unpredictable. It is naïve to think that one can forecast future on the basis of current trends. Over time, the present trends may weaken or even reverse themselves. Further, new trends will emerge in a totally undreamt of fashion.

Given the uncertainty about future, beware of plans that give you an illusion of order. As Max Gunther says: "Do not get rooted in long-range plans or long-term investments. Instead, reach to events as they unfold in the present. Put your money into ventures as they present themselves and withdraw it from hazards as they loom up."

SUMMARY

- To be a better investor, executive, parent, friend, or person, we should approach problems from a multi-disciplinary perspective. Put differently, we should learn to find wisdom from diverse sources.
- In his book *The Wisdom of Crowds,* James Surowiecki argues that the aggregation of information in groups results in decisions that are often better than *that which could have* been made by any single person in the group.
- In his book *The Difference,* Scott Page addresses the "why" of the wisdom of crowds. One of his core ideas is the **diversity prediction theorem**. According to this theorem:
  Collective error = Individual error (the ability of the individual)
  – Diversity of prediction (cognitive diversity)
- Naseem Taleb's seminal book *Fooled by Randomness* is about luck disguised and perceived as skill and, more generally, randomness disguised and perceived as determinism.
- If you take any text, say James Joyce's *Ulysses*, you will find that a few words are used very frequently and many words are used relatively rarely. If the word distribution is expressed on a proportional log scale, it will be a straight line from the upper left hand of the chart to the bottom right hand of the chart. George K. Zipf, a Harvard linguist,

observed this relationship in a number of systems and wrote about them in his famous book *Human Behavior and the Principle of Least Effort*.

- Zipf's law, as scientists call it, is an example of a "power law".
- To express his law, Zipf specified a very simple equation:
  $$\text{Rank} \times \text{Size} = \text{Constant}$$
- Perhaps the best known model that explains power laws is the **self-organised criticality** model, popularised by Per Bak a physicist.

  Paul Krugman, a Nobel laureate in economics, believes that the principle of "self-organised criticality" can be usefully applied to economics.
- In general, if returns are independent over time (which means that they behave like a random walk), the standard deviation of the average return over n years is $\sigma/\sqrt{n}$, where σ is the standard deviation of one-year return and n is the length of investment horizon. This means that as the investment horizon elongates, the standard deviation of average return decreases, and as the investment horizon contracts, the standard deviation of average return increases.
- As the observation period contracts, noise dominates performance.
- Despite its limitations, the classical capital market theory has substantially advanced our understanding of capital markets. However, since it is approaching the limit of its usefulness, a new model that has higher explanatory power is required. Michael J. Mauboussin has suggested that the capital market may be regarded as a complex adaptive system. "Complex" means that there is a lot of interaction, "adaptive" means that the agents change and evolve, and "system" implies that the whole is greater than sum of the parts. This model appears to be more consistent with what is known in disciplines like physics and biology.
- The central characteristics and properties of a complex adaptive system are as follows: Aggregation, Adaptive Decision Rules, Non-Linearity, Feedback Loops.
- Mauboussin summed up the implications of the new model as follows: "From a practical standpoint, managers who subscribe to standard capital market theory and operate on the premise of stock market efficiency will probably not go too far astray. However, complex adaptive systems may provide a useful perspective in areas like risk management and investor communication."
- Just as Adam Smith's invisible hand is the cornerstone of classical economics, Keynes' animal spirits are the cornerstone of a different view of the economy that explains the inherent instability of capitalism. Keynes argued that the proper role of the government is to countervail the excesses caused by our animal spirits.
- According to Akerlof and Shiller the five different aspects of animal spirits are: confidence, fairness, corruption and antisocial behaviour, money illusion, and stories.
- The halo effect refers to the human tendency to make specific inferences on the basis of a general impression. Thus, when a company is doing well financially, observers

conclude that it has an innovative strategy, a visionary CEO, a motivated workforce, a vibrant culture, superb customer orientation, and so on. When the company's performance falls, people are quick to infer that it has a flawed strategy, a confused CEO, a complacent workforce, a stifling culture, an apathy toward customers, and so on.

- As Phil Rosenzweig put it aptly: "When financial performance is strong, people tend to have broadly favourable opinions of other things that are less tangible; and when performance falters, they make the opposite judgments. As a result, many of the things, we commonly believe *drive* company performance, are better understood as the *result of* performance."
- The first misconception about business performance is the notion that there is a formula or blueprint for achieving superior performance. It must be emphasised that formulas can never explain business success as accurately as the laws of physics for a fundamental reason: performance in business in inherently relative, not absolute.
- The second misconception is linked to the first one. If you mistakenly believe that firm performance is absolute, not relative, you may erroneously infer that performance is driven entirely by internal factors such as value system and quality of people.
- Strategic choices are made under conditions of uncertainty. Hence, even good strategic decisions may turn out badly yet the fact that they produced bad outcomes does not necessarily imply that they were mistaken.
- Here are some suggestions to think more clearly about your company's performance: Beware of the halo effect. Refrain from the tendency to make easy attributions based on company performance and make decisions based on valid data.
- Richard H. Thaler, a leading behavioural economist, made the following six bold predictions about how economics will develop over the next couple of decades. (a) Home economicus will begin losing IQ, reversing a 50-year trend. (b) Homo economicus will become a slower learner. (c) The species populating economics models will become more heterogeneous. (d) Economists will study human cognition. (e) Economists will distinguish between normative and descriptive theories. (f) Homo economicus will become more emotional.
- In his keynote address at the CFA Institute Annual Meeting 2012, James Montier indentified four flaws of finance: Bad models; Bad policies; Bad incentives; Bad behaviour.
- John Bogle laments the supersession of the culture of investment by the culture of speculation.
- Despite meagre natural resources, the Swiss are a wealthy lot. To a great extent their affluence is due to their skill in investment and risk taking. Max Gunther refers to the Swiss as "the world's cleverest investors, speculators and gamblers."
- In a fascinating book, entitled *The Zurich Axioms,* Max Gunther presents the Swiss wisdom in terms of 12 major axioms.

SOLVED PROBLEMS

1. The expected return from equities is 13 per cent and the standard deviation of one-year return is 18 per cent. What will be the standard deviation of average return for the following investment horizons: 1 month and 5 years?

   Solution

   - The standard deviation of return for 1 month period is:

     $$\sigma/\sqrt{n} = 18/\sqrt{1/12} = 18/0.29 = 62.35 \text{ per cent}$$

   - The standard deviation of return for a 5 year period is:

     $$\sigma/\sqrt{n} = 18/\sqrt{5} = 8.05 \text{ per cent}$$

2. The expected return from a stock is 18 per cent with a standard deviation of 36 per cent. (a) What is the probability of success (defined as positive return) in any given year? (b) What will be the proportions of performance and noise over three years?

   Solution

   (a) Since the standard deviation of return over one year period is 36 per cent and the average return is 18 per cent, 0 per cent (which separates success from failure) is 0.5 σ to the left of the mean (18 per cent). Consulting the standard normal distribution table, we find that the probability to the left of 0 per cent is 0.3085, meaning that the probability to the right of 0 percent is 0.6915. This means that the probability of success is 0.6915.

   (b) The standard deviation of return over a period of 6 months is:

   $$36/\sqrt{0.5} = 50.91\%$$

   Since the average return remains at 18% over a 6 month period, we observe 2.83 parts noise for one part performance.

PROBLEMS

1. The expected return from equities is 14 per cent and the standard deviation of one-year return is 20 per cent. What will be the standard deviation of average return for the following investment horizons: 5 years, 2 years, 1 year, 6 months, and 1 month?
2. The expected return from equities is 16 per cent and the standard deviation of one-year return is 25 per cent. What will be the standard deviation of average return for the following investment horizons: 10 years, 3 years, 3 months and one week?
3. The expected return from a stock is 15 per cent with a standard deviation of 20 per cent. What is the probability of success (defined as positive return) in any given year? What will be the proportions of performance and noise over 2 years?

