



# FINANCIAL MANAGEMENT

## Theory and Practice

10e

A red, circular wax seal with the text '35 YEARS' in yellow and 'COMMEMORATIVE EDITION' in white, all in a serif font.



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Prasanna Chandra

**Financial Management**  
**Theory and Practice**  
**Tenth Edition**

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**Dr Prasanna Chandra**, Director of Centre for Financial Management, is an MBA, PhD (Finance). He has nearly five decades of teaching experience in postgraduate and executive education programmes. He was a professor of finance at Indian Institute of Management, Bangalore for nearly two decades. He was a visiting professor of finance at Southern Illinois University, USA for two years. He was appointed as a member of several committees including the Capital Issues Advisory Committee, the High Powered Committee on Insurance Sector Reforms, and the SEBI Committee on Derivatives. He has served on the boards of a number of organizations including Torrent Pharmaceuticals, Power Finance Corporation, UTIIAS, ICFAI, SDMIMD, IFCI, IIM (B), Templeton Mutual Fund, Bangalore Stock Exchange Limited, and Karnataka Soaps and Detergents Limited. He has been a consultant to many organizations.

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He has published ten other books – *Strategic Financial Management: Managing for Value Creation; Projects: Planning, Analysis, Financing, Implementation, and Review; Investment Analysis and Portfolio Management; Investment Game; Corporate Valuation; Finance Sense; Fundamentals of Financial Management; Behavioural Finance and Valuation of Equity Shares* and has authored over 70 articles in professional journals and business periodicals. He has been a Fulbright Scholar and a UNDP Fellow. He

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# **Financial Management**

## **Theory and Practice**

### **Tenth Edition**

**Prasanna Chandra**

*Director*

*Centre for Financial Management (CFM)*  
*Bangalore*



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**To**

*My students and readers*

*for their inspiration*

*and*

*Padma, Pranav and Savita*

*for their support*

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## Preface to the Tenth Edition

*Financial Management: Theory and Practice, 10/e* is designed as a comprehensive reference cum textbook in financial management. This book seeks to:

- Build understanding of the central ideas and theories of modern finance
- Develop familiarity with the analytical techniques helpful in financial decision making
- Furnish institutional material relevant for understanding the environment in which financial decisions are taken
- Discuss the practice of financial management

The primary thrust of the book is to show how financial theory can be applied to solve problems in practice. An attempt has been made to relate theory to practice. Indeed, the theory presented has its imperfections and inadequacies, yet it is a potent tool for analysing practical problems.

## **A Response to Evolving Concerns**

The past two decades have witnessed a dramatic transformation of the Indian business and financial scene, due to deregulation, liberalisation, partial privatisation, globalisation, automation, and the ascendance of the services sector.

In the wake of these developments, investment and financing avenues have expanded considerably, competition has intensified in all sectors, institutional investors have become a major force, financial prices have become more volatile, corporates have grown in size and complexity, and intangible assets have assumed greater significance.

In response to these opportunities and challenges, shareholder value has become the central corporate agenda, mergers, acquisitions, and restructuring have gathered momentum, financial derivatives have emerged as tools for risk management, corporate governance and transparency have received a lot of emphasis, and performance management has become a major concern.

This book, in its various editions, has tried to capture the central themes and evolving concerns of corporate financial management. It can justifiably claim to be the most contemporary and comprehensive Indian book in the field. This is reflected in its growing popularity among management students and practitioners.

## What's New in this Edition?

Enthused by the excellent response to the previous edition of this book and prodded by the suggestions received from the readers, I have added the following new material to strengthen the book.

- A note on *Finance in Action* to provide a flavor of what happens in the real world of finance.
- New sections or sub-sections on the following topics: Continuous Compounding, Value of a Put Option, Option Delta, Behavioural Biases in Capital Investments, Insolvency and Bankruptcy Code, and Financial Management in Small and Medium Enterprises.
- Fourteen new appendixes: Appendix 6A: *XNPV and XIRR*; Appendix 15A: *Five Principles of Capital Allocation*; Appendix 15B: *Agency Problems in Capital Budgeting*; Appendix 15C: *APV, WACC, and FTE Approaches to Valuation*; Appendix 16A: *Six Tests of Market Efficiency*; Appendix 16B: *Two Aspects of EMH*; Appendix 18A: *Shift from Loans to Bonds*; Appendix 18B: *A Life Cycle View of Financing*; Appendix 22A: *The Dividend Puzzle*; Appendix 23A: *Corporate Strategy and Working Capital Management*; Appendix 27A: *Bank Lending Rates*; Appendix 31A: *Merton Miller's Views on Financial Innovations*; Appendix 34A: *'India Way' of Managing Overseas Acquisitions*; and Appendix 42A: *State of the Art: Satisfaction and Contribution to Value*.
- Several new cases on topics like Estimation of Cash Flows, Risk Analysis, Credit Management, and Corporate Valuation.
- A number of additional problems on Time Value of Money, Valuation of Bonds and Stocks, Risk and Return, and other topics.

Apart from this new material, a number of cases, exhibits, and tables have been updated. Finally, a lot of material relating to regulatory framework and financial management practices has been revised and expanded.

## Special Features

Designed to provide a firm grounding in the principles, techniques, and practice of financial management, this book has the following special features.

- **Comprehensive coverage** It covers a wide spectrum of topics in financial management quite comprehensively. Some of the topics like Value Based Management, Financial Management in Sick Units, Financial Management in Companies with Special Characteristics, The State of our Knowledge, and Behavioural Finance are unique to this book.
- **Decisional focus and analytical approach** This book primarily seeks to show how a wide range of financial decision situations should be analysed. An attempt has been made to describe the setting of various decisions, dwell on the quantitative and qualitative considerations relevant for such decisions, and explain analytical methods which are helpful in analysing these decisions.
- **Emphasis on behavioural dimension** This book draws on the rich literature of the emerging field of ‘behavioural finance’ to illuminate many facets of financial management.
- **Numerous illustrations** Various concepts, tools, and techniques of financial management have been illustrated with suitable examples. Where necessary, two or three examples of gradually increasing complexity have been provided.
- **Discussion of practice** In several important areas of financial management, such as capital expenditure analysis, cost of capital, risk analysis, credit management, capital structure planning, dividend policy, corporate governance, and risk management, the practice of business firms has been described and evaluated.
- **Procedural orientation** Procedural aspects of term loan financing, public issue of capital, lease financing, mergers and amalgamations, and so on, have been discussed. This is

meant to give the reader a feel for ‘how to go about’ in the world of finance.

## **Organisation and Use of the Text**

There are several ways of organising the material presented in this book. So, I have made the book highly modular. This gives the instructor a great deal of flexibility in sequencing the material.

I have used the material in this book for a set of two courses: a basic course and an advanced course. For the basic course titled ‘Financial Management’ or ‘Corporate Finance’ or ‘Managerial Finance’, I have used **Parts 1 through 5** and **Parts 7 and 8** with the following exceptions – **Chapter 10: Options and Their Valuation**, **Chapter 15: Capital Budgeting– Extensions**, and **Chapter 31: Working Capital Management – Extensions**.

For the advanced course titled ‘Strategic Financial Management’ or ‘Advanced Financial Management’ or ‘Topics in Finance’ I have used the rest of the book.

While the book is primarily targeted at students of MBA, ACA, CMA, CFA, and ACS programmes and finance professionals, it will also be useful for all managers interested in understanding the financial dimensions of business.

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## Preface to the First Edition

This book seeks to discuss the theory of finance which provides the framework for investment and financing decisions, expound several analytical methods used to cope with varied problems in financial management, and present information about the institutions and environment relevant to corporate finance.

The principle concern of the book is to show how financial theory can be applied to solve problems in practice. An attempt has been made to relate theory to practice. Of course, the theory presented has its imperfections and inadequacies. Yet, it is a potent tool for analysing practical problems.

My students and participants of numerous executive development programmes prodded me to write this book. They pointed towards the need for a book which has an adequate treatment of analytical tools, a well rounded description of tax and regulatory framework and the financial system in India, a comprehensive coverage of various issues in financial management, and a discussion of financial management practices. I am hopeful that the book meets these requirements.

In writing this book I have drawn on a vast amount of literature in finance. Naturally, I owe an intellectual debt to the numerous authors who have enriched the stream of literature in finance by their contributions. I have also benefited from the insights and experiences of a number of practitioners in the field, with whom I have had many discussions.

I express my thanks to Smt. B. S. Nagaveni and Smt. P.S. Shantha Bai who cheerfully typed the manuscript of the book. My greatest gratitude, of course, is to my wife, Padma, for her encouragement and sacrifice.

**Prasanna Chandra**

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I eagerly look forward to suggestions for improvements in this book.

**Prasanna Chandra**

## Finance in Action

If you look at a business newspaper any day, you will find several news items about corporate financial decisions. For example, the *Business Standard* of July 25, 2018 reported, among others, the following. Reliance Jio to invest ₹ 500 billion in fibre-to-home foray; HDFC Bank is likely to prefer an issue of American Depository Receipts (ADR) over Qualified Institutional Placement (QIP) for its ₹ 15.5 billion (\$2.2 billion) equity raising exercise; the Reserve Bank of India (RBI) is reportedly studying the feasibility of a dividend policy which will require it to transfer to the government a pre-determined portion of the surplus it earns; Government mulls selling \$2.6 billion NHPC stake to NTPC.

Financial management is concerned with maximising shareholder value primarily through sound investment and financing decisions, efficient working capital management, sensible corporate restructuring, judicious risk management, and a well-designed performance management system. This book discusses various concepts, theories, and techniques that are helpful in financial management.

In this note we provide a flavour of what happens in the *real world* of finance to whet your appetite for the material that lies ahead.

## A. Goal of the Firm and Valuation

**Goal of the Firm** Infosys, a leading IT company, articulated the goal of firm in the following words: “Corporate governance is about maximising shareholder value legally, ethically, and on a sustainable basis, while ensuring fairness to every stakeholder—the company’s customers, employees, investors, vendor-partners, the government of the land, and the community.”

**Strategic Priorities** Speaking ahead of the board meeting where he took charge as the chairman of Tata Sons Ltd, the holding company of the Tata Group, N. Chandrasekaran listed his strategic priorities. His focus will be to bring the group closer to leverage its collective strength, reinforce a leader’s mindset among the operating managers across the group, bring greater rigour to capital allocation policies, and deliver superior returns to its shareholders.

**Intrinsic Value** The decisions of Berkshire Hathaway, a \$600 billion U.S. conglomerate giant, are guided by the intrinsic value principle. As Warren Buffett, the Chairman and CEO of Berkshire Hathaway and the world’s most renowned finance practitioner, wrote: “Intrinsic value is an all-important concept that offers the only logical approach to evaluating the relative attractiveness of investments and businesses. Intrinsic value can be defined simply: It is the discounted value of the cash that can be taken out of a business during its remaining life.”

**Equity Valuation** Mary Meeker, a star security analyst at Morgan Stanley, released a report in April 2003 when eBay’s price was \$89.22. In this report, her task was to develop a target price for eBay over the subsequent 12 months. For doing this, she used three valuation heuristics—price–earnings (P/E) ratio, P/E to growth ratio, and price–sales ratio—along with the discounted cash flow (DCF) valuation to arrive at a target price of \$106.

**The Power of Duration** Thanks to a decline in bond yields between mid-2015 and mid-2016, the 40 years Japanese bond carrying a coupon of 1.4% appreciated by nearly 60% in one year.

**Valuation of King Fisher Airlines Brand** Based on a complaint by State Bank of India(SBI), the Central Bureau of Investigation has filed a charge sheet against Grant Thorton, leading global tax and advisory firm, for allegedly submitting a “highly inflated and exaggerated” value of ₹ 3406.30 crore for King Fisher Airlines brand. This report was cited by Vijay Mallya when he used KFA’s brand value as a collateral against a loan from SBI. By contrast, Brand Finance had valued KFA’s brand at ₹ 1911 crore.

Apparently, King Fisher Airlines gave Grant Thorton highly inflated figures regarding the financial condition of KFA and future profitability projections/forecasts which were at variance from the ones supplied to the banks. According to some sources, the information provided to the banks was also at variance with reality.

## B. Investment Decisions

**Investment Criteria** The Financial Executives International (FEI) asked Chief Financial Officers (CFOs) how frequently their firms use various techniques of investment decision making. The top two techniques identified by survey respondents were IRR (internal rate of return) and NPV (net present value), each of these techniques being used by 75% respondents. Interestingly, the payback rule ranked third with 57% of the CFOs reporting its use.

**Estimation of Cash Flows** When several oil majors decided to construct the Alaska Pipeline, the initial cost estimate was about \$700 million. The final cost, however, was about \$7 billion. While this may be an extreme example, it highlights the pitfalls of forecasting.

**Capital Allocation at ITC** Despite a number of diversifications, ITC delivered a return on capital employed of more than 15% every year during the decade 2002–2015. This can be attributed to its judicious capital allocation policy: 50% of cash flow from operations has been paid out as dividends, about 35% of cash flow from operations has been deployed in businesses with consistently healthy return on capital employed, and the quantum of unrelated capex has been kept within limits.

**Investment Decision** In early 2011, Indigo placed an order for 1580 Airbus A 320 aircrafts, the largest single order for large jets in the history of commercial aviation. It planned to finance this acquisition with an IPO and Sale and Leaseback arrangement.

## C. Financing and Distribution Decisions

**GDR Issue** In May 1992, Reliance Industries Limited raised \$150 million, by way of a GDR (Global Depository Receipts), the first Indian company to do so. Indian companies prefer Luxembourg stock exchange for GDR issues as the deal at Luxembourg can be closed very fast.

**Initial Public Offering** Alibaba, an online trading company, raised a whopping 25 billion dollars in an IPO in 2014. The investment banks who arranged the deal pocketed a cool 300 million dollars.

**Book Building** Inter Globe Aviation Limited (which runs Indigo Airlines) came out with a public equity issue of ₹ 3130 crore. For ₹ 10 par value shares the price band for bidding was set as ₹ 700 to ₹ 765. The issue received enthusiastic response from investors and was over-subscribed 6.14 times. The issue price was fixed ₹ 765 and the company decided to issue 39,464,562 shares.

**Long-term Financing** In April 2012, Tata Steel issued non-convertible debentures worth 1500 crore carrying a coupon of 2% with a redemption premium for a tenure of 10 years on private placement basis.

**Project Financing** Recently when HINDALCO embarked upon its ambitious growth plan for doubling its Alumina and Aluminum capacity involving a capital outlay of ₹ 35,000 crore, the company evaluated various options for financing. The company opted for 'Project Financing' in the domestic rupee loan market, since it was not possible to raise large amounts by way of ECBs, corporate bonds or corporate loans.

**Differential Voting Right Shares** Tata Motors was the first company to issue differential voting right (DVR) shares in India in 2008, when it needed funds for its JLR acquisition. A DVR share is entitled to 5% more dividend than ordinary shares.

**Deep Discount Bonds** The Industrial Development Bank of India issued deep discount bonds in 1996 which had a face value of 2 lakh

and a maturity period of 25 years. The bonds were issued at 5300. The bonds carried no interest.

**Masala Bonds** Masala bonds are rupee-denominated bonds issued to foreign investors. HDFC was the first company to issue these bonds in 2016. Investors assume foreign-exchange risk in addition to currency risk. Investors can buy protection against currency risks by hedging their rupee exposure. But hedging is expensive as it costs 5 to 6%. Obviously, these bonds make sense for issuers who want to avoid foreign-exchange risk and investors who are inclined to assume foreign-exchange risk.

**Green Bonds** Green bonds are regular bonds issued by companies for financing sustainable environment-friendly projects. Yes Bank was the first issuer of green bonds in India in February 2015 when it raised ₹ 1000 crore. The first dollar green bond from India was issued by Exim Bank in April 2015 for raising \$ 500 million. While there are global standards for green bonds, in India a standard code has not been developed so far.

**Dividend Policy of Infosys** The Board of Directors of Infosys reviews the dividend policy periodically and as on April 13, 2017, decided to change the dividend policy to upto 70% of free cash flow (net cash provided by operating activities less capital expenditure as per the consolidated statement of cash flows under IFRS). The earlier dividend policy was to distribute upto 50% of post-tax profits.

**Share Buyback** On Monday February 20, 2017, the board of Tata Consultancy Services Ltd. (TCS) approved a buyback of equity shares at ₹ 2,850 per share at a premium of 18.4% on Friday's closing price. The company will buy back up to 5.61 crore shares or 2.85% of the total outstanding equity for an amount not exceeding ₹ 16,000 crore. The buyback is proposed to be made on a proportionate basis under the tender offer route using the stock exchange mechanism. It is subject to approval of shareholders by means of a special resolution through a postal ballot.

The TCS stock rallied as much as 6.1% to ₹ 2,555 immediately after the announcement, before paring gains and closing 4% higher

as ₹ 2487.05.

**Bond Refunding** Satlej Jal Vidyut Nigam borrowed 2100 crore at an average cost of 9%. The money was used to repay the 1540 crore loan from the World Bank (carrying 14.5% interest) and 560 crore for meeting capital expenditures.

**Buybacks by PSUs** In order to meet its disinvestment targets in 2018-19, the government has pressurised several PSUs to buyback shares. This makes a mockery of disinvestment. The primary purpose of PSU disinvestment is to transfer government ownership in the hands of non-government entities and expose PSUs to the discipline of the capital market.

By forcing PSUs to buyback shares, these objectives are not achieved. Further, they deprive PSUs of the resources required for further investments. From a corporate finance perspective, buybacks make sense when a firm has excess liquidity or when its stock is undervalued and not when the owners need money for their own purposes. So, the government-directed buybacks to PSUs will hurt their competitiveness and harm the interest of minority shareholders.

## D. Working Capital Management

**Working Capital Management** In response to financial crisis and economic downturn, the global aluminium company Alcoa made working capital a priority in 2009. Over the following 4-5 years, the company reduced its net working cycle—the time it takes to turn assets and liabilities into cash—by 23 days and unlocked \$ 1.4 billion in cash.

**Liquidity Management** As on March 31, 2017, Infosys had deposits of ₹ 27,722 crore with banks and financial institutions. These deposits were time deposits which can be drawn by the Company at any point without prior notice or penalty on the principal.

**Liquidity Management at Reliance Industries Limited (RIL)** RIL effectively manages its cash and cash equivalents through a diversified investment portfolio which has an appropriate mix of steady accrual, tax efficient and higher duration assets with lower reinvestment risk. The portfolio consists of wide ranging fixed income instruments, viz., Government securities, corporate bonds, top rated mutual fund investments, and bank fixed deposits. A substantial portfolio is invested in top rated instruments like sovereign bonds, AAA papers, and bank's fixed deposits. The diversification across instruments and counterparties ensures that there is a minimal concentration risk. The investment portfolio is monitored and operated under a robust risk management framework with a very nimble and dynamic adjustment to portfolio mix as and when necessary to ensure capital protection and appropriate risk adjusted returns.

**Negative Cash Cycle** Internet-based bookseller [Amazon.com](#) manages its cash cycle extremely well. It turns its inventory over 26 times a year, making its inventory period very short. It charges its customer's credit card when it ships a book and it gets paid by the credit card firm usually in a day. Finally, it takes about 46 days to pay the suppliers. All this implies that [Amazon.com](#) has a negative cash cycle.

**Cash Pooling** A large portion of the total cash generation of Birla Carbon occurs in countries like Korea, Thailand, Brazil, and India, that have exchange controls and restrictions on movement of cash. So, the company found it challenging to move cash from these countries to places where cash is required for growth or debt servicing. To address this challenge, the company is implementing an efficient cash pooling scheme that enables a virtual fungibility, without moving the cash physically. The bankers providing this facility would run a virtual consolidated book that would allow the company to withdraw funds in one country against cash balances held in another country.

**Reserve Based Lending** Cairn India had a hard time persuading banks in India to lend against its oil reserves as they were not used to reserve-based lending. To satisfy the bankers, the company created a legal structure that linked bank lending to Cairn India's participating interest in the project and securing it that way.

**Float Reduction** The Public Financial Management System (PFMS) platform, administered by the Department of Expenditure and implemented by the Controller General of Accounts, is an end-to-end solution for processing payments, tracking, monitoring, accounting reconciliation, and reporting. The PFMS platform minimised float in the system by releasing funds only when implementing agencies need them. The 'just-in-time release' of funds saves over ₹ 10,000 crore of interest for the government.

## **E. Mergers, Acquisitions, and Restructuring**

**Merger** On Monday, April 7, 2014, Sun Pharmaceuticals announced that it will acquire Ranbaxy Laboratories in an all-stock merger in which Ranbaxy shareholders will get 0.8 shares of Sun Pharmaceuticals for every share in Ranbaxy.

**Acquisition and Divestiture** In 1998, Daimler paid \$36 billion for Chrysler in a bid to become a global carmaker. In 2017, after years of bleeding, Daimler sold Chrysler for \$7.4 billion to Cerberus Capital Management of New York, a private equity firm specialising in restructuring troubled companies.

**Cross-border Takeover** Vodafone's \$183 billion takeover of Mannesman of Germany in 2000 has been the biggest hostile cross-border takeover in Europe to date. The initial bid of \$106 billion was raised to \$183 billion to consummate the deal. In 2006, Vodafone took a goodwill charge (write-off) of \$28 billion, one of the largest post-acquisition write-offs.

**Acquisition** Wipro initially acquired a minority stake in Spectramind, the largest third party IT Enabled Services Company in India. After a positive 'courtship' period, Wipro concluded the deal for complete acquisition in July 2002. Wipro's CFO Suresh Senapathy commented later: "Looking back, even with the benefit of hindsight, we could not have picked up a better business for our first acquisition. At the turn of the millennium, ITES was the sunrise industry."

**Merger** In April 2017, Cairn India was merged with its parent Vedanta Limited, in a move to consolidate Vedanta's position as one of the world's largest diversified natural resource companies. The combined entity will have a market capitalization of \$15.6 billion and a free float of 49.9 percent.

As per the deal, shareholders of Cairn India received, for each equity share held, one equity share of face value of 1 and four 7.5% redeemable preference shares (RPS) in Vedanta with a face value of 10 each.

Justifying the merger the company said, "Vedanta will have one of the strongest balance sheets in the Indian corporate sector with flexibility to balance capital allocation to the highest return projects while providing a strong and stable dividend."

**Disastrous Acquisition** Bank of America purchased the home-mortgage lender Countrywide Financial Corporation in 2008 for \$2.5 billion. By 2011, Bank of America had racked up \$18 billion in losses on Countrywide's assets. As one director commented, "It turned out to be the worst decision we ever made."

**Strategic Alliance** In 2016, Tata Motors, Bharat Forge, and General Dynamics Land Systems (GDLS) of the U.S. signed an agreement for the Ministry of Defence's (MoD's) Future Infantry Combat Vehicle (FICV) Programme. FICV is billed as a project worth \$11 billion (78000 crore). Tata Motors will lead the consortium. Tata Motors has strengths in design, development, and integration of mobility platforms. Bharat Forge has competence in fighting platforms and manufacturing. General Dynamics has expertise in systems integration.

Commenting on this alliance, Ravi Pisharody of Tata Motors said, "Defence particularly needs partners with long-term commitments, to see products and solutions through multiple generations of evolution. We three have joined hands for a complete FICV solution for the armed forces."