DISCUSSION QUESTIONS

1. What is the wisdom of crowds? What does explain the wisdom of crowds?
2. What are the central distinctions presented in the table of confusion provided by Nassim Taleb in his book *Fooled by Randomness*?
3. What is a power law? Why should investors bother about power laws?
4. What is Zipf's law? What modifications were suggested by Mandelbrot to the Zipf's law?
5. Discuss the idea of self-organised criticality.
6. What are the key results of the classical capital market theory? Empirically, what are the shortcomings of the classical capital market theory?
7. What are the central characteristics and properties of a complex adaptive system?
8. What is the empirical evidence on the complex adaptive model?
9. What are the implications of the complex adaptive model?
10. Why does Niall Ferguson argue that financial evolution is a lot like natural selection?
11. What are the differences between natural evolution and financial evolution?
12. Discuss the following aspects of animal spirits, viz. confidence, fairness, corruption and antisocial behaviour, money illusion, and stories, as identified by George Akerlof and Robert Shiller in their book *Animal Spirits*.
13. What are Richard Thaler's predictions about how economics would develop over the next couple of decades?
14. Discuss Ronald Coase's argument about "Saving Economics from the Economists."
15. What is 'halo effect'?
16. What misconceptions characterise prominent works like *In Search of Excellence: Lessons from America's Best Run Companies* and *Built-to-Last: Successful Habits of Visionary Companies*?
17. Discuss the four flaws of finance, as identified by James Montier.
18. Discuss the clash of cultures according to John C. Bogle.
19. Discuss the Zurich Axioms.

APPENDIX 14A

STUMBLING ON HAPPINESS

The key points of Daniel Gilbert's insightful book, *Stumbling on Happiness,* First Vintage, 2006, are as follows:

1. The human being is the only animal that thinks about the future. As Gilbert put it, "We think about the future in a way that no other animal can, does or even has, and this simple, ubiquitous,

ordinary act is a defining feature of our humanity." As a philosopher observed, the human brain is an *anticipation machine* and *making future* is an important activity. The frontal lobe of the human brain is a time machine that allows us to experience the future before it arrives.

2. Why do our human brains think about the future when there is so much to think about the present situation? There are several reasons. First, thinking about the future can be pleasurable. As Daniel Gilbert put it, "We daydream about hitting a home-run at the company picnic, posing with the lottery commissioner and a door-sized cheque, or making snappy patter with the attractive teller at the bank, not because we expect or even want these things to happen, but because merely imagining these possibilities is itself a source of joy." Studies confirm that when people think about the future they generally imagine themselves achieving and succeeding rather than faltering or failing. Just the way we fill our photo albums with pictures of the happiest moments from our memory lane, we frolic in the best of all imaginary tomorrows when we stroll up the imagination avenue. Indeed, imagining the future can be so pleasurable that sometimes we would rather think about it than get there.

   While imagining happy futures makes us feel happy, it can also cause trouble. Researchers have found that when people find it easy to do something, they tend to overestimate the probability of its occurrence.

3. We make lawful, regular, and systematic mistakes when we try to imagine our personal futures. The prospectiscope, through which we look forward in time or consider the future, is defective. The future turns out to be different from the way it appears through the prospectiscope. We experience illusions of foresight just the way we experience illusions of eyesight (optical illusions) and illusions of hindsight. All the three types of illusions are explained by the same principles of human psychology.

   As Daniel Gilbert put it, "Because most of us get so much more practice imagining good than bad events, we tend to overestimate the likelihood that good events will actually happen to us, which leads us to be unrealistically optimistic about our futures."

   Of course, the futures that we imagine are not always pleasant. They are often unpleasant or scary, and people tend to worry about the future rather than revel in it. We worry about our future for two reasons. First, anticipating unpleasant events can mitigate their impact. Second, worry and anxiety can motivate us to do the right things by exaggerating the unpleasant consequences of our behaviour.

   Besides providing pleasure and preventing pain, prospection serves an even more important function. We want to know what is likely to happen so that we can do something about it. We want to control the experiences we are about to have. We find it gratifying to exercise control, not just for the future it creates, but for the exercise itself. As Gilbert put it, "Being effective—changing things, influencing things, making things happen—is one of the fundamental needs human brains seem to be naturally endowed, and much of our behaviour from infancy onwards is simply an expression of this penchant for control." He added, "Our desire to control is so powerful, and the feeling of being in control so rewarding, that people often act as though they can control the uncontrollable." That is why people feel more confident about winning a lottery if they can control the number on their tickets, and similarly they feel more confident about winning a dice toss if they can toss the dice themselves. Researchers believe that the feeling of control, whether

real or illusory, is one of the wellsprings of mental health. As Gilbert says, "So if the question is 'why should we want to control our futures?' surprisingly right answer is that it feels good to do so. Impact is rewarding; mattering makes us happy. The act of steering one's boat down the river of time is a source of pleasure, regardless of one's port of call."

4. The best way to understand the shortcomings of *imagination* (the faculty that enables us to see the future) is to understand the shortcomings of *memory* (the faculty that enables us to see the past) and *perception* (the faculty that enables us to see the present).
5. Our memory of an event is altered by information acquired after the event. Brains *reweave* their experience, rather than *retrieve* their experience. Similarly, perceptions are portraits, not photographs, and they reflect the artist's hands as much as the things portrayed. As the renowned historian Will Durant put it, "The world as we know is a construction, a finished product almost; one might say, a manufactured article to which the mind contributes as much by its moulding forms as the thing contributes by its stimuli."

   As Daniel Gilbert put it, "We tend to forget that our brains are talented forgers, weaving a tapestry of memory and perception whose detail is so compelling that its inauthenticity is rarely detected." He added, "In a sense, each of us is a counterfeiter who prints phony dollar bills and then happily accepts them for payment, unaware that he is both the perpetrator and victim of a well-orchestrated fraud."
6. The mistakes that we make in accepting the validity of our memories and perceptions are the same that we make in imagining our futures. While our imagination constructs the images of future with ease, it does not consciously supervise the construction of these mental images. It treats them the way it treats memories and perceptions, assuming initially that they are accurate representations of the objects being imagined.
7. When scientists want to establish the causal relationship between two things (say cholesterol and heart attacks), they compute a mathematical index based on co-occurrences (the proportion of sample that has high cholesterol and heart attacks) and non co-occurrences (the proportion of same that has high cholesterol and no heart attack and the proportion of sample that has low cholesterol and heart attack). It is necessary to analyse all these quantities to assess the likelihood of a causal relationship between cholesterol and heart attack.
8. While scientists follow the rigorous methodology described above, ordinary people follow a naïve approach when they want to know whether two things are causally related. As Daniel Gilbert says, "They routinely search for, attend to, consider, and remember information about what *did* happen, and fail to search for, attend to, consider, and remember information about what *did not*.' Nearly four centuries ago, Sir Frances Bacon, philosopher and scientist, said that failure to consider absences was among the most serious errors of the human mind:

   "By far the greatest impediment and aberration of the human understanding arises from (the fact that)…those things which strike the sense outweigh the things which, although might be more important, do not strike it directly. Hence, contemplation usually ceases with seeing, so much so that little or no attention is paid to things invisible."
9. The way we think about future is influenced by our inattention to absences. As Gilbert put it, "Just the way we do not remember every detail of a past event, or every detail of a current event, so do

we fail to imagine every detail of any future event." He added, "But just as we tend to treat the details of future events that we *do* imagine as though they were actually going to happen, we have an equally troubling tendency to treat the details of future events we *don't* imagine as though they were *not* going to happen." Put differently, we fail to consider not only how much imagination fills in, but also how much it leaves out.

10. When our brains plug holes in their conceptualisations of yesterday, they rely on a material called today. This may be called the phenomenon of *presentism*. This tendency to fill in the holes of past from the present is particularly pronounced when it comes to remembering our past.

    Presentism applies to the past as well as future. A time-honored tradition is to underestimate the novelty of the future. When scientists make wrong predictions, they almost *always* err by predicting that the future will be mostly like the present.

    Presentism in the future is even more pronounced. As Gilbert put it, "If the past is a wall with some holes, the future is a hole with no walls. Memory *uses* the filling-in trick, but imagination *is* the filling-in trick, and if the present lightly colours our remembered pasts, it thoroughly infuses our imagined futures." He added, "More simply said, most of us have a tough time imagining a tomorrow that is terribly different from today, and we find it particularly difficult to imagine that we will ever think, want or feel differently that we do now."

11. For almost a century, psychologists assumed that traumatic events, such as loss of a beloved one or violent crime, have a devastating and durable impact on those who experience it. Recent research, however, shows that most people are surprisingly resilient in the face of trauma. As a group of researchers observed, "resilience is often the most commonly observed outcome trajectory following exposure to a potentially traumatic event."

    Humans have tremendous resilience to recover from adversity. We are equipped with what Daniel Gilbert calls a "psychological immune system." We somehow expect things to be worse than they generally turn out to be, so it is easier to recover from them. As Jason Zweig put it, "Because we imagine that our reactions to bad events will never fade, our own powers of recuperation rake us by surprise. On the flip side, we also adjust to good things much faster than we anticipate."

    According to Daniel Gilbert, "A *healthy* psychological immune system strikes a balance that allows us to feel good enough to cope with our situation but bad enough to do something about it." He added, "We need to be defended, not defenseless or defensive, and thus our minds naturally look for the best view of things while simultaneously insisting that those views stick reasonably close to facts."