**Demerger** Arvind Limited demerged its Branded Apparel undertaking to Arvind Fashion Limited and the Engineering Undertaking to Anveshan Heavy Engineering Limited and amalgamated The Anup Engineering Limited with Anveshan Heavy Engineering Limited (The name of Anveshan Heavy Engineering Limited shall be changed to The Anup Engineering Limited). According to the management of Arvind the rationale for demerger is to impart greater focus, enhance operational efficiency, attract different types of investors as well as management teams, and incentivise management through aligned ESOP schemes.

**Disinvestment** In 2018, the Government of India sold its 51.1% equity stake in Hindustan Petroleum Corporation Limited (HPCL) for ₹ 473.97 per share, at a premium of over 10 per cent of the 60-days' weighted average price of HPCL's scrip. The total consideration was ₹ 370 billion.

## F. Risk Management

**Financial Swap** In 1981, the Swiss market, saturated with World Bank debt, was unwilling to absorb any more. The World Bank, however, could borrow in the US market on attractive terms. With the help of IBM, which was quite acceptable in the Swiss market, the problem was solved. IBM borrowed in the Swiss market, World Bank borrowed in the US market, and IBM and the World Bank swapped their debts.

**Hedging** In the turbulent environment that prevailed in the wake of the recent global recession, shipping companies began concentrating on the offshore segment, as this business provides a perfect hedge for these companies. When crude prices are high (say over \$90 per barrel), shipping business suffers but oil exploration becomes profitable.

**Hedging at Coca Cola** Manik Jhangiani, CFO of Coca Cola, described the company's hedging strategy as follows: "Our hedging strategy is clear. We are not looking to beat the market. We are just trying to increase certainty around our cost structure. We do not hedge for translational exposure. When we communicate with the market, we actually give guidance and provide our information data both on a currency-neutral basis and with the impact of currencies."

**Hedging at Alstom** Nicholas Tissot, CFO of Alstom explained the company's hedging strategy as follows: "As soon as an order is firmed up, we have a full blown analysis of currency flows. Then that exposure is systematically hedged over the horizon available in the market, with a rolling forex strategy. To avoid paying too much in fees to bank, we use an electronic platform."

## G. Performance Management

**Economic Value Added (EVA)** Hindustan Lever (now Hindustan Unilever) switched to EVA as the key performance metric, in the mid-1990s, as V.K. Vishwanathan, the then financial controller, put it: “That involved a big change. When it was introduced, it was not introduced by the accountants but by the businesses themselves. We felt that the best way to implement the system was to get the businesses to buy into it. Therefore, with it came both focus and acceptability. There are other non-financial measures, but among the financial measures, this is now the single-most important financial performance measure that we use as the only yardstick today.”

**Performance Management** Haier, the Chinese white goods manufacturer, reorganised its 80,000-person workforce into 2,000 independent units, each responsible for managing its own profits and losses. After this move, its performance improved significantly and its market capitalisation soared, tripling between 2011 and 2014.

**Executive Compensation** An important responsibility of Warren Buffett is to determine the salaries and incentives for the CEOs of its operating businesses. Buffett describes how he does it: “Berkshire employs many different incentive arrangements, with their terms depending on such elements as the economic potential or capital intensity of a CEO’s business. Whatever the compensation arrangement, though, I try to keep it both simple and fair. When we use incentives—and these can be large—they are always tied to the operating results for which a given CEO has authority.”

**ESOP** Edelweiss Financial Services used ESOPs (Employee Stock Option Plans) creating one of the most broad-based employee ownerships among financial services companies in India. The consistent growth of the company can be attributed to the culture of ownership and partnership that is nurtured amongst the employees.

**Economic Value Added** In an *Economic Times* survey, three quarters of the Chief Financial Officers reported using Economic Value Added for some purpose, such as capital budgeting or as

performance measure for external reporting (annual report) or internal comparison between strategic business units and product lines.

**Governance Problem** In January 2014, the board of Maruti Suzuki approved the expansion of its Gujarat plant through a 100% subsidiary of Suzuki Motors. Such a move would short-change the minority shareholders of Maruti Suzuki. On January 28, 2014, the stock price of Maruti Suzuki fell by 8%. Thanks to the opposition of institutional investors in the following months, Maruti Suzuki dropped the proposal.

## **PART-I**

### **Introduction**

- 1** Financial Management: An Overview
  - 2** The Financial System
-

## Financial Management: An Overview

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Discuss the various forms of business organisation.
- ✓ Describe the three broad areas of financial decision making.
- ✓ Defend the goal of shareholder wealth maximisation.
- ✓ State the fundamental principle of finance.
- ✓ Describe the building blocks of modern finance.
- ✓ Discuss the nature of agency problem in finance.
- ✓ Explain what is meant by corporate social responsibility.
- ✓ Show how the finance function is organised.
- ✓ Elucidate the relationship of finance to economics and accounting.
- ✓ Describe the emerging role of financial manager in India.

Suppose you are planning to start your own business. No matter what the nature of your proposed business is and how it is organised, you will have to address the following questions:

- What capital investments should you make? That is, what kinds of real estate, machineries, R&D programmes, IT infrastructure, and so on should you invest in?
- How will you raise money to pay for the proposed capital investments? That is, what will be the mix of equity and debt in your financing plan?
- How will you handle the day-to-day financial activities like managing your inventories, collecting your receivables and paying your suppliers?

While these are not the only concerns of financial management, they are certainly the central ones.

This book discusses the theories, analytical methods, and practical considerations that are helpful in addressing various issues in financial management, a discipline that has assumed great significance in recent times. It also describes the financial environment in which the business operates.

Before we begin our odyssey, let us get a bird's eye view of financial management, also referred to as *corporate finance* or *managerial finance*. This chapter provides such an overview.

## 1.1 ■ FORMS OF BUSINESS ORGANISATION

All firms face the basic problems of capital budgeting, capital structure, dividend policy, working capital management, and financial control. However, these issues tend to be more complex for companies than for other forms of organisation.

Since this book focuses primarily on financial management of companies—note that large firms are almost invariably organised as companies—you should know how a company differs from other forms of business organisation like sole proprietorship, partnership, and cooperative society.

**Sole Proprietorship** A sole proprietorship firm is a business owned by a single person. This is the simplest form of business, subject to minimal regulation. You can set up a sole proprietorship firm by obtaining a license, if the same is required for the business you want to engage in, and throwing open your doors. Thanks to its simplicity, most businesses begin as sole proprietorship firms. No wonder there are more sole proprietorships than any other form of organisation.

From a legal and tax point of view, a sole proprietorship firm has no separate status apart from its owner. The owner realises all the profits and bears all the losses. The owner indeed has unlimited personal liability for the debts of the business. By the same token, there is no distinction between business and personal income and all business income is taxed as personal income. A variant of sole proprietorship is a **One Person Company** which allows a single individual to operate a corporate entity with limited liability protection.

The equity capital of a sole proprietorship is limited to the personal wealth of the owner. Hence such firms often cannot grow beyond a point for want of capital.

**Partnership** A partnership firm is a business owned by two or more persons. It may be viewed as an extension of sole proprietorship. The partners bear the risks and reap the rewards of the business.

Generally, a partnership comes into being with the execution of a partnership deed that specifies, *inter alia*, the capital contributions, shares, rights, duties, and obligations of the partners. In India, partnerships are governed by the Partnership Act, 1932. This legislation regulates the

relationship between the partners *inter se* as well as between the partners and the parties dealing with the partnership firm.

A partnership firm is a distinct legal and tax entity. It can pay interest and remuneration to the partners and claim the same as tax-deductible expenses. Of course, these incomes are taxable in the hands of the partners. The tax rate applicable to the net profit of the partnership firm is presently 30 percent.

While a partnership firm can benefit from the varied experience and expertise of the partners and draw on their combined capital resources, its advantages and disadvantages are more or less similar to that of a sole proprietorship firm.

**Limited Liability Partnership** Recently a new form of business organisation called Limited Liability Partnership (LLP) was introduced in India. Its distinctive feature is that it is a partnership firm wherein the liability of some or all the partners is limited. An LLP must have at a minimum two partners and at least one of them should be an Indian resident. The partners are accountable for regulatory and legal compliance. The rights and duties of the partners are governed by the agreement between the partners or between the LLP and the partners.

Since the LLP is treated as a firm, it does not have to pay the minimum alternative tax on book profits and the dividend distribution tax. The interest that an LLP can pay on the investments made by the partners is limited to 12 percent of the total income of the LLP.

The remuneration can be paid to the partners as per the slabs fixed under the law. The net profit of the LLP would be taxed at 30 percent. The partners, of course, have to pay taxes for their interest and remuneration received from the LLP.

**Cooperative Society** A cooperative society may be defined as “a society which has as its objective the promotion of economic interests of its members in accordance with cooperative principles.”

The members of the cooperative society are its owners. The management of the cooperative society is vested in the hands of the management committee elected by the members.

The advantages of a cooperative organisation are as follows: (a) It can be formed easily. (b) The liability of the members is limited. (c) Grants and financial assistance are provided by the government to cooperative organisations.

The disadvantages of a cooperative organisation are as follows: (a) Cooperatives' ability to attract talent is limited. (b) Members do not have an incentive to provide capital because the dividend rate is low and the principle of 'one member, one vote' is followed. (c) Often, influential members may exploit the cooperative society for personal gains.

**Company** A company is collectively owned by the shareholders who entrust the task of management to their elected representatives called the directors. The salient features of a company are as follows:

- The company is a distinct legal "person", separate from its owners, the shareholders. It can own assets, incur liabilities, enter into contracts, sue and be sued in its name. In India, a company is formed under The Companies Act, 2013, a central legislation.
- There are two basic requirements for registering a company: (i) The proposed name of the company must be approved by the Registrar of Companies (ROC) of the state in which the company plans to have its registered office. (ii) The Memorandum of Association (which defines the constitution of the company, the objective, and the scope of activities of the business) and the Articles of Association (which specify the rules and regulations for internal governance) have to conform to the provisions of the Companies Act and have to be approved by the ROC.
- The liability of the shareholders of a company is limited to the share capital subscribed to by them. Once this amount is fully paid up, they have no further obligation.
- A company must pay taxes on its profits. Moreover, shareholders of the company are liable to pay taxes on the dividend received by them.<sup>1</sup> So, in effect, there is double taxation.
- Setting up and managing a company is more complicated than setting up and managing other forms of organisation because companies are governed by the The Companies Act 2013, a very elaborate and comprehensive piece of legislation.

A company may be a private limited company or a public limited company. The key differences between them are as follows:

- A private limited company must have at least two shareholders (members) whereas a public limited company must have at least seven shareholders. While there is no limit on the number of shareholders of a public limited company, the number of shareholders of a private limited company cannot exceed 200.

- A public limited company invites members of the public to subscribe to its shares, whereas a private limited company cannot do so.
- A public limited company permits free transfer of shares whereas a private limited company usually imposes restrictions on such transfers.
- A private limited company has greater operational flexibility in conducting its affairs compared to a public limited company. It is exempted from a number of requirements or restrictions that are applicable to the latter.

On the whole, the public limited company is the most appropriate form of business organisation, except, of course, when the business is small. The reasons are: (a) The risk to investors is limited. (b) The potential for growth is immense because of access to substantial funds. (c) Investors enjoy liquidity because of free transferability. Thanks to these advantages, large and medium-sized businesses are generally organised as public limited companies. Reliance Industries, State Bank of India, Sun Pharma, and Infosys Technologies, for example, are public limited companies. So are overseas businesses such as General Electric, Intel, British Petroleum, Sony, and Asea Brown Boveri.

To identify that a firm is a company, the following letters are used after its name: Inc. in the United States, PLC for a public company in the United Kingdom, LTD for a private company in the United Kingdom, AG for a public company in Germany, GmbH for a private company in Germany, SA in France, SpA in Italy, NV in the Netherlands, and AB in Sweden.

## 1.2 ■ FINANCIAL DECISIONS IN A FIRM

As mentioned in the beginning of this chapter, there are three broad areas of financial decision making viz., capital budgeting, capital structure, and working capital management.

**Capital Budgeting** The first and perhaps the most important decision that any firm has to make is to define the business or businesses that it wants to be in. This is referred to as strategic planning and it has a significant bearing on how capital is allocated in the firm. As strategic planning calls for evaluating costs and benefits spread out over time, it is essentially a financial decision making process.

Once the managers of a firm choose the business or businesses they want to be in, they have to develop a plan to invest in buildings, machineries, equipments, research and development, godowns, showrooms, distribution network, information infrastructure, brands, and other long-lived assets. This is the capital budgeting process.

Considerable managerial time, attention, and energy is devoted to identify, evaluate, and implement investment projects. When you look at an investment project from the financial point of view, you should focus on the magnitude, timing, and riskiness of cash flows associated with it. In addition, consider the options embedded in the investment projects.

**Capital Structure** Once a firm has decided on the investment projects it wants to undertake, it has to figure out ways and means of financing them.

The key issues in capital structure decision are: What is the optimal debt-equity ratio for the firm? Which specific instruments of equity and debt finance should the firm employ? Which capital markets should the firm access? When should the firm raise finances? At what price should the firm offer its securities?

An allied issue is the distribution policy of the firm. What is the optimal dividend payout ratio for the firm? Should the firm buyback its own shares?

Capital structure and dividend decisions should be guided by considerations of cost and flexibility, in the main. The objective should be to minimise the cost of financing without impairing the ability of the firm to raise finances required for value creating investment projects.

**Working Capital Management** Working capital management, also referred to as short-term financial management, refers to the day-to-day financial activities that deal with current assets (inventories, debtors, short-term holdings of marketable securities, and cash) and current liabilities (short-term debt, trade creditors, accruals, and provisions).

The key issues in working capital management are: What is the optimal level of inventory for the operations of the firm? Should the firm grant credit to its customers and, if so, on what terms? How much cash should the firm carry on hand? Where should the firm invest its temporary cash surpluses? What sources of short-term finance are appropriate for the firm?

## 1.3 ■ GOAL OF FINANCIAL MANAGEMENT

In proprietorships and partnerships, owners are actively involved in management. But in companies, particularly large public limited companies, which have many shareholders, ownership is separated from management. For example, it is practically impossible for tens of thousands shareholders of Larsen and Toubro to participate actively in management. They have to necessarily delegate authority to the board of directors, which in turn appoints the top management.

Since shareholders differ in their tastes, wealth, investment horizons, and personal opportunities, delegation can work only if they can agree on a common objective. Indeed, there is a natural financial objective on which almost all shareholders would agree: maximise the current market value of the firm's equity. Shareholders, regardless of their personal tastes or preferences, can do more if their shares are worth more. They can give money for charity or travel to exotic locations; they can spend now or save for future.

Much of the theory in corporate finance is based on the assumption that managers should strive to maximise the value of the firm. The value of the firm is equal to the value of its equity and debt claims. Under normal circumstances the value of the debt claims remains fairly stable. So maximising the value of the firm is equivalent to maximising the value of equity.

There are three compelling arguments in support of the goal of shareholder wealth maximisation, viz., legal, economic, and decisional. From a **legal** point of view, managers, as agents of shareholders are expected to further the interests of shareholders, who are their principals, as established in Anglo-Saxon law. As Alfred Rappaport said, "In a market-based economy which recognises the rights of private property, the only social responsibility of business is to create value and do so legally and with integrity."

The **economic** argument for maximising shareholder wealth rests on the premise that the pursuit of this goal serves the larger public interest by maximising social wealth. As Bennett Stewart put it, "The quest for value drives scarce resources to their most productive uses and their most efficient users. The more effectively resources are deployed, the more robust will be the economic growth and the rate of improvement in our

standard of living. Adam Smith's invisible hand is at work when investors' private gain is a public value."

According to the **decisional** argument, for purposeful or rational behaviour, an organisation requires a single-valued objective function, because it is logically impossible to maximise in more than one dimension. If a manager is told to maximise market share, current profits, employment, future growth in profits, and something else, he cannot make a well-reasoned decision. In effect, he will be left with no objective. The absence of a well-defined function handicaps the firm in its competition for survival.

Despite the forceful arguments in favour of the goal of shareholder wealth maximisation, its supremacy has been challenged, among others, by the capital market sceptics, the strategic visionaries, and the balancers. The arguments of these critics and the rebuttal by the defendants of shareholder wealth maximisation principle are summarised below.

Critique	Defence
<ul style="list-style-type: none"><li>The <i>capital market sceptics</i> argue that the stock market displays myopic tendencies, often wrongly prices securities, and fails to reflect long-term values. Managers, on the other hand, are well-informed and make decisions based on more reliable and robust measures of value creation.</li></ul>	<ul style="list-style-type: none"><li>Based on extensive empirical evidence, financial economists argue that in developed capital markets, share prices are the least biased estimates of intrinsic values and managers are not generally better than investors in assessing values.</li></ul>
<ul style="list-style-type: none"><li>The <i>strategic visionaries</i> argue that the firms should pursue a product market goal like maximising the market share, or enhancing customer satisfaction, or minimising costs in relation to competitors, or achieving a zero defect level. If the firm succeeds in implementing its product market strategy, investors would be amply rewarded.</li></ul>	<ul style="list-style-type: none"><li>It is true that shareholder wealth is created only through successful product market strategies. For example, satisfied and loyal customers are essential for value creation. However, beyond a certain point customer satisfaction comes at the cost of shareholder value. When that happens, the conflict should be resolved in favour of shareholders to enhance the long-term viability and competitiveness of the firm.</li></ul>

- The *balancers* argue that a firm should seek to ‘balance’ the interest of various stakeholders, viz. customers, employees, shareholders, creditors, suppliers, community and others.
  - Balancing the interest of various stakeholders is not a practical governing objective. There is no way to figure out what the right ‘balance’ is. When managers confront complex problems involving numerous tradeoffs, they will have no clear guidelines on how to resolve the differences. Each manager would be left to his own judgment. In a large organisation this can lead to confusion and even chaos.
- 

**Alternative Goals** Are there other goals, besides the goal of maximal shareholder wealth, that express the shareholders’ viewpoint? Several alternatives have been suggested: maximisation of profit, maximisation of earnings per share, maximisation of return on equity (defined as equity earnings/net worth). Let us examine them.

Maximisation of profit is not as inclusive a goal as maximisation of shareholders’ wealth. It suffers from several limitations:

- Profit in absolute terms is not a proper guide to decision-making. It should be expressed either on a per share basis or in relation to investment.
- It leaves considerations of timing and duration undefined. There is no guide for comparing profit now with profit in future or for comparing profit streams of different durations.
- If profits are uncertain and described by a probability distribution, the meaning of profit maximisation is not clear.

The goals of maximisation of earnings per share and maximisation of return on equity do not suffer from the first limitation mentioned above. However, they do suffer from the other limitations and hence are also not suitable.

In view of the shortcomings of the alternatives discussed above, maximisation of the wealth of equity shareholders (as reflected in the market value of equity) appears to be the most appropriate goal for financial decision-making. Though the strict validity of this goal rests on certain rigid

assumptions, it can be reasonably defended as a guide for financial decision-making under fairly plausible assumptions about capital markets.

**A Modification** Given a certain number of outstanding shares, managers should act to maximise the current share price of their firm. However, if managers believe that the intrinsic value of their firm's share differs from the current market price of the share, then an important issue arises: Should managers seek to maximise the current market price of the share, which embeds only public information, or should they seek to maximise the intrinsic value of the share, based on their private information? If they seek to maximise the current market price they serve the interest of short-term shareholders; if they seek to maximise the intrinsic value of the share they serve the interest of long-term shareholders.

Given this inherent conflict, managers may strive to maximise a weighted average of the firm's current share price ( $S_C$ ) and its intrinsic value ( $S_I$ ) as shown below:

$$W_c S_c + W_I S_I$$

**What Do Firms Do?** Business firms often pursue several goals. They seek to achieve a high rate of growth, enjoy a substantial market share, attain product and technological leadership, promote employee welfare, further customer satisfaction, support education and research, improve community life, and solve other societal problems. Since managers spend most of their working day dealing with employees, customers, and suppliers, and building relationships with them, it is quite natural for them to consider their interests.

Some of these goals may, of course, be in consonance with the goal of shareholder wealth maximisation. For, a rapid growth rate, a dominant market position, and a higher customer satisfaction may lead to increasing returns for equity shareholders. Even efforts towards solving societal problems may further the interest of shareholders in the long run by improving the image of the firm and strengthening its relationship with the environment. When these other goals seem to conflict with the goal of maximising shareholder wealth, it is helpful to know the cost of pursuing these goals. The tradeoff has to be understood. It should be appreciated that maximisation of the wealth of shareholders constitutes the principal guarantee for efficient allocation of resources in the economy and hence is to be regarded as the normative goal from the financial point of view.

**Shareholder Orientation in India** Most companies in India till the early 1990s paid lip service to the goal of shareholder wealth maximisation. They showed sporadic concern for the shareholders, mainly when they approached the capital market for raising capital. Things, however, have been changing since the mid-1990s. A confluence of forces appears now to be prodding companies to accord greater importance to the goal of shareholder wealth maximisation. The important ones are as follows:

*Foreign Exposure* The scions of most business families have gone abroad for higher education, particularly to the U.S. Hence they seem to appreciate the importance of shareholder value more.

*Greater Dependence on Capital Market* In the wake of liberalisation, the investment opportunities for the private sector have expanded considerably and consequently its appetite for funds has increased substantially. Thanks to significant freedom that companies now enjoy in pricing equity issues, there is a stronger incentive to access the capital market. The higher corporate needs for funds and the greater dependence on the capital market have induced firms to become more shareholder friendly.

*Growing Importance of Institutional Investors* Companies are relying more on mutual funds, private equity funds, financial institutions, and foreign portfolio investors for raising equity capital. Institutional investors tend to be more discerning and have the muscle and motivation to nudge companies to pursue shareholder friendly policies.

*Abolition of Wealth Tax on Financial Assets* Previously wealth tax, subject to some exemptions, was payable on equity shares. This induced many controlling groups to ignore and even depress share prices. With the abolition of wealth tax on equity shares and other financial assets, there is now an incentive to enhance share prices. This gets heightened when business magnates nurture a desire to join the exclusive billionaire's club.

To sum up, in the new environment there is a greater incentive and compulsion to focus on creating value for shareholders. This new corporate thinking has been articulated very well by Infosys in these words: "Corporate governance is about maximizing shareholder value legally, ethically, and on a sustainable basis, while ensuring fairness to every stakeholder—the company's customers, employees, investors, vendor-partners, the government of the land, and the community." This view has been echoed by Anand Mahindra: "All of us are beginning to look at companies as owned by shareholders. The key is to raise shareholder

returns. Those companies where the promoters continue to believe that they own the company and everything they do is in their own interest, are in trouble.”

Interestingly, the Kumar Mangalam Committee on Corporate Governance, set up by the Securities and Exchange Board of India, in its draft report mentioned that “The fundamental objective of corporate governance is the enhancement of the long-term shareholder value while at the same time protecting the interest of other stakeholders.”