12. The psychological immune system does its job using processes that may be described as tactics or strategies. These terms should not persuade us to think of people as schemers who are consciously trying to put a positive spin on their experience. On the contrary, research suggests that people are typically unaware of what they are doing and why they are doing. However, when asked for a reason, they readily supply one.

    Positive views, to be credible, must be based on facts that we honestly believe in. How do we do this? Gilbert explains, "We accomplish this by unconsciously cooking the facts and then consciously consuming them. The diner is in the dining room, but the chef is in the basement. The benefit of all this unconscious cookery is that it works; but the cost is that it makes us strangers to ourselves."

13. Because of our ignorance of our psychological immune system, we tend to mispredict the circumstances under which we will blame others and also mispredict the circumstances under which we blame ourselves.
14. In the long run, people of every age and every walk of life, regret inactions more than actions. This may be because our psychological immune system has greater difficulty in creating positive and credible views of inactions than those of actions.
15. A defensive system is effective if it responds to threats, and it is practical if it responds to only those threats that exceed some critical threshold. This means that unlike large threats, small threats are not detected by the radar. Like any defensive system, the psychological immune system obeys this principle. Paradoxically, this means that it is easier to achieve a positive view of a *very bad* experience than of a *bad* experience. As Gilbert put it, "When experiences make us feel sufficiently unhappy, the psychological immune system cooks facts and shifts blame in order to offer a more positive view. But it doesn't do this *every* time we feel the slightest tingle of sadness, jealousy, anger or frustration." He added, "Intense suffering triggers the very processes that eradicate it, while mild suffering does not, and this counterintuitive fact can make it difficult for us to predict our emotional futures."
16. People are likely to find a positive view of the things they are stuck *with* than of things *they're* not. People find silver linings only when they must. As Gilbert put it, "Inescapable, inevitable and irrevocable circumstances trigger the psychological immune system, but as with the intensity of suffering, people do not always recognise that this will happen." Our failure to anticipate how inescapability triggers our psychological immune system, that promotes our happiness, can lead us to some painful mistakes.
17. Seeing in time is similar to seeing in space. However, there is one important difference between spatial and temporal horizons. When we see a distant elephant, our brains are aware that the elephant looks smooth and vague and lacks in detail because it is spatially far away, and so we do not mistakenly conclude that the elephant itself is smooth and vague. But when we remember or imagine an event which is temporally distant, our brains perceive the distant events as smooth and vague as we imagine remembering them, overlooking the fact that details disappear with temporal distance.
18. When we have unpleasant experiences, we explain them in ways that makes us feel better. The mere act of explaining helps the impact of unpleasant events. As Gilbert put it, "The eye and the brain are conspirators, and like most conspiracies, theirs is negotiated behind closed doors, in the backroom, outside of our awareness. Because we do not realise that we have generated a positive view of our current experience, we do not realise that we will do so again in the future."
19. Our memory stores an idiosyncratic synopsis of our experience and not a feature-length film of our experience. Infrequent or unusual experiences and final scenes are often the most memorable and this impairs our ability to learn from experience. As Gilbert put it, "The fact that the *least* likely experience is often the *most likely memory,* can break havoc with our ability to predict future experiences." He added, "The more ambiguous the subject is, the more license the artist takes, and few subjects are more ambiguous than emotional experience. Our memory for emotional episodes is overly influenced by unusual instances, closing moments and theories about how we *must* have felt way back then, all of which gravely compromise our ability to learn from experience. Practice, it seems, doesn't always make perfect."

20. Since retrospection is a poor guide to prospection, you should be better off by simply asking others, who are currently having the experience you are contemplating, as to how they feel. While this idea sounds simple, you may not accept it. You may say, as Gilbert put it, "I am a walking, talking idiosyncrasy, and thus I am better off basing my predictions on my somewhat fickle imagination than on the reports of people whose preferences, tastes and emotional proclivities are so radically different from mine."
21. One of the most reliable scientific facts is that average person does not see himself as an average. As Gilbert put it, "Most students see themselves as more intelligent than an average student, most business managers see themselves as more competent than an average business manager, and most football players see themselves as having better 'football sense' than their teammates. According to one research team, "most of us appear to believe that we are more athletic, intelligent, organised, ethical, logical, interesting, fair minded, and healthy—not to mention more attractive—than an average person."
22. What makes us think that we are so special or unique? There are at least three reasons. First, while we *experience* our own thoughts and feelings, we must *infer* what others are experiencing. Second, we simply *enjoy* thinking of ourselves as special and we prize our unique identities. Third, we tend to overestimate our uniqueness because we overestimate everyone's uniqueness. As Gilbert put it, "Our mythical belief in the variability and uniqueness of individuals is the main reason why we refuse to use others as surrogates." He added, "The irony, of course, is that surrogation is a cheap and effective way to predict one's future emotions, but because we don't realise just how similar we all are, we reject this reliable method and rely instead on our imaginations, a flawed and fallible as they may be."

APPENDIX 14B

PHISHING FOR PHOOLS: THE ECONOMICS OF MANIPULATION AND DECEPTION

In their book, *Phishing for Phools: The Economics of Manipulation and Deception*, Princeton University Press, 2015, George A. Akerlof and Robert J. Shiller, both Nobel laureates in Economics, argue that markets harm as well as help, challenging Adam Smith's insight that markets are essentially benign and always create the greater good. To make profits, sellers systematically exploit our psychological weaknesses and ignorance through manipulation and deception. Markets are filled with tricks and traps that will *phish* us as *phools*.

Markets give and take away. As they put it, "The financial system soars, and then crashes. We are attracted, more than we know, by advertising. Our political system is distorted by money. We pay too much for gym memberships, cars, houses, and credit cards. Drug companies ingeniously market pharmaceuticals that do us little good."

The book explains a modern paradox. While we live in a time when we are better off than ever before, many people lead lives of quiet desperation. The book also shows how economic trickery can be contained through greater knowledge and sensible regulation.

APPENDIX 14C

THE EASTERLIN PARADOX

While richer nations and households are happier compared to poorer nations and households, increase over time in per capita income in the industrialised nations has not resulted in greater happiness. For example, between 1958 and 1987, Japan's per capita GDP increased fivefold but its happiness level hardly changed. This puzzle is called the "Easterlin Paradox."

What explains this paradox? Three interrelated explanations have been offered: Genes, Habituation, and Social comparisons.

Genes One theory is that we are born with a "set point" for happiness and our happiness fluctuates around that point.

Habituation Over time, we become habituated or accustomed to most things and hence they are not as pleasurable as they were in the beginning. Further, people tend to overestimate the pleasure they would derive from owning material goods. Psychologists call it the "impact bias." There is an adage about the two happiest days in a boat owner's life—the day of purchase and the day of sales.

Social Comparisons Given their competitive nature, people judge how well they are doing by comparing themselves with some reference group. Ambrose Bierce defined happiness as "an agreeable sensation arising from contemplating the misery of another."

APPENDIX 14D

THE PARADOX OF CHOICE*

In modern society, people have a wide range of choices in almost all areas of life, such as consumer goods, education, career, friendship, parenting, healthcare, religious observance, entertainment, and so on. Undoubtedly, choice improves life. Without choice, life can be very suffocating. The autonomy and control that choice provides are very powerful, liberating, and positive.

However, as the number of choices multiplies, the efforts required for making a good decision increase. There is a cost to have an overload of choice. We are enamored of freedom, self-determination, and variety, and we want to cling tenaciously to the profusion of choices. This leads to bad decisions, stress, anxiety, and dissatisfaction.

As Barry Schwartz put it, "As the number of choices grows further, the negatives escalate until we become overloaded. At this point, choice no longer liberates, but debilitates. It might even be said to tyrannize."

In his book *Development as Freedom*, Nobel laureate Amartya Sen examines the nature and importance of freedom and autonomy. He argues that instead of being fetishistic about freedom of choice, we should ask whether choices nourish us or deprive us. While freedom is essential to self-

*Adapted from Barry Schwartz *The Paradox of Choice: Why Less is More,* Harper Collins, 2016.

respect, not all choices enhance freedom. The increasing choice with respect to goods and services may indeed diminish freedom by absorbing time and energy that can better be devoted to other matters.

Barry Schwartz says that the expanded choice available to Americans has diminished their satisfaction. The experience of choice as a burden rather than privilege is due to a complex interaction among various psychological processes which include, in Barry Schwartz's words, "rising expectation, awareness of opportunity costs, aversion to tradeoffs, adaptation, regret, self-blame, the tendency to engage in social comparisons, and maximising."