## 1.4 THE FUNDAMENTAL PRINCIPLE OF FINANCE

The key question that you have to ask before making a business decision is: will the decision raise the market value of the firm? To answer this question, let us look at the fundamental principle of finance:

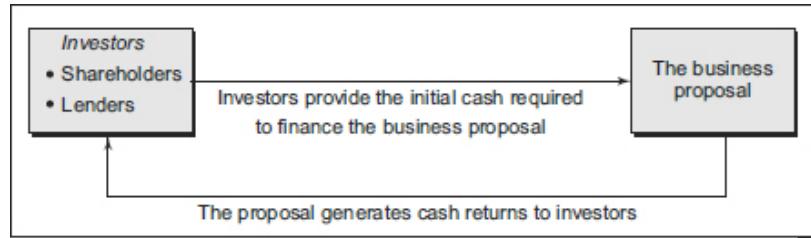
A business proposal—regardless of whether it is a new investment or acquisition of another company or a restructuring initiative—raises the value of the firm only if the present value of the future stream of net cash benefits expected from the proposal is greater than the initial cash outlay required to implement the proposal.

The difference between the present value of future cash benefits and the initial outlay represents the net present value or NPV of the proposal:

Net present value = Present value of future cash benefits – Initial cash outlay

Note that the costs and benefits of a business proposal have to be measured in cash. As shown in [Exhibit 1.1](#), investors who finance a proposal invest cash and are hence interested in cash returns.

### Exhibit 1.1 Cash Alone Matters



To convert the expected cash returns from the proposal into a present value figure an appropriate discount rate has to be applied. The discount rate reflects the riskiness of the proposal.

## 1.5 ■ BUILDING BLOCKS OF MODERN FINANCE

While corporate finance emerged as a distinct field of study at the turn of 20<sup>th</sup> century, the literature on corporate finance through the early 1950s consisted largely of ad hoc theories and institutional detail, but little of systematic analysis. **The Financial Policy of Corporations** by Arthur S. Dewing, published in 1919, was the major textbook on corporate finance for generations. It focused primarily on certain episodic events like formation, issuance of capital, major expansion, mergers, reorganisation, and liquidation in the life cycle of a firm and discussed them mainly in descriptive and institutional terms. Prior to the 1950s, corporate finance theory was riddled with inconsistencies and had a predominantly prescriptive orientation. Likewise, the theory of financial markets prior to 1950s was as undeveloped as the theory of corporate finance.

In the 1950s, fundamental changes began to occur in the field of finance. The analytical methods and techniques of economics began to be applied to problems in finance, resulting in a major transformation. This evolution was accompanied by a change from the normative to the positive. The focus shifted from questions such as “What should the investment, financing, and dividend policies of the firm be?” to questions such as “What are the effects of alternate investment, financing, or dividend policies on the value of the firm?” This shift was essential to provide a scientific basis for formulating corporate policy decisions.

It must be recognised that a richer set of positive theories provides the basis for answering normative questions. This important relation between positive and normative theories is often not realised. Purposeful decisions are founded on an explicit or implicit use of positive theories. To decide what action you should take to meet your objective, you should know how the alternative actions affect the desired outcome – and this is what a positive theory does. For example, to choose among alternative financial structures you should know how the alternatives affect expected cash flows, risk, and therefore the firm value. If you use incorrect positive theories, your decisions would have unexpected and undesirable outcomes.

The years since the early 1950s have witnessed the development of the following major building blocks of modern financial economics.

- **Efficient markets theory:** Analysis of how prices change over time in speculative markets.

- **Portfolio theory:** Formation of an optimal portfolio of securities.
- **Capital asset pricing theory:** Determination of asset prices under conditions of uncertainty.
- **Option pricing theory:** Determination of the prices of contingent claims such as call options.
- **Agency theory:** Analysis of incentive conflicts in contractual relations.

Apart from the above building blocks, which form the core of the neoclassical finance, another major development that has a bearing on financial decisions is **behavioural finance**. Unlike neoclassical finance which assumes that people are rational, behavioural finance considers social, cognitive, and emotional factors that influence decisions and examines their effects on market prices, returns, and allocation of resources.

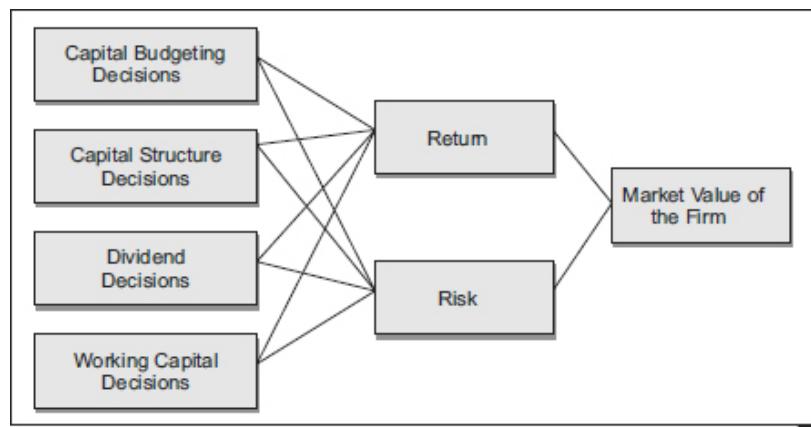
## 1.6 ■ RISK-RETURN TRADEOFF

Financial decisions often involve alternative courses of action. Should the firm set up a plant which has a capacity of one million tons or two million tons? Should the debt-equity ratio of the firm be 2:1 or 1:1? Should the firm pursue a generous credit policy or niggardly credit policy? Should the firm carry a large inventory or a small inventory?

The alternative courses of action typically have different risk-return implications. A large plant may have a higher expected return and a higher risk exposure, whereas a small plant may have a lower expected return and a lower risk exposure. A higher debt-equity ratio, compared to a lower debt-equity ratio, may save taxes but expose the firm to greater risk. A 'hot' stock, compared to a defensive stock, may offer a higher expected return but also a greater possibility of loss.

In general, when you make a financial decision, you have to answer the following questions: What is the expected return? What is the risk exposure? Given the risk-return characteristics of the decision, how would it influence value? [Exhibit 1.2](#) shows schematically the relationship between the key financial decisions, return, risk, and market value.

**Exhibit 1.2 Decisions, Return, Risk and Market Value**



## 1.7 ■ AGENCY PROBLEM

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 ownership through share transfers without affecting the operations of the firm. It ensures that the 'knowhow' 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.

## 1.8 ■ BUSINESS ETHICS AND SOCIAL RESPONSIBILITY

Is the goal of shareholder wealth maximisation congruent with high standards of ethical behaviour and concern for societal problems? Yes, it is. Many companies which have created enormous value for their shareholders are highly admired for their ethical behaviour and concern for society.

Every company should consider its business ethics and its corporate social responsibility. Business ethics essentially focuses on the behaviour of employees and corporate social responsibility is concerned with the contributions that a company should make to worthwhile social causes.

**Business Ethics** Business ethics refers to the standards of conduct or moral behaviour as applied to business practices. Ethics and fraud are used commonly in business reporting, but they have different meanings. *Fraud* involves violating the law, whereas *unethical behaviour* involves breaching the code of ethics or moral behaviour. While fraud can be defined objectively, unethical behaviour is defined rather subjectively.

A business firm is deemed to practice high standards of ethics if it deals with its employees, suppliers, customers, creditors, shareholders, and community in a fair and honest manner.

In general, ethical behaviour and long-run profitability are positively correlated. Ethical behaviour helps a firm to avoid fines and legal expenses, build public trust, attract and retain talented people, and gain the loyalty of customers who appreciate its policies. As Kumaramangalam Birla, Chairman of the Aditya Birla group, put it: “Doing business with a strong sense of values is a win-win game for all. Customers, employees, suppliers and investors trust organisations that live by a clear set of values. Most important, good corporate behaviour tends to attract the best talent to work for an organisation. So being good is not only good for itself, but also very good for business growth and sustainability.”

Conscious of the virtues of ethical behaviour, many firms have put in place codes of ethical behaviour. However, the most important thing is the example set by top management through its actions and behaviour and the system of reward and punishment.

Of course, given the subjective nature of ethics, in many cases the choice between ethics and profits is not unambiguous.

**Corporate Social Responsibility** Corporate social responsibility (CSR), an allied issue, has received a great deal of attention particularly in recent years. There are various definitions of corporate social responsibility. The World Business Council, for example, defines it as follows:

“Corporate social responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large.”

The advocates of corporate social responsibility argue that a business firm must contribute to solve societal problems. Their argument rests on the following premises:

- A business operates with the franchise given to it by the society and hence it has a reciprocal obligation to the society.
- Government, NGOs, and other non-business institutions may not have enough resources and capabilities to address all the societal problems. So, business firms with their massive resources and managerial capabilities must pitch in.

Economists like Frederick Hayek and Milton Friedman, however, have argued that a business firm should not swerve from its economic goal. If a business firm engages itself in social programmes it may become vulnerable to competitive encroachment. Let shareholders decide in their personal capacity what they want to contribute in various social programmes. This role should not be arrogated by corporate managements whose primary mandate is economic.

Notwithstanding the forceful argument of Milton Friedman, many business firms in practice do contribute to various social causes. They give donations to hospitals and educational institutions, contribute to relief programmes, sponsor sport events, encourage and motivate their employees to participate in community development projects, so on and so forth.

The government has also been laying emphasis on ‘inclusive growth.’ That is why, the central government has mandated that companies with at least ₹ 5 crore net profit or ₹ 1000 crore turnover or ₹ 500 crore net worth should spend at least 2 percent of their three-year average annual net profit on CSR projects.

**Creating Shared Value** Traditionally, the primary responsibility for solving social problems lay with the government and, to some extent, with

the non-government organizations. Since resources are largely with the corporations, they must be actively engaged in addressing social problems. Indeed, corporations can work out scalable solutions for social problems, provided they can benefit from solving social problems. The conventional wisdom that business profits from *creating* social problems must be replaced by new thinking that business profits from *solving* social problems.

Take the case of pollution. We have learnt that by reducing pollution business can generate profit. Issue by issue it is now being realised that there is no conflict between social progress and economic efficiency in a fundamental sense. Here are some examples: Heart Healthy Oils in the U.S. has a profitable operation while promoting healthy nutrition. Jain Irrigation in India is helping in saving water with its drip irrigation business which is a profitable activity. The social forestry project of ITC in India is an economically viable operation.

Addressing social issues with a viable business model, that can be scaled up and hence not constrained by resources, leads to creating shared value. Michael Porter, the principal proponent of creating shared value, argues that shared value is capitalism of a higher kind:

$$\text{Shared Value} = \text{Social Value} + \text{Economic Value}$$

## 1.9 ■ ORGANISATION OF THE FINANCE FUNCTION

Financial management is in many ways an integral part of the jobs of managers who are involved in planning, allocation of resources, and control. The responsibilities for financial management are dispersed throughout the organisation. For example:

- The engineer, who proposes a new plant, shapes the investment policy of the firm.
- The marketing analyst provides inputs in the process of forecasting and planning.
- The purchase manager influences the level of investment in inventories.
- The sales manager has a say in the determination of the receivables policy.
- Departmental managers, in general, are important links in the financial control system of the firm.

There are, however, many tasks of financial management and allied areas (like accounting) which are specialised in nature and which are attended to by specialists. These tasks and their typical distribution between the two key financial officers of the firm, the treasurer and the controller<sup>2</sup>, are shown in [Exhibit 1.3](#). Note that the treasurer is responsible mainly for financing and investment activities and the controller is concerned primarily with accounting and control.

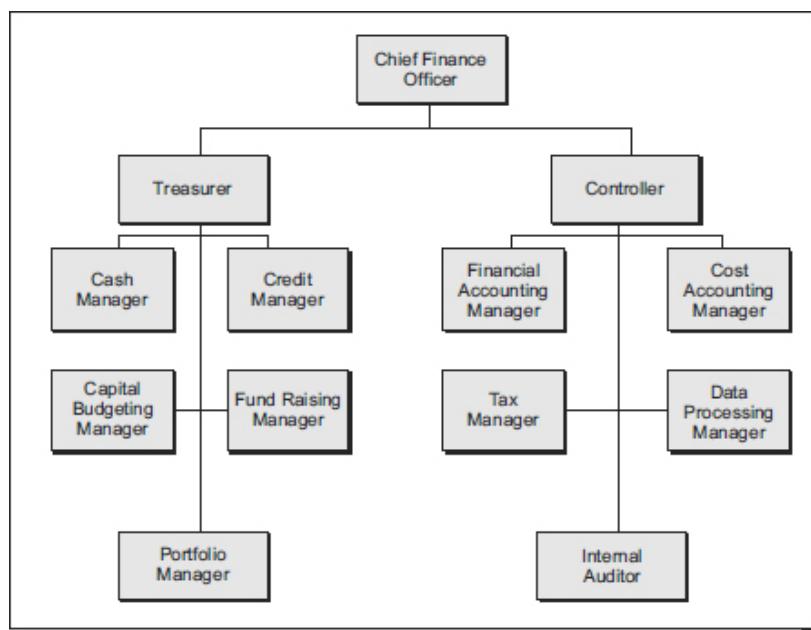
### Exhibit 1.3 Functions of the Treasurer and the Controller

Treasurer	Controller
Obtaining finance	Financial accounting
Banking relationship	Internal auditing
Cash management	Taxation
Credit administration	Management accounting
Capital budgeting	and control

Typically, the chief finance officer, who may be designated as Director (Finance) or Vice President (Finance), supervises the work of the treasurer and the controller. In turn, these officers are assisted by several specialist managers working under them. The finance function in a large organisation may be organised as shown in [Exhibit 1.4](#).

The financial officers, in addition to their specialised responsibility, have significant involvement in injecting financial discipline in corporate management processes. They are responsible for emphasising the need for rationality in the use of funds and the need for monitoring the operations of the firm to achieve desired financial results. In this respect, the tasks of financial officers have assumed new dimensions. Instead of just looking after routine financing and accounting activities, they guide and participate in the tasks of planning, funds allocation, and control so that the financial point of view is sufficiently emphasised in the process of corporate management.

#### **Exhibit 1.4    Organisation of Finance Function**



## 1.10 ■ RELATIONSHIP OF FINANCE TO ECONOMICS AND ACCOUNTING

Financial management has a close relationship to economics on the one hand and to accounting on the other.

**Relationship to Economics** There are two important linkages between economics and finance. The macroeconomic environment defines the setting within which a firm operates and the microeconomic theory provides the conceptual underpinning for the tools of financial decision making.

Key macroeconomic factors like the growth rate of the economy, the domestic savings rate, the role of the government in economic affairs, the tax environment, the nature of external economic relationships, the availability of funds to the corporate sector, the rate of inflation, the real rate of interest, the market risk premium, and the terms on which the firm can raise finances define the environment in which the firm operates. No financial manager can afford to ignore the key developments in the macroeconomic sphere and the impact of the same on the firm.

While an understanding of the macroeconomic developments sensitises the financial manager to the opportunities and threats in the environment, a firm grounding in microeconomic principles sharpens his analysis of decision alternatives. Finance, in essence, is applied microeconomics. For example, the principle of marginal analysis — a key principle of microeconomics according to which a decision should be guided by a comparison of incremental benefits and costs — is applicable to a number of managerial decisions in finance.

To sum up, a basic knowledge of macroeconomics is necessary for understanding the environment in which the firm operates and a good grasp of microeconomics is helpful in sharpening the tools of financial decision making.

**Relationship to Accounting** The finance and accounting functions are closely related and almost invariably fall within the domain of the chief financial officer as shown in [Exhibit 1.4](#). Given this affinity, it is not surprising that in popular perception finance and accounting are often considered indistinguishable or at least substantially overlapping. However, as a student of finance you should know how the two differ and how the two

relate. The following discussion highlights the differences and relationship between the two.

*Score Keeping vs. Value Maximising* Accounting is concerned with score keeping, whereas finance is aimed at value maximising. The primary objective of accounting is to measure the performance of the firm, assess its financial condition, and determine the base for tax payment. The principal goal of financial management is to create shareholder value by investing in positive net present value projects and minimising the cost of financing. Of course, financial decision making requires considerable inputs from accounting. As Gitman says: “The accountant’s role is to provide consistently developed and easily interpreted data about the firm’s past, present, and future operations. The financial manager uses these data, either in raw form or after certain adjustments and analyses, as an important input to the decision making process.”

*Accrual Method vs. Cash Flow Method* The accountant prepares the accounting reports based on the accrual method which recognises revenues when the sale occurs (irrespective of whether the cash is realised immediately or not) and matches expenses to sales (irrespective of whether cash is paid or not). The focus of the financial manager, however, is on cash flows. He is concerned about the magnitude, timing, and risk of cash flows as these are the fundamental determinants of values.

*Certainty vs. Uncertainty* Accounting deals primarily with the past. It records what has happened. Hence, it is relatively more objective and certain. Finance is concerned mainly with the future. It involves decision making under imperfect information and uncertainty. Hence, it is characterised by a high degree of subjectivity.

## 1.11 ■ EMERGING ROLE OF THE FINANCIAL MANAGER IN INDIA

Until the early 1990s, the financial manager in India functioned in a highly regulated environment and enjoyed limited freedom in designing key financial policies. From the early 1990s, however, the complexion of the economic and financial environment has changed in many ways. The important changes have been as follows.

- The industrial licensing framework has been substantially relaxed, leading to considerable expansion in the scope of private sector investment.
- The Monopolies and Restrictive Trade Practices Act has been virtually abolished and the Foreign Exchange Management Act has been considerably liberalised.
- Freedom has been given to companies in designing and pricing the securities issued by them.
- The system of cash credit has been largely replaced by a system of working capital loans.
- Stable and administered interest rates have given way to volatile and market-determined interest rates. Exchange rates, too, have become more volatile and market-determined.
- The scope for foreign direct investment has expanded considerably and foreign portfolio investment has assumed great significance.
- Investors have become more discerning, demanding, and assertive.
- The pace of mergers, acquisitions, and restructuring has intensified.
- Derivative instruments such as options and futures have been introduced.

Thanks to these changes, the job of the financial manager in India has become more important, complex, and demanding. More so in the wake of global competition, technological developments, volatile financial prices, economic uncertainty, tax law changes, ethical concerns over financial dealings, and shareholder activism.

The key challenges for the financial manager appear to be in the following areas.

- Investment planning
- Financial structure
- Mergers, acquisitions, and restructuring

- Working capital management
- Performance management
- Risk management
- Investor relations

## 1.12 ■ OUTLINE OF THE BOOK

A manager should strive to maximise the value of his firm. To achieve this goal, he must understand how businesses are organised, how the financial system functions, what the tax code is, and how accounting information is used to assess business performance. In addition, he must be familiar with the fundamentals of the time value of money, risk and return relationship, and valuation of securities and derivative instruments. This background helps in making decisions that have a bearing on the value of the firm's securities. Organised to reflect these considerations, the book is divided into ten parts.

### *Part I Introduction*

[Chapter 1](#) provides an overview of the discipline of financial management. [Chapter 2](#) discusses the principal components of the Indian financial system.

### *Part II Financial Analysis and Planning*

[Chapter 3](#) examines the contents of financial statements and discusses the basics of taxation and cash flow. [Chapter 4](#) discusses the techniques for analysing financial statements and applications of financial statement analysis. [Chapter 5](#) presents various tools of financial planning.

### *Part III Fundamental Valuation Concepts*

[Chapter 6](#) dwells on the ideas of compounding and discounting and their use in establishing financial equivalences. [Chapter 7](#) explains how financial securities, bonds and equity stocks, may be valued. [Chapter 8](#) discusses the concepts of risk and return and shows how they are related. [Chapter 9](#) examines portfolio theory and asset pricing models. [Chapter 10](#) discusses how options work and explains option pricing models.

#### *Part IV Capital Budgeting*

[Chapter 11](#) discusses the techniques of capital budgeting. [Chapter 12](#) shows how the project cash flows are developed. [Chapter 13](#) explains the techniques of risk analysis. [Chapter 14](#) presents the concept and measurement of cost of capital. [Chapter 15](#) explores some advanced issues in capital budgeting.

#### *Part V Long-Term Financing*

[Chapter 16](#) discusses the efficient market hypothesis and examines its implications for corporate finance. [Chapter 17](#) describes the characteristics of various sources of long-term financing. [Chapter 18](#) explains how securities are issued in the primary market for raising long-term finance.

#### *Part VI Capital Structure and Dividend Decisions*

[Chapter 19](#) expounds various views on the relationship between capital structure and cost of capital. [Chapter 20](#) dwells on the considerations and tools helpful in planning the capital structure. [Chapter 21](#) examines various positions on the relationship between dividend policy and share valuation. [Chapter 22](#) discusses practical aspects of the dividend decision.

#### *Part VII Working Capital Management*

[Chapters 23 through 28](#) focus on working capital management, which is concerned with the management of current assets and liabilities. [Chapter 23](#) clarifies the key issues relating to working capital policy. [Chapter 24](#) presents the tools of cash management. [Chapter 25](#) discusses important aspects of credit

management. Chapter 26 dwells on various facets of inventory management. Chapter 27 describes various sources of financing current assets. Chapter 28 explains some advanced techniques for managing working capital.

#### *Part VIII Debt and Hybrid Financing*

Chapter 29 throws light on the nature of debt financing and explains analytical issues relating to debt. Chapter 30 analyses the features of leasing, hire purchase, and project finance. Chapter 31 discusses convertible debentures, warrants, and hybrid securities.

#### *Part IX Corporate Valuation and Shareholder Value*

Chapter 32 explains the discounted cash flow and non-discounted cash flow methods of corporate valuation. Chapter 33 expounds various approaches to value-based management. Chapter 34 explains the mechanics of mergers, acquisitions, and restructuring and discusses the financial and managerial facets of these transactions. Chapter 35 looks at various aspects of corporate governance and executive compensation. Chapter 36 discusses various issues in performance measurement and balanced scorecard.

#### *Part X Special Topics*

Comprising Chapters 37 through 42, Part X discusses several special topics in financial management. Chapter 37 explains the distinctive features of international financial management. Chapter 38 examines the causes, symptoms, prediction, and revival of sick units. Chapter 39 explores

financial management in companies with special characteristics. [Chapter 40](#) describes a variety of hedging devices, mostly derivative instruments, and their use in corporate risk management. [Chapter 41](#) discusses some of the key topics in behavioural finance. [Chapter 42](#) summarises the state of our knowledge in finance.

## SUMMARY

- The three broad areas of financial management are **capital budgeting, capital structure, and working capital management**.
- The primary goal of financial management is to **maximise the value of the firm**.
- A business proposal augments the value of the firm if its **net present value** is positive.
- The important forms of business organisation are the **sole proprietorship, the partnership firm, the private limited company, and the public limited company**. From the point of view of shareholder wealth maximisation, the public limited company form appears to be the most appropriate.
- The major building blocks of financial economics are **efficient markets theory, portfolio theory, capital asset pricing theory, option pricing theory, agency theory, and behavioural finance**.
- The lack of perfect alignment between the interests of managers and shareholders results in the **agency problem**. To mitigate this problem, **effective monitoring** has to be done and **appropriate incentives** have to be offered.
- Financial management is an integral part of the job of managers. There are, however, many tasks of financial management and allied areas (like accounting), which are specialised in nature and attended to by key financial officers, like the **treasurer** and the **controller**.
- A basic knowledge of **macroeconomics** is necessary for understanding the environment in which the firm operates and a good grasp of **microeconomics** is helpful in sharpening the tools of financial decision making.
- Financial decision making requires considerable inputs from **accounting**.
- Since the early 1990s the complexion of the economic and financial environment has altered in many ways, making the job of the financial manager more important, complex, and demanding.