What Can We Do

What can we do to mitigate the sources of distress? Barry Schwartz offers the following suggestions:

1. Choose When to Choose For each decision we face, the benefits of having options are obvious, but the costs are subtle and, more important, they are cumulative. Hence, it is not that a particular choice that creates the problem. Rather, the cumulative burden of all the choices tends to be onerous.

To cope with the problem of excessive choices, we must focus our time and energy on the choices in our lives that really matter.

2. Be a Chooser, Not a Picker A "chooser" is a person who decides after reflection and, if the existing options are not satisfactory, explores the possibility of creating new options. A "picker" is a person who passively selects from whatever is available.

It is better to be a chooser than a picker. To have the time to choose more and pick less, we must make some decisions automatic by relying on rules, habits, norms, and customs. This will conserve time for the decisions that matter the most. As Barry Schwartz put it, "Good decisions take time and attention, and the only way we can find the needed time and attention is by choosing our spots."

3. Satisfice More and Maximise Less In a culture that provides too many choices, maximisers suffer the most. As Barry Schwartz put it, "It is the maximisers who worry most about regret, about missed opportunities, and about social comparisons, and it is maximisers who are most disappointed when the results of decisions are not as good as they expected."

By accepting decisions that are "good enough" we can simplify decision making and increase satisfaction. While satisficers may not do well than maximisers in terms of certain objective standards, they usually have better subjective experience.

Since maximising about everything is impossible, we must learn to embrace, appreciate, and enjoy satisficing, rather than being simply resigned to it. As Barry Schwartz put it, "Becoming a conscious, intentional satisficer makes comparison with how other people are doing less important. It makes regret less likely. In the complex, choice-saturated world we live in, it makes peace of mind possible."

4. Think about the Opportunity Costs of Opportunity Costs When we make a decision, it makes sense to think about the alternatives that we will pass up in choosing our most-preferred option. If we ignore these "opportunity costs" we are likely to overestimate the value of the most preferred option. However, the more we think about opportunity costs, the less will be the satisfaction we will obtain from whatever we choose. So, the trick is to reflect on opportunity costs to some extent, but not to a great extent.

5. Make Your Decisions Irreversible When we can reverse a decision we tend to be less satisfied with it. On the other hand, when we make a decision that is final, we resort to a variety of psychological processes that make us feel better about our choice relative to the alternatives foregone. When a decision is reversible, we don't benefit much from these psychological processes.

6. Practice an "Attitude of Gratitude" How we evaluate choices is profoundly influenced by what we compare them with, including the alternatives that exist only in our imaginations. As Barry Schwartz put it, "The same experience can have both delightful and disappointing aspects. Which of these we focus on may determine whether we judge the experience to be satisfactory or not. When we imagine better alternatives, the one we chose can seem worse. When we imagine worse alternatives, the one we chose can seem better."

If we consciously strive to be grateful for what is good about a choice or experience and be less disheartened by what is bad about a choice or experience, we can significantly enhance our subjective experience.

Since gratitude does not often come to us naturally, we have to practice an "attitude of gratitude" consciously. As Barry Schwartz put it, "When life is not good, we think a lot about how it could be better. When life is going well, we tend not to think much about how it could be worse. But with practice, we can learn to reflect on how much better things are than they might be which will in turn make the good things in life feel even better."

7. Regret Less Regret, actual or potential, characterises many decisions. While regret is normal and serves a useful function, excessive regret can be dysfunctional and even preclude decisions. So an effort has to be made to minimise regret.

Barry Schwartz says: "We can mitigate regret by

1. Adopting the standards of a satisfier rather than a maximiser;
2. Reducing the number of options we consider before making a decision;
3. Practicing gratitude for what is good in decision rather than focusing on our disappointments with what is bad."

8. Anticipate Adaptation We adapt to almost everything that we experience regularly. As Barry Schwartz put it, "When life is hard, adaptation enables us to avoid the full brunt of the hardship. But when life is good, adaptation puts us on a 'hedonic treadmill' robbing us of the full measure of satisfaction we expect from each positive experience."

While we can't prevent adaptation, we can develop realistic expectations about how experiences tend to change over time. To diminish disappointment from adaptation, be a satisficer and spend less time and energy agonising over decisions.

Beware of the hedonic treadmill (we tend to adapt to a given experience so that it feels less good over time) as well as the satisfaction treadmill (we tend to adapt to a given level of feeling good so that it stops feeling good enough). To deal with the phenomena of hedonic treadmill and satisfaction treadmill, the habit of gratitude can be helpful. As Barry Schwartz says, "Imagining all the ways in which we could be feeling worse might prevent us from taking for granted (adapting to) how good we actually feel."

9. Control Expectations We evaluate an experience largely by how it compares with our expectations. So by controlling our expectations we can enhance our satisfaction with the outcome of decisions. This

seems difficult in a world that encourages high expectations and offers a profusion of choices. However, expectations can be lowered by reducing the number of options that are considered, by being a satisficer rather than a maximiser, and by allowing for **serendipity**.

10. Curtail Social Comparisons We have a tendency to evaluate the quality of our experiences by comparing ourselves with others. While social comparison can provide useful information, it often diminishes our satisfaction; so we should do it less. As Barry Schwartz put it, "Because it is easier for a satisficer to avoid social comparison than for a maximiser, learning that 'good enough' is good enough may automatically reduce concern with how others are doing." It makes sense to focus on what makes us happy and what gives meaning to our life.

11. Learn to Love Constraints Thanks to the multiplicity of choices we face, freedom of choice can become a tyranny of choice. Hence, we should welcome constraints on the possibilities we face, as they can be liberating not limiting. Rules, standards, and norms can impose such limits. As Barry Schwartz put it, "By deciding to follow a rule (for example, always wear a seat belt; never drink more than two glasses of wine in one evening), we avoid having to make a deliberate decision again and again." He added, "This kind of rule-following frees up time and attention that can be devoted to thinking about choices and decisions to which rules don't apply."

APPENDIX 14E

SCARCITY

Scarcity preoccupies the mind. As Sendhil Mullainathan and Eldar Shafir put it: "Scarcity captures the mind. The mind orients automatically, powerfully, toward unfulfilled needs. For the hungry, that need is food. For the busy it might be a project that needs to be finished. For a lonely, a lack of companionship."

Since scarcity captures our mind, we have less mind to give to the rest of life. It reduces our mental capacity or bandwidth for other things, making us less insightful, more myopic, and less controlled. This has dire consequences as it further perpetuates scarcity. As Mullainathan and Shafir put it, "Scarcity creates its own trap. That is why the poor remain poor, why busy stay busy, why diets fail so often."

To avoid the dysfunctional consequences of scarcity, some slack is essential. If there is no slack, managers are likely to mortgage the future to make ends meet today. Jewish Sabbath is one of the wisest interventions we know of for dealing with the tradeoffs of scarcity. It is a totally uncluttered day—a day of tranquility, serenity, and rejuvenation.

■ ■

Appendix **A**

Global Financial Crisis

For a quarter-century, beginning in early 1980s, finance enjoyed its golden age. As an *Economist* article put it: "As financial globalisation spread capital more widely, markets evolved, businesses were able to finance new ventures, and ordinary people had unprecedented access to borrowing and foreign exchange. Modern finance improved countless lives."

But more recently, something went seriously wrong that led to an unprecedented global financial crisis. It surfaced in the subprime mortgage sector in the US in August 2007 and, followed by the collapse of Lehman Brothers in September 2008, snowballed into a global financial crisis. It led to the bankruptcy/rescue of the top five investment banks on Wall Street, the biggest insurance company (AIG), the biggest bank (Citibank), the biggest automobile company (General Motors), and the biggest mortgage underwriters (Fannie Mae and Freddie Mac). It is widely regarded as the greatest crisis in the history of financial capitalism because of the speed and intensity with which it simultaneously propagated to other countries. Apart from its huge financial cost, its adverse impact on the real economy has been severe. According to IMF, in 2009 the world GDP declined by 0.8 and the world trade volume contracted by 12 per cent.

The crisis has called for re-examining the dominant tenets in macro-economics. It has challenged in the belief in the self-correcting nature of financial markets and brought to focus the role of finance in economic growth.

CONTRIBUTORY FACTORS

A confluence of factors seems to have caused the global financial crisis. The major ones are discussed below:

• Macro-economic Imbalances

Last decade has witnessed an explosion of macro-economic imbalances in the world, with a very high savings rate in countries like China and very low savings rates in countries like the US. The high savings rate resulted in a fall in the real risk-free interest rate to historically low

levels. For example, in 1990, the risk-free index-linked government bonds in UK or US provided 3 per cent real rate. In recent years, it fell below 2 per cent and at times to about 1 per cent.