## **QUESTIONS**

1. What are the advantages and disadvantages of the following forms of business organisation: sole proprietorship, partnership, cooperative society, private limited company, and public limited company?
2. Discuss the three broad areas of financial decision making.
3. What is the justification for the goal of maximising the wealth of shareholders?
4. What do the critics of the goal of maximising shareholder wealth say? What is the rebuttal provided by the advocates of maximising shareholder wealth?
5. Critically evaluate the goals of maximisation of profit and maximisation of return on equity.
6. What forces are prodding companies in India to accord greater importance to the goal of shareholder wealth maximisation?
7. Discuss the risk-return tradeoff in financial decisions.
8. Describe briefly the building blocks of modern finance.
9. Why is there a separation of ownership and management in large companies?
10. What are agency costs and how can they be mitigated?
11. "Financial management is in many ways an integral part of the jobs of managers." Comment.
12. How is the finance function typically organised in a large company?
13. Discuss the relationship of financial management to economics and accounting.
14. Comment on the emerging role of the financial manager in India.

## **PRACTICAL ASSIGNMENT**

To enhance your learning of finance, it would be worthwhile to apply concepts, principles, and techniques discussed in this book to real-life companies. To facilitate this, a series of practical assignments are given in this book. For doing these assignments, you are expected to choose one of the following companies: Reliance Industries, ONGC, TCS, Infosys, ITC, Hindustan Unilever, BHEL, Larsen & Toubro, Coal India, ICICI Bank, Tata Steel, NTPC, Maruti Suzuki, Sun Pharma, and Mahindra & Mahindra.

You can download the annual reports of your chosen company from the company's website and get capital market trading information from sources such as National Stock Exchange (NSE) & Bombay Stock Exchange (BSE) websites, CAPITALINE Database, CMIE PROWESSIONAL Database, and Bloomberg database.

In this assignment, the first of the many to follow in the other chapters of the book, you are required to provide a brief write up on the company (covering its history, products, markets, capacity, turnover, shareholding pattern, major competitors, and so on) and comment on its objective(s).

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- <sup>1</sup> Presently in India, however, shareholders are not liable to pay any tax on the dividend received by them. Rather, the company itself has to pay taxes on the dividend paid by it. This is, of course, in addition to the taxes it pays on its profits.
  - <sup>2</sup> Even though a firm may not have two separate financial officers designated as treasurer and controller, it is helpful to distinguish the functions of treasurership and controllership.

## 2 CHAPTER

# The Financial System

## Learning Objectives

After studying this chapter you should be able to:

- ✓ Discuss the functions of the financial system.
- ✓ Describe the characteristics of financial assets.
- ✓ Classify financial markets along various dimensions.
- ✓ Explain the factors that determine the rates of return.
- ✓ Discuss the types of financial intermediaries and the rationale for financial intermediaries.
- ✓ Describe the functions of the Reserve Bank of India and the Securities and Exchange Board of India.
- ✓ Discuss the growth and trends in the Indian financial system.

The purpose of this book is to help you make better financial decisions. These decisions are made in the context of a financial system that constrains and facilitates them.

The financial system comprises of a variety of intermediaries, markets, and instruments that are related in the manner shown in [Exhibit 2.1](#). It provides the principal means by which savings are transformed into investments. Given its role in the allocation of resources, the efficient functioning of the financial system is critical to a modern economy.

Joseph Schumpeter argued long back that financial development promotes economic growth. Several studies have documented the link between financial development and economic growth, validating the Schumpeter argument.

Financial development can contribute to economic growth in three important ways:

- It raises the level of savings.
- It directs savings toward real investments in productive capacities, thereby fostering capital accumulation.

- It improves the efficacy of investment allocation through the monitoring and signaling functions of the capital markets.

While an understanding of the financial system is useful to all informed citizens, it is particularly relevant to the financial manager. He negotiates loans from financial intermediaries, raises resources in the financial markets, and invests surplus funds in financial instruments. In a very significant way he manages the interface between the firm and its financial environment.

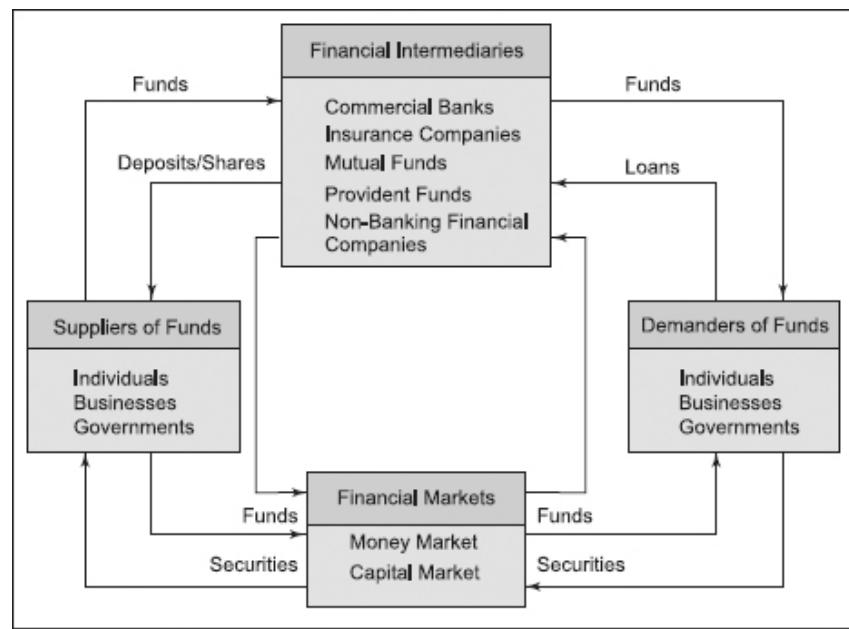
This chapter provides a conceptual framework for understanding how the financial system works, so that you can make better financial decisions.

## 2.1 ■ FUNCTIONS OF THE FINANCIAL SYSTEM<sup>1</sup>

The financial system performs the following interrelated functions that are essential to a modern economy:

- It provides a payment system for the exchange of goods and services.
- It enables the pooling of funds for undertaking large scale enterprises.
- It provides a mechanism for spatial and temporal transfer of resources.
- It provides a way for managing uncertainty and controlling risk.
- It generates information that helps in coordinating decentralised decision making.
- It helps in dealing with the incentive problem when one party has an informational advantage.

**Exhibit 2.1** The Financial System



**Payment System** Depository financial intermediaries such as banks are the pivot of the payment system. Credit card companies play a supplementary role. To realise the importance of this function, simply look at

the hardship and inconvenience caused when the payment system breaks down.

**Pooling of Funds** Modern business enterprises require large investments which are often beyond the means of an individual or even of hundreds of individuals. Mechanisms like financial markets and financial intermediaries, which are an integral part of the financial system, facilitate the pooling of household savings for financing business. If you look at it from the other side, the financial system enables households to participate in large indivisible enterprises.

**Transfer of Resources** The financial system facilitates the transfer of economic resources across time and space. As Robert Merton says:

“A well-developed, smooth-functioning financial system facilitates the efficient life-cycle allocations of household consumption and the efficient allocation of physical capital to its most productive use in the business sector.”

“A well-developed, smooth-functioning capital market also makes possible the efficient separation of ownership from management of the firm. This in turn makes feasible efficient specialisation in production according to the principle of comparative advantage.”

**Risk Management** A well-developed financial system offers a variety of instruments that enable economic agents to pool, price, and exchange risk. It provides opportunities for **risk-pooling** and **risk-sharing** for both household and business firms.

The three basic methods for managing risk are: hedging, diversification, and insurance. **Hedging** entails moving from a risky asset to a riskless asset. A forward contract, for example, is a hedging device. **Diversification** involves pooling and sub-dividing risks. While it does not eliminate the total risk, it redistributes it to diminish the risk faced by each individual. **Insurance** enables the insured to retain the economic benefits of ownership while laying off the possible losses. Of course, to do this a fee or insurance premium has to be paid.

**Price Information for Decentralised Decision Making** Apart from the manifest function of facilitating individuals and businesses to trade in financial assets, financial markets serve an important latent function as well. They provide information that helps in coordinating decentralised decision making. Robert Merton puts it thus:

"Interest rates and security prices are used by households or their agents in making their consumption-saving decisions and in choosing the portfolio allocations of their wealth. These same prices provide important signals to managers of firms in their selection of investment projects and financings."

**Dealing with Incentive Problem** When one party to a transaction has information that the other does not have, **informational asymmetry** exists. This leads to the problems of moral hazard and adverse selection, which are broadly referred to as agency problems. The nature of these problems may be illustrated with reference to insurance. A person who has taken a fire insurance policy is likely to become somewhat negligent. This is the **moral hazard** faced by the insurance company. A person who is more likely to experience fire losses will be inclined to take fire insurance. This is the **adverse selection** problem faced by the insurance company.

Financial intermediaries like banks and venture capital organisations can mitigate the problem of informational asymmetry by handling sensitive information discreetly and developing a reputation for profitable activity.

## 2.2 ■ FINANCIAL ASSETS

Broadly speaking, an asset whether tangible or intangible is any possession that has value in exchange. A tangible asset is one whose value depends on its physical properties. Examples of tangible assets are land, buildings, machines, and vehicles. An intangible asset represents a claim to some future benefits. Financial assets, for example, are intangible assets as they represent claims to future cash flows. The terms financial asset, instrument, or security are used interchangeably.

The entity that offers future cash flows is called the issuer of the financial asset and the owner of the financial asset is called the investor. Here are some examples of financial assets:

- A 10-year bond issued by the Government of India carrying an interest rate of 7 percent.
- A 7-year non-convertible debenture issued by Reliance Industries Limited carrying an interest rate of 8 percent.
- A 3-year car loan provided by Citibank to an individual at an interest rate of 12 percent.
- Equity shares issued by NTPC to the general investing public through an initial public offering.
- A call option granted by Infosys Technologies Limited to an employee that gives him the right to buy 100 shares of Infosys at an exercise price of ₹ 900.

**Debt Versus Equity Claims** A financial asset may entitle its owner to a fixed amount or a varying, residual amount. In the former case, the financial asset is called a debt security – the 10-year Government of India bond and the 7-year non-convertible debenture of Reliance Industries Limited are examples of debt security. In the latter case, the financial asset is referred to as an equity security – the equity shares issued by NTPC are an example of equity security.

Some securities straddle both the categories. Preference shares, for example, represent an equity claim that entitles the owner to get a fixed rupee amount. This payment, however, can be made only when the issuer earns a profit.

## 2.3 ■ FINANCIAL MARKETS

A financial market is a market for creation and exchange of financial assets. If you buy or sell financial assets, you will participate in financial markets in some way or the other.

**Functions of Financial Markets** Financial markets play a very pivotal role in allocating resources in an economy by performing three important functions:

1. Financial markets **facilitate price discovery**. The continual interaction among numerous buyers and sellers who throng financial markets helps in establishing or discovering the prices of financial assets. Well-organised financial markets seem to be remarkably efficient in price discovery. Price discovery means the discovery of price at which demand and supply are matched.
2. Financial markets **provide liquidity** to financial assets. Investors can readily sell their financial assets through the mechanism of financial markets. In the absence of financial markets which provide such liquidity, the motivation of investors to hold financial assets will be considerably diminished. Thanks to negotiability and transferability of securities through the financial markets, it is possible for companies (and other entities) to raise long-term funds from investors with short-term and medium-term horizons. While one investor is substituted by another when a security is transacted, the company is assured of long-term availability of funds.
3. Financial markets considerably **reduce the cost of transacting**. The two major costs associated with transacting are search costs and information costs. **Search costs** comprise explicit costs such as the expenses incurred on advertising when one wants to buy or sell an asset and implicit costs such as the effort and time one has to put in to locate a customer. **Information costs** refers to costs incurred in evaluating the investment merits of financial assets.

**Classification of Financial Markets** There are different ways of classifying financial markets. One way is to classify financial markets by the type of financial claim. The **debt market** is the financial market for fixed claims (debt instruments) and the **equity market** is the financial market for residual claims (equity instruments).

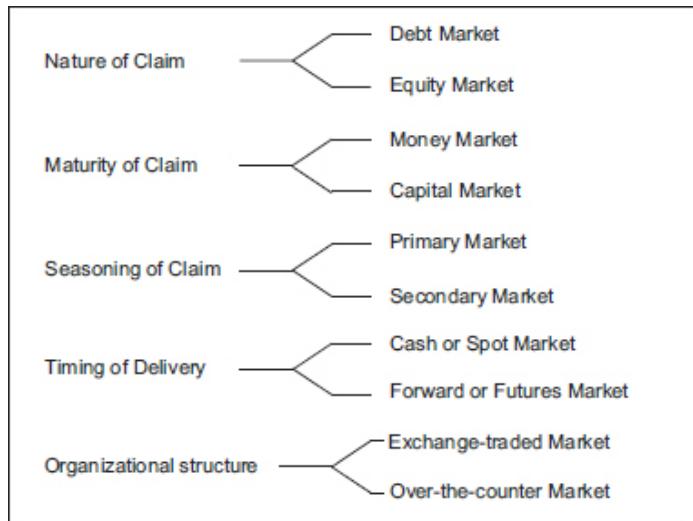
A second way is to classify financial markets by the maturity of claims. The market for short-term financial claims is referred to as the **money market** and the market for long-term financial claims is called the **capital market**. Traditionally the cut off between short-term and long-term has been one year – though this dividing line is arbitrary, it is widely accepted. Since short-term financial claims are almost invariably debt claims, the money market is the market for short-term debt instruments. The capital market is the market for long-term debt instruments and equity instruments.

A third way to classify financial markets is based on whether the claims represent new issues or outstanding issues. The market where issuers sell new claims is referred to as the **primary market** and the market where investors trade outstanding securities is called the **secondary market**.

A fourth way to classify financial markets is by the timing of delivery. A **cash or spot market** is one where the delivery occurs immediately and a **forward or futures market** is one where the delivery occurs at a predetermined time in future.

A fifth way to classify financial markets is by the nature of its organisational structure. An **exchange-traded market** is characterised by a centralised organisation with standardised procedures. An **over-the counter market** is a decentralised market with customised procedures. [Exhibit 2.2](#) presents a summary of the classification of financial markets.

## **Exhibit 2.2** Summary Classification of Financial Markets



**Rise of Formal Financial Markets** The role of formal financial markets has expanded rapidly in recent years. The key factors which have

contributed to this are as follows:

- Robust mechanisms for ensuring that trades are completed according to agreed terms.
- Adequate legal procedures to settle disputes.
- Low transaction costs.
- Transparent availability of information on trades and prices.
- Adequate protection to investors.
- High liquidity.

**Forces of Changes** Financial markets have undergone significant transformation since the mid-1980s, thanks to the following factors:

- Technological advances in computing and telecommunications.
- The wave of deregulation and liberalisation that has been sweeping the world.
- Consolidation and globalisation in the wake of heightened competition.

## 2.4 ■ FINANCIAL MARKET RETURNS

Everyday we are bombarded with news and reports on financial market returns like interest rates and equity returns over various media like newspapers, television, radio, and on-line computer service.

**Interest Rates** An interest rate is a rate of return promised by the borrower to the lender. Different interest rates apply to different kinds of borrowing and lending. For example, the mortgage rate applies to a home loan whereas the term lending rate applies to a term loan for an industrial project.

The interest rate on any type of loan (or fixed income security) depends on several factors, the most important being the unit of account, the maturity, and the default risk. The *unit of account* is the medium such as rupees, dollars, pounds, yen, or gold in which payments are denominated. The *maturity* of a loan is the period over which it is paid back. *Default risk* is the possibility that the borrower may not honour his commitment to pay interest and principal as promised.

Generally, the interest rate is low when the unit of account depreciates very little due to inflation, the maturity period is short, and the default risk is negligible. On the other hand, the interest rate is high when the unit of account depreciates due to inflation, the maturity period is long, and the default risk is high.

**Rates of Return on Risky Assets** Interest rates represent promised returns on debt instruments. However, many assets do not promise a given return. For example, if you invest in equity shares or real estate or a piece of art or for that matter any risky asset you don't earn an assured return.

How should one measure the rate of return on a risky asset like equity stock? The return from such an asset comes from two sources: cash dividend and capital gain (or loss).

To illustrate, suppose you buy a share of a company's equity stock at a price of ₹ 100. After one year you get a dividend of ₹ 5 and the share price rises to ₹ 115. Your one-year return,  $r$ , is:

$$\begin{aligned}
 r &= \frac{\text{Cash dividend}}{\text{Beginning price}} + \frac{\text{Ending price} - \text{Beginning price}}{\text{Beginning price}} \\
 &= \frac{5}{100} + \frac{115 - 100}{100} \\
 &= 5\% + 15\%
 \end{aligned}$$

The first component is called the dividend income component (or dividend yield) and the second component is called the capital change component (or capital yield).

**Inflation and Real Interest Rate** To make meaningful economic comparisons over time, the prices of goods and services must be corrected for the effects of inflation. A distinction has to be made between *nominal prices*, or prices in terms of some currency, and *real prices*, or prices in terms of purchasing power. This point may be illustrated with an example. Suppose the price of butter increases from ₹ 200 per kg in year 0 to ₹ 220 per kg in year 1. During this period the Consumer Price Index increases from 500 to 540, that is by 8 percent. So we say that even though the nominal price of butter increased by 10 percent, its real price rose by only 1.85 percent  $((1.10/1.08) - 1)$ .

Just as a distinction is made between nominal and real prices, so too a distinction is made between nominal and real interest rates. The nominal interest rate on a bond is the rate of return in nominal terms whereas the real rate is the nominal rate corrected for the inflation factor. For example, if you earn a nominal rate of 15 percent in a year when the inflation rate is 10 percent, your real rate works out to 4.55 percent  $((1.15/1.10) - 1)$ .

The general relationship between these rates is as per *Fisher hypothesis* as follows:

$$1 + \text{Real rate} = \frac{1 + \text{Nominal rate}}{1 + \text{Inflation rate}}$$

Put differently

$$\text{Real rate} = \frac{\text{Nominal rate} - \text{Inflation rate}}{1 + \text{Inflation rate}}$$

**Determinants of Rates of Return** What factors determine the rates of return in a market economy? The principal factors are:

- Expected productivity of capital
- Degree of uncertainty characterising the productivity of capital
- Time preferences of people
- Degree of risk aversion

*Expected Productivity of Capital* Capital resources, comprising of tangible capital and intangible capital, help in producing goods and services. Tangible capital consists of physical assets like factories, mines, dams, railway networks, power stations, roads, and inventories. Intangible capital consists of non-physical assets like patents, copyrights, technical know-how, and brand image.

The productivity of capital is expressed as a percentage per year, referred to as the return on capital. The expected return on capital varies across time and place. *Inter alia*, it depends on the state of technology, availability of other factors of production, and the strength of demand for goods and services produced by capital.

The returns earned by investors ultimately depend on how productive the capital is. Hence, the higher the expected productivity of capital, the higher rates of return in the economy, and vice versa.

*Degree of Uncertainty about Productivity of Capital* The return on capital is subject to uncertainty stemming from a host of factors like technological changes, shifts in consumer preferences, erratic weather, policy changes, social unrest, and so on.

Equity securities have a claim to the profits earned on capital. Other things being equal, the higher the degree of uncertainty about the productivity of capital, the higher the risk premium required by equity investors, and vice versa.

*Time Preferences of People* People prefer current consumption to future consumption. Why? A principal reason is that they know that they are alive now and can enjoy current consumption whereas they are not sure whether they will be alive in future to enjoy deferred consumption. Other things being equal, the greater the preference of the society for current consumption, the higher the interest rate in the economy and vice versa.

*Degree of Risk Aversion* The return on capital in any economy, as we have learnt, is uncertain. The financial system provides a mechanism for partitioning the uncertain return on capital into different streams subject to different risks. Very broadly, it splits the uncertain return on capital into two components: a risk-free return earned on debt securities and a risky return earned on equity securities. The following relationship holds:

$$\text{Risk-free return on debt securities} < \text{Expected return on capital} < \text{Expected return on equity securities}$$

Put differently, risk-averse people who want a risk-free return have to compensate risk-tolerant people for bearing risk in the form of risk premium. Other things being equal, the higher the degree of risk-aversion of the population, the higher will be the risk premium, and correspondingly the lower will be the risk-free rate.

**Other Factors that Influence Interest Rate Levels** The following are the other factors that influence interest rates: monetary policy, fiscal deficit or surplus, international flows, and the level of business activity.

*Money Supply* The Reserve Bank of India (RBI) regulates the money supply in the economy. An expansionary monetary policy of RBI lowers the interest rates. A contractionary monetary policy, on the other hand, pushes the interest rates up.

*Fiscal Deficit (or Surplus)* If the government spends more than its revenues, it runs a fiscal deficit which is met by borrowing or printing money. If the government borrows, it pushes the interest rate up. If it prints money, the increased money supply raises inflationary expectations, which eventually pushes interest rates up. Thus, other things being equal, the larger the fiscal deficit, the higher the interest rate. A fiscal surplus has the opposite effects.

*International Factors* If India buys more (less) than it sells to other countries, it has a trade deficit (surplus). A trade deficit has to be financed through borrowings. Hence, the larger the trade deficit, the higher the level of borrowing which pushes the interest rates up. A trade surplus has the opposite effects.

*Level of Business Activity* When business activity expands the demand for funds increases which tends to push interest rates up. On the other hand, when business activity contracts, the demand for funds decreases which tends to push interest rates down.

**Interest Rates in India** Interest rates in India traditionally were highly regulated. There was a time when the bank deposit rates, bank lending rates, lending rates of financial institutions, corporate fixed deposit rates, and so on were completely regulated by the government. In the wake of financial liberalisation, most of these rates have been substantially deregulated.

There is a variety of interest rates in the economy. The key interest rates are as follows. The *repo rate* is the rate at which banks obtain funds from the RBI by selling securities and simultaneously agreeing to repurchase them at a later date at a predetermined price. The *bank rate* is the rate at which banks, which need cash temporarily, can borrow from the RBI. The *treasury bill rate* is the rate on money market instruments issued by the Government of India. The *base rate* is the minimum interest rate at which banks lend. The *term deposit rate* is the rate paid by banks on fixed deposits. The *10-year government bond rate*, often taken as the representative of the government-borrowing rate, is the yield on 10-year government bonds.

The key interest rates in India as on 23.01.2014 were as follows:

■ Bank rate : 6.75 percent	■ Term deposit rate > 1 year : 6.25 to 7.5 percent
■ Repo rate : 6.50 percent	■ Yield on 10-year Government bond : 7.58 percent
■ 364 day Treasury bill rate : 6.82 percent	■ Base rate : 8.95 to 9.45 percent

## **2.5 ■ FINANCIAL INTERMEDIARIES**

Financial intermediaries are firms that provide services and products that customers may not be able to get more efficiently by themselves in financial markets. A good example of a financial intermediary is a mutual fund which pools the financial resources of many people and invests in a basket of securities. It enjoys economies of scale in conducting research, in maintaining records, and in executing transactions. Hence it offers its customers a more efficient way of investing than what they can generally do on their own. The important products and services of financial intermediaries include checking accounts, savings accounts, loans, mortgages, mutual fund schemes, insurance contracts, credit rating, and so on.

## Rationale for Financial Intermediaries

Before we learn about various financial intermediaries in India, let us understand the rationale for financial intermediaries. Put differently, what are the benefits to individual investors when they invest indirectly through financial intermediaries rather than directly in operating companies? It seems that there are several advantages:

**Diversification** The pool of funds mobilised by financial intermediaries is invested in a broadly