The fall in real interest rates has led to rapid growth of credit in some developed countries (which fuelled a property boom) along with a decline in credit standards. It also drove investors to search for improvement in yield, however slight it may be. Any product that appeared to increase yield by 10, 20, or 30 basis points, without adding measurably to risk, seemed attractive.

Unbridled Financial Innovation

The demand for yield enhancement was met by a wave of financial innovation, focused on securitised credit instruments.

Securitisation involves packaging a designated pool of assets (mortgage loans, consumer loans, hire purchase receivables, and so on) and issuing securities which are collateralised by the underlying assets and their associated cash flow streams. Securitisation gained in importance from the early 1980s and was regarded as a major financial innovation that reduced the risk of the banking system as credit risk was transferred to the end investors.

But when the crisis broke, it was realised that most of the holdings of securitised credit instruments were in the books of highly leveraged banks and financial institutions and not in the books of end investors. As the *Turner Review* noted: "The evolution of the securitised credit model was accompanied by a remarkable growth in the relative size of the wholesale financial services within the overall economy, with activities internal to the banking system growing far more rapidly than end services to the real economy." For example, in UK the debt of the financial sector as a proportion of GDP increased from 30 per cent in 1987 to nearly 250 per cent in 2007. Naturally, the growth of the relative size of the financial sector, and in particular the activities in securitised credit instruments, increased systemic risk, contributing to the credit boom during the upswing and accentuating the subsequent downswing.

A worrisome aspect of this growth was the fact that, collateralised debt obligations (CDOs) loomed large in this wave of financial innovation. A CDO is a product backed by a diversified pool of debt obligations such as corporate bonds, bank loans, emerging market bonds, asset-backed securities, mortgages, and other CDOs. When the underlying pool of debt obligations represents bond-type instruments, a CDO is called a collateralised bond obligation (CBO); when the underlying pool of debt obligations represents bank loans, a CDO is called a collateralised loan obligation (CLO).

The problem with CDOs is that they have a very high and imperfectly embedded leverage and are very difficult to value. As Emanuel Dreman of Goldman Sachs says: "With Black-Scholes model you know what you are assuming when you use the model, and you know exactly what has been swept out of view, and hence, you can think clearly about what you may have overlooked." With CDOs he says, "you don't know how to adjust for its inadequacies." It appears that the sophisticated US financial services overwhelmed the relatively unsophisticated financial services elsewhere.

• Misplaced Reliance on Sophisticated Maths

The expansion of financial sector and the complexity of securitised credit products was accompanied by the development of sophisticated mathematical models for measuring and managing risks. But these models were based on the assumption that the distribution of future prices would be similar to their past distribution. This was indeed a fragile assumption that caused massive damage.

As Warren Buffett noted: "Indeed, the stupefying losses in mortgage-related securities came in large part because of flawed, history-based models used by salesmen, rating agencies, and investors." He warns "Investors should be skeptical of history-based models. Constructed by a nerdy-sounding priesthood using esoteric terms such as beta, gamma, sigma, and the like, these models tend to look impressive. Too often, though, investors tend to forget to examine the assumptions behind the symbols."

In a similar vein, Edmund Phelps, Nobel laureate in economics, said: "Risk assessment and risk-management models were never well-founded." He adds: "There was a mystique to the idea that market participants know the price to put on this or that risk. But it is impossible to imagine that such a complex system could be understood in such detail and with such amazing correctness. The requirements of information have gone beyond our abilities to gather."

• Flawed VAR Calculations

An important abuse of quantitative analysis has been with respect to value at risk (VAR) calculation. VAR reflects a limit on the loss of value of a portfolio, on account of normal market movements, which will be exceeded only with a small pre-specified probability. Thus, if VAR is ₹10 million (or whatever) with a confidence level of 95 per cent, it means that there is only a ₹5 per cent probability that the loss in portfolio value will exceed ₹10 million. Quantifying risk in this fashion requires sophisticated analytical modelling and simulation analysis. The typical VAR analysis is based on the assumption that the underlying market movement follows a normal distribution.

Benoit Mandelbrot, the polymath who invented fractal theory, calculated the theoretical changes (under normal distribution) and the actual changes of the Dow Jones Industrial Average (DJIA) over the period 1916 to 2003, as shown below:

Theory	*Reality*
More than 3.4 per cent on 58 days	More than 3.4 per cent on 1001 days
More than 4.5 per cent on 6 days	More than 4.5 per cent on 366 days
More than 7 per cent once in 300,000 years	More than 7 per cent on 48 days

Mandelbrot argues that the market movement is characterised by fat-tail distribution and not normal distribution. The market should have been "mildly stable" but it was actually "wildly stable."

This presents a conundrum. As an *Economist* article put it: "On the one hand, you cannot observe the tails of the VAR curve by studying extreme events, because extreme events are rare by definition. On the other hand, you cannot deduce very much about the frequency of

rare extreme events from the shape of the curve in the middle." Put differently, while VAR is good at predicting small losses in the middle of the distribution; it is unreliable in predicting severe losses that are much rarer, but matter the most.

Modern finance has, perhaps, made the tails fatter. When all kinds of specific risks in foreign exchange, interest rates, and stock prices are traded away the portfolio may appear safer. But in reality, every day risk may be swapped for an exceptional risk like the failure of the insurer, as it happened with AIG.

• Explosive Growth in Derivatives

Since the early 1970s financial prices—exchange rates, interest rates, commodity prices, and equity prices—have become more volatile. To cope with these risks, corporations and banks resorted to the use of derivatives like options, futures, forwards, and swaps.

Another force that fuelled the explosion in derivatives was a powerful combination of mathematics and computing. Before the development of Black-Scholes model, option pricing was more or less educated guesswork. The Black-Scholes model instilled confidence in buyers and sellers to trade heavily in derivatives. Explains Emanuel Derman of Goldman Sachs: "In a thirsty world filled with hydrogen and oxygen, someone had finally worked out how to synthesise H_2O."

A significant portion of trading in derivatives takes place in the OTC (over-the-counter) market. In June 2008, the volume of outstanding OTC derivatives contracts was of $530 trillion (interest rate derivatives accounted for $460 trillion, credit default swaps accounted for $60 trillion, and equity derivatives accounted for $10 trillion). The staggering size and complexity of derivatives market and the fact that it is mostly an OTC market increases the potential danger of market disruption.

John Shad, former chairman, Securities Exchange Commission expressed concern about this phenomenon. He said: "Futures and options are the tail wagging the dog. They have escalated the leverage and volatility of the markets to precipitous, unacceptable levels." Warren Buffett echoed a similar warning "Charlie and I are of one mind in how we feel about derivatives and the trading activities that go with them: we view them as time bombs, both for the parties that deal in them and the economic system."

Warren Buffett had expressed his concern in 2003 itself: "Many people argue that derivatives reduce systemic problems, in that participants who can't bear certain risks are able to transfer them to stronger hands. These people believe that derivatives act to stabilise the economy, facilitate trade, and eliminate bumps for individual participants. And, on a micro level, what they say is often true. Indeed, at BH, I sometimes engage in large scale derivatives transactions in order to facilitate certain investment strategies. Charlie and I believe, however, that the macro picture is dangerous and getting more so. Large amounts of risk, particularly credit risk, have become concentrated in the hands of relatively few derivatives dealers, who in addition trade extensively with one another. The troubles of one could quickly infect the others."

Unfortunately, the bulk of the financial community, enamoured of the derivatives revolution, did not appreciate the systemic implications of the explosive growth of derivatives.

Regulatory Laxity The general euphoria about the contribution of modern finance to economic performance seems to have induced complacency in regulators. For example, in 2004, the Securities Exchange Commission (SEC) exempted the brokerage units of investment banks from a regulation that limited the amount of debt they could take in return for a greater oversight of the investment activities of the banks by the SEC. The SEC merely relied on the firms' own computer models for determining the riskiness of investments. And it hardly did anything to follow up on the risky activities uncovered by its examiners. Thanks to the connivance of the regulators, investment banks could increase their debt equity ratio to such preposterous levels as 30:1.

A conspicuous example of regulatory laxity was the introduction of 'Commodity Futures Modernisation Act' on the last day of the last session of a lame duck 106th session of the US Congress in 2000. This Act removed the various capital constraints on lending and exempted derivatives and credit default swaps from legislatory purview. This had a far-reaching impact on the US financial system. As an example, in 2000 when the US Congress introduced the new legislation the size of the CDS (credit default swaps) market was $100 billion; in late 2008 the size of the CDS market was $60 trillion.

• Flaw in the Business Model of Investment Banks

Investment banks originally started off as brokerage firms and then diversified into underwriting of securities and advisory services. None of these businesses requires huge amounts of capital.

When commissions on their traditional businesses declined, investment banks further diversified into proprietary trading and then to private equity, businesses which require large amounts of capital to be committed to risky and illiquid assets. To finance these risky businesses they recklessly levered themselves. In August 2008, even after additional equity infusions, Lehman Brothers had a debt-equity ratio of 20:1. With such vulnerability, the acquisition of a property investment company at the height of the property bubble was sufficient to kill Lehman Brothers.

There were serious flaws in the model followed by investment banks. First, their assets were financed in the wholesale markets. If there is uncertainty about the value of the assets, access to funds is cut off, triggering a collapse. Second, high leverage incentivises managers to take huge risks. If the bets succeed, managers get outsized rewards; if the bets fail, shareholders get screwed up.

One can argue that the irresponsible behaviour of financial institutions is a manifestation of moral hazard to a certain extent. The involvement of the Federal Reserve Bank of New York in rescuing Long-term Capital Management, perhaps, prodded large financial institutions to assume more risk.

• Excessive Leverage in European Banks

While Europeans criticised the US investment banks for their casino capitalism, their own banks such as UBS, Credit Suisse, ING, Dexia, and B N P Paribas had debt-equity ratios nearing

50:1. Using the Basel norms, European banks justified their high leverage by arguing that their assets (including much sovereign debt) were of high quality.

Yet the crisis of late 2008 taught some sobering lessons. First, even the highest rated assets can get tainted in a crisis thereby inflicting huge losses on highly leveraged banks. Second, in a panic, even the biggest financial institutions are vulnerable to a run on deposits or panic sales of securities. Third, practices like capital adequacy norms and mark-to-market are pro-cyclical, not anti-cyclical.

• Reverse Natural Selection in Finance

In financial services, there is always a temptation to play. This tendency has been heightened with the evolution of financial services from a guild of small partnerships to a joist of gigantic multinational corporations and clashing egos. As Chuck Prince, CEO of Citigroup in 2007, said: "As long as the music is playing you have got to get up and dance." A bank of Citi's size cannot sit on the sidelines without inviting criticism from investors and commentators.

The perturbing message in Prince's words is that bit by bit boom induces excessive risk taking, thereby causing reverse natural selection. As an *Economist* article says: "The end of partnerships turned private rivalries into a public tournament. The senior managers' wealth, careers and status were completely wrapped up in their firm's pre-eminence. League tables, quarterly results, daily share-price movements, total shareholder returns, all are ways of keeping score." It adds: "If you did not compete you were a dullard. If you pulled back your career may be cut short."

To paraphrase Keynes, the market can stay irrational longer than you can stay in your job. So in the last 35 years it appeared that everyone in finance tried to be someone else. As an *Economist* article put it: "Hedge funds and private equity wanted to be as cool as a dotcom. Goldman Sachs wanted to be as smart as a hedge fund. The other investment banks wanted to be as profitable as Goldman Sachs. America's retail banks wanted to be as cutting edge as investment banks. And European banks wanted to be as aggressive as American banks. They all ended up wishing they could be back precisely where they started."

✦ WHAT THE EXPERTS SAY

The view of someone caught in a disaster is usually limited. Be it a soldier in a battle, or a survivor of a plane crash, or a victim of a tsunami, each person develops a subjective perception of the event from a narrow perspective. Anthropologists call this "The Rashomon Effect," drawing from the Kurosawa classic where several witnesses to a murder provide plausible but different accounts.

People caught in the middle of a financial crisis also experience a similar biasing of perspective. Although financial disasters are not corporal, yet they tend to inflict pain of the same order as physical catastrophe and warp the perspective of people.

With this caveat in mind, let us look at the financial crisis of 2008 which was the most severe of its kind since the Great Depression of 1930s. It has been analysed, diagnosed, and researched by many. A number of books have been written about the crisis, its origins, and its

aftermath. Some are insider accounts by people close to the epicenter of the crisis; some are scholarly treatises by eminent social scientists; some are memoirs of policy makers who were caught flat-footed; and some are attempts by journalists to stitch together a coherent story.

Insider accounts present trader's tales in an anecdotal fashion and expectedly focus on larger-than-life personae. Two very good examples of insider accounts are *The Greatest Trade Ever* by Greg Zuckerman and *The Big Short* by Michael Levis. Greg Zuckerman and Michael Levis are facile practitioners of faction, the art of presenting fact as though it were fiction.

In *The Greatest Trade Ever* Zuckerman narrates the story of John Paulson of the eponymous hedge fund who defied Wall Street, bet heavily (by tripling a 'stake' of $12.5 billion) against institutions that went into collapse and against mortgage-backed securities that went into default, and came out on the top. In *The Big Short* Michael Levis focused on a small band of Wall Street traders who went against the crowd and made huge killings.

Levis and Zuckerman do an excellent job of letting their characters take a job of centrestage. But to understand the nuts and bolts of the instruments traded, you have to read Scott Paterson's *The Quants*. Paterson discusses complex mathematical models in a rigorous, yet non-technical manner, and explains why some of those models went disastrously wrong and what happens to an institution when the models go awry.

While Paterson adopted a micro-perspective, others have attempted to present a global macro-picture. One of them is Gillian Tett whose *Fool's Gold* provides a historical perspective dating back to the early 1990s when credit derivatives were introduced. In this well-researched and comprehensive work, Tett analyses the crisis from the perspective of social anthropology. Ranged alongside is *The End of Wall Street* by Roger Lowenstein, an eminent financial historian. He constructs a broad historical narrative of the crisis base. His narrative is based on interviews and utterly merciless profiles of the who's-who in the world of global finance. Another interesting book is Andrew Sorokin's *Too Big to Fail* which presents the inside story of how Wall Street and Washington fought to save the financial system and themselves.

In his book *Freefall* Joseph Stiglitz, a Nobel Laureate in Economics and former Chief Economist, World Bank, draws on concepts like information asymmetry, moral hazard and incentives to brilliantly dissect the crisis and explain how Washington was too accommodating to the demands of Wall Street. He is highly critical of the failed nostrums from the Chicago school of free-market economists. According to him, financiers have enriched themselves at the expense of vulnerable citizens, materialism outweighed commitment, environment has been ignored, and trust has broken down. He wants this to be a moment of "reckoning and reflection." He concludes the book by asking: "Will we seize the opportunity to restore our sense of balance between the market and the state, between individualism and the community, between man and nature, between means and ends?"

Another notable economist with an interesting take is Nouriel Roubini, who is renowned as Dr. Doom for issuing a public warning about the bubble as early as 2006. His book *Crisis Economics: A Crash Course in the Future of Finance*, co-authored with Stephen Mihm, tries to define the ground rules for recognizing bubbles. He hypothesises that there are discernible recurrent patterns and it behooves us to recognise them and proactively handle them. Interestingly, Roubini draws as often on Keynes and Marx, as on Hayek and Schumpeter.

Finally, there are two titles which appear as pleas for the defence. In a matter of months Alan Greenspan, the former chairman of the US Federal Reserve Board, who was earlier a darling of

financial markets, became the demon who facilitated the worst financial and economic crisis in 80 years. His autobiographical account *Adventures in a New World* appeared in 2007, before the bubble burst. It is, in his own words, an eloquent "psychoanalysis of himself" and an excellent first person insight into U.S. politics and several presidents.

Another key policy maker Hank Paulson, as the US Treasury Secretary in 2008, was a prime mover of the massive bailouts. In his book *On The Brink* he narrates his side of the story rather well.

Collectively these books provide a multifaceted picture of the worst financial crisis the world has seen since the Great Depression of the 1930s. It perhaps it will take years for the social scientists to reach some kind of a consensus on what really happened.

✦ SOME POSSIBLE REMEDIES

The recent global financial crisis is deep and has been caused by excesses committed over the past few decades. It calls for a multi-pronged approach which may include the following initiatives.

1. **Replace Dollar with an International Reserve Currency** The emergence of the US dollar as the de facto global reserve currency has contributed substantially to the topsy turvy global economic situation. Serious initiatives are required at to replace the US dollar with an international reserve currency. Such substitution would transform the global economic architecture the way the fall of the Berlin wall altered the political architecture of the world.
2. **Encourage Greater Savings in the Developed Countries** Warren Buffett has been arguing for a change in the savings and consumption habits of Americans. Seized of this matter, President Barack Obama seems to be determined to take policy measures to encourage Americans to save and invest more.
3. **Enhance the Capital Requirements of the Banking Sector** As the *Turnover Review* has argued, the banking sector should be subjected to a stringent capital regime which entails: (i) more and higher quality capital than required in the past; (ii) more capital specifically against trading book risk-taking; and (iii) some type of counter-cyclical capital regime, with capital buffers being built up in periods of strong economic growth so that they can be drawn on in downturns." Such a regime will enable the banking system to absorb and moderate, rather than magnify, the amplitudes of macroeconomic cycles.
4. **Develop Clearing Systems for Derivative Trades** Several reports have emphasised that there is an unnecessary multiplication of gross exposures in the derivatives market. Hence, there is a need for compression that nets out offsetting bilateral positions. As the *Turner Review* noted: "Achieving a reduction in net positions outstanding could be achieved via firms closing out existing exposures, but would be greatly assisted by the development of clearing systems with central counterparties, allowing multilateral netting and reducing economic exposures to these outstanding versus the central counterparty."

5. **Introduce Some Form of Product Regulation** In the last few decades, the regulatory philosophy has been that product regulation has to be avoided as it stifles innovation. It is based on the premise that the market is a better judge than the regulator of whether a product delivers value.

   However, some people believe that a lot of financial innovation is worthless and even potentially harmful. William Buiter of London School of Economics argues a stripped down version of finance will suffice for a modern economy.

   In a remarkably perceptive lecture given in 1984, Nobel laureate James Tobin expressed his concern over the introduction of new-fangled instruments.

   "I (suspect) we are throwing more and more of our resources, including the cream of our youth, into financial activities remote from the production of goods and services into activities that generate high private rewards disproportionate to their social productivity. I suspect that the immense power of the computer is being harnessed to this 'paper economy,' not to do the same transactions more economically but to balloon the quantity and variety of financial exchanges… I fear that, as Keynes saw even in his day, the advantages of the liquidity and negotiability of financial instruments come at the cost of facilitating *n*th degree speculation which is short-sighted and inefficient."

   Perhaps there is a case for introducing regulation on financial products by specifying sensible restrictions such as the maximum loan-to-value ratios or loan-to-income ratios.
6. **Regulate OTC Derivatives** There is an urgency to regulate OTC derivatives. This can perhaps provide 90 per cent protection against the kind of systematic breakdown witnessed in the recent global financial crisis. All financial institutions should be required to provide explicit margin collateral against their liabilities arising from OTC derivatives. They should also be required to report positions on a fair value basis, rather than book basis.

SUMMARY

- For a quarter-century, beginning in early 1980s, finance enjoyed its golden age. But more recently, something went seriously wrong that led to an unprecedented global financial crisis.
- The crisis has challenged the belief in the self-correcting nature of financial markets and brought into focus the role of finance in economic growth.
- A confluence of factors seems to have caused the crisis. The major ones are: (i) macro-economic imbalances, (ii) unbridled financial innovation, (iii) misplaced reliance on sophisticated maths, (iv) flawed VAR calculations, (v) explosive growth in derivatives, (vi) regulatory laxity, (vii) flaw in the business model of investment banks, (ix) excessive leverage in European banks, and (x) reverse natural selection in finance.
- A number of books have been written about the crisis, its origins, and its aftermath. Some are insider accounts by people close to the epicenter of the crisis; some are

scholarly treatise by eminent social scientists; some are memoirs of policy makers who were caught flat-footed; some are attempts by journalists to stitch together a coherent story. Perhaps, it will take years for the social scientists to reach some kind of a consensus on what really happened.

- The crisis calls for a multi-pronged approach which may include the following initiatives: (i) Replace dollar with an international reserve currency (ii) Encourage greater savings in the developed countries, (iii) Enhance the capital requirements of the banking sector, (iv) Develop clearing systems for derivative trades, (v) Introduce some form of product regulation.

DISCUSSION QUESTION

1. Discuss the factors that seem to have contributed to the global financial crisis.

■ ■

Appendix **B**

Outline for a 3-Credit Course in Behavioural Finance

Background

Standard finance also known as rational finance or neoclassical finance or traditional finance has five building blocks:

- Investors are rational.
- Markets are efficient.
- Investors design their portfolio as per the dictates of mean variance portfolio.
- Expected returns are a function of risk (measured by beta), as suggested by the capital asset pricing model.
- Managers are rational and pursue policies aimed at long-term shareholder wealth maximisation.

For each of the foundation blocks of standard finance, behavioural finance offers an alternative. According to behavioural finance:

- Investor are "normal," not rational.
- Markets are characterised by inefficiencies, even if it is difficult to beat them.
- Investors design their portfolio according to behavioural portfolio theory, not mean variance portfolio theory.
- Expected returns follow behavioural asset pricing theory in which expected returns are determined by factors other than beta.
- Managers suffer from biases that cause erosion of shareholder wealth.

Course Objective

The objective of this course is to:

- Discuss the fundamental heuristics, psychological biases, and emotional and social factors that affect financial decision making.
- Explain the concepts of prospect theory, framing, and mental accounting.
- Look at the neuroscientific and evolutionary underpinnings of observed financial behaviour.

- Discuss market inefficiencies and outcomes that arise from behavioural factors.
- Understand why investors behave the way they do and how they can become more rational.
- Discuss the behavioural aspects of corporate finance.
- Draw on wisdom from other sources.

Course Content and Schedule

Part I: Rational Finance and Behavioural Challenge
Session 1: Rational Expectations paradigm and the Behavioural Challenge
Session 2: Foundations of Rational Finance

Part II: Foundations of Behavioural Finance
Sessions 3-4: Heuristics and Biases
Session 5: Self-deception
Sessions 6-7: Prospect Theory, Framing, and Mental Accounting
Session 8: Inefficient Markets Hypothesis
Session 9: Emotional and Social Forces
Session 10: Neuroscientific and Evolutionary Perspective

Part III: Behavioural Aspects of Investment
Sessions 11-12: Investor Behaviour
Sessions 13-14: Market Outcomes
Sessions 15-16: Value Investing

Part IV: Behavioural Corporate Finance
Sessions 17-18: Behavioural Corporate Finance
Session 19: Building a Smart Organisation

Part V: Other Insights
Session 20: Wisdom from Other Sources

*Each session is of 1.5 hours

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Glossary

1/n heuristic Assigning equal weight to all choices under consideration.

adaptive markets hypothesis (AMH) Derived from evolutionary principles, the AMH can be viewed as a new version of the EMH (efficient markets hypothesis). The AMH takes a biological, not physical, view of the market.

affect Emotional feeling.

affect heuristic Relying primarily on intuition, instinct, and gut feeling.

agency costs The difference between the value of an actual firm and the value of a hypothetical firm in which management and shareholder interests are perfectly aligned.

alpha The excess rate of return on a security beyond what is predicted by an equilibrium model like CAPM or APT.

ambiguity aversion People have an aversion for ambiguity.

anchoring and adjustment Forming an estimate by beginning with a somewhat arbitrary initial number and adjusting it on the basis of new information. The adjustment often tends to be insufficient, thereby causing an anchoring bias.

annual report The report issued annually by a company to its shareholders. It primarily contains financial statements. In addition, it presents the management's view of the operations of the previous year and the prospects for future.

anomalies Empirical phenomena that appear to incongruent with respect to the efficient markets hypothesis.

arbitrage A simultaneous purchase and sale of a security (or currency) in different markets to derive benefit from price differential. It involves zero risk and zero net investment but yet generates profits.

availability bias Overweighting information that is readily available and intuitive compared to information that is more abstract and less salient.

aversion to sure loss Accepting an actuarially unfair risk in an attempt to avoid a sure loss.

backfill bias Bias in the average returns of a sample of funds caused by considering the return of only funds that happen to be successful.

balance sheet The balance sheet shows the financial condition of a firm at a given point of time.

base rate information Information pertaining to the general environment.

base rate neglect People consider the base rate (prior information) but not sufficiently

bayes' theorem The probability of event B, conditional on event A, is equal to the probability of event A, conditional on event B, multiplied by the ratio of the simple probabilities of event B to event A.

behavioural asset pricing model Stocks with desirable characteristics provide low expected returns and stocks with undesirable characteristics provide high expected returns.

behavioural life cycle hypothesis Over the course of their lives, people use mental accounts to deal with self-control problems that may lead to insufficient savings.

behavioural portfolio theory People divide their money into several mental account layers, arranged as a portfolio pyramid. Each layer corresponds to a specific goal.

benchmark portfolio A portfolio that serves as a benchmark for evaluating the performance of an investment manager.

beta A risk measure based on how the returns on a given security vary with the market.

bias A predisposition to commit error.

black swan A black swan has three attributes: (1) It is an outlier. (2) It carries an extreme impact. (3) People concoct explanations for its occurrence after the fact.

bounded rationality People do not make fully optimal decisions because of cognitive limitations or information gathering costs.

brain stem The brain stem which lies at the base of the brain sits on the top of the spinal cord. It keeps us alive by governing vital functions.

catering Choosing a financial policy that caters to investors' psychological needs.

cerebral cortex The folded outer surface of the brain, the cerebral cortex (which accounts for about 80 per cent of the brain) is the brain's logistical centre.

cognitive dissonance The mental discomfort that people experience when newly acquired information is at variance with pre-existing understanding.

confirmation bias People tend to overlook information that is contrary to their views in favour of information that confirms their views.

conjunction fallacy Misestimating the probability of an event that represents a conjunction (or simultaneous occurrence) of two or more separate events.

conservatism Investors tend to be too slow in updating their beliefs in response to new evidence.

conspicuous consumption Consumption of things that are markers of a person's relative success.

debias Mitigate susceptibility to biases.

disposition effect Investors tend to sell winners too early and hold losers too long.

diversification heuristic When choices are not mutually exclusive, people like to try to bit of everything.

dopamine The pleasure chemical of the brain.

earnings management Using the flexibility in accounting rules in an attempt to project better performance.

efficient frontier A graph showing the set of portfolios that maximise expected return at each level of portfolio risk.

efficient market An efficient market is one in which the market price of a security is an unbiased estimate of its intrinsic value.

efficient markets hypothesis The proposition that security prices reflect all publicly available information.

emotional style Richard Davidson has identified six dimensions of Emotional Style: Resilience Style, Outlook Style, Social Intuition Style Self-Awareness Style Sensitivity to Context Style, and Attention Style.

endowment effect People tend to place greater value on what belongs to them relative to the value they would place on the same thing, if it belonged to someone else.

escalation of commitment Throwing good money after bad.

event study A research methodology that seeks to isolate the impact of a given event on stock returns.

excessive optimism Overestimating the probability of favourable outcomes and underestimating the probability of unfavourable outcomes.

extrapolation bias Forming forecasts by extrapolating past trends.

facial feedback theory Facial expressions are not only the results of our emotions but are also capable of influencing our emotion.

familiarity bias People have a preference for the familiar.

fMRI Functional magnetic resonance imaging.

frame Description.

framing effect The manner in which the setting for the decision is described has an influence on the decision.

free rider problem Managers have an incentive to shirk in the hope of riding on the performance of others.

functional fixation The tendency to latch on to a single object in a habitual way.

gambler's fallacy Overweighting the probability of an event because it has not occurred recently in line with its normal probability.

golem effect Lower expectations lead to a decrease in performance.

groupthink Groups strive for consensus at the expense of a realistic evaluation of alternatives.

hedonic editing People prefer to savour gains separately rather than together, but integrate small losses into a larger loss/gain.

heuristic A rule of thumb.

hindsight bias Viewing an event as obvious or almost certain in hindsight when it is neither obvious nor almost certain when viewed in foresight.

home country bias Domestic investors hold mostly domestic securities.

house money effect After experiencing a gain, people are willing to take more risk.

hubris hypothesis Firms experience the winner's curse in acquisitions due to hubris.

hyperbolic discounting In hyperbolic discounting, valuation falls very rapidly for small delay periods, but then falls slowly for longer delay periods.

illusion of control People tend to overestimate the extent to which they can control events.

illusion of effectiveness People tend to have unwarranted confidence in their decision.

illusion of knowledge People tend to believe that the more knowledgeable they are, the more accurate their forecasts are likely to be.

inattentional blindness People are not likely to see what they are not looking for.

incentive compatibility constraint Choosing the incentive compensation system to align the interest of the agent with that of the principal.

information cascade Large trends or fads begin when people ignore their private information but take cues from the action of others.

inside view Taking a view on a project on the basis of details specific to the project.

law of small numbers The belief that small samples closely mirror the population from which they are drawn.

limbic system Consisting of a group of structures surrounding the top of the brain stem, the limbic system is the seat of emotions and motivation.

limits of arbitrage Smart investors do not fully exploit mispricing because of the risk that mispricing may increase before it decreases.

loss aversion Psychologically, people feel more strongly about the pain from a loss than the pleasure from an equal gain.

magical thinking Attributing causal relationships between actions and events which seemingly cannot be justified by reason and observation.

mental accounting Mentally people separate information into manageable pieces by keeping them into separate accounts.

miscalibration People tend to overestimate- or- miscalibrate- the precision of their knowledge.

modern portfolio theory A theory that helps in making rational portfolio choices on the basis of risk-return tradeoffs and efficient diversification.

momentum Recent winners tend subsequently to outperform the market and recent losers tend subsequently to underperform the market.

money illusion People confuse between "nominal" changes and "real" changes.

naïve realism People think that they see the world directly, as it really is.

narrative fallacy A flawed story of the past that shapes our views of the world and our expectations of the future.

narrow framing Viewing a repeated risk as if it were a single deal.

neurotransmitters Molecules that transmit signals between neurons in the brain.

opaque framing Describing a decision task in such a way that it is not easy to discern the consequences of the decision.

outside view Taking a view on a project by comparing it with a large population of similar projects.

overconfidence People tend to believe that they are better than average.

overreaction A change in market price which is disproportional to the significance of an event.

overweighting of small probabilities Over-weighting small probabilities associated with extreme events.

P/E heuristic An approach to valuation that involves multiplying an earnings forecast by a P/E ratio.

paradox of skill When everyone in a certain sphere of activity is uniformly more skilful, the vagaries of luck matter more.

PEG heuristic An approach to valuation which involves multiplying an earnings forecast, a growth rate forecast, and a PEG ratio.

PET Positive emission tomography.

planning fallacy People tend to under-estimate the time and resources required for a task.

Plutchick's wheel of emotions According to Robert Plutchick, there are eight basic or primary emotions: joy, trust, fear, surprise, sadness, anticipation, anger, and disgust.

polarisation Group processes that tend to accentuate risk disposition.

portfolio theory A theory concerned with the delineation of efficient portfolios and selection of optimal portfolios.

post-earnings announcement drift A positive earnings surprise results in a positive drift in stock price after the announcement, and a negative earnings surprise results in a negative drift in stock price after the announcement.

premortem technique A sneaky way to get to motivate people to serve as a devil's advocate without encountering resistance.

price-to-sales heuristic An approach to valuation which involves multiplying a sales forecast and a price-to-sales ratio.

probability matching People randomise their guesses with approximately the same relative frequency as the underlying distribution.

prospect theory A psychological approach that describes the way people choose among risky alternatives.

psychological reactance theory People hate to lose the freedom they already have.

pymaglion effect Higher expectations induce better performance.

random walk A random walk means that successive stock prices are independent and identically distributed.

recency bias If something has occurred recently it is likely to be recalled easily.

reference dependence The value of a prospect depends on gains and losses relative to a reference point, which is usually the status quo.

reference point A benchmark used for measuring gains and losses.

representativeness Tendency to form judgments based on stereotypes.

return on equity The ratio of equity earnings to net worth.

reversion to mean An outcome that is far from the average will be followed by an outcome that is closer to the average.

saliency bias An event which is reported widely in media is deemed to occur with a higher probability.

self-attribution bias People tend to ascribe their success to their skill and their failure to their bad luck.

snake-bite effect After incurring loss, people are less inclined to take risk.

social proof To decide what to do, people look at what others are doing.

statement of profit and loss The statement of profit and loss reflects the results of operations over a specified period.

status quo bias People would like to keep the things the way they have been.

strategy paradox The behaviours and characteristics that maximise a firm's probability of notable success also maximise its probability of failure.

strong-form efficiency Prices reflect all available information, public as well as private.

sunflower management The tendency for groups to align with the opinion of their leaders.

sunk-cost effect People routinely consider historical costs when making decisions about the future.

survivorship bias Bias in the average returns of a sample of funds caused by the exclusion of funds that left the sample as they happened to be unsuccessful.

System 1 and System 2 Psychologists believe that there are two systems in the mind. System 1 operates automatically and rapidly System 2 is effortful, deliberate, and slow.

systematic risk Risk that cannot be diversified away. It is also referred to as market risk or non-diversifiable risk.

value stocks Stocks which have a low P/E ratio or low price to cash flow or low price to book ratio.

WYSIATI Acronym for 'what you see is all there is.

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CFM-MHE Series in Finance

Honorary Consulting Editor: Dr. Prasanna Chandra

The CFM-MHE Series in Finance, a joint initiative of the Centre for Financial Management and McGraw Hill Education (India), seeks to synthesise the findings of financial research with the concerns of practitioners. The aim of the books in this series is to convey the important developments in the theory and practice of finance in a rigorous, but relatively non-technical manner for the benefit of: (a) finance practitioners and (b) students of MBA.

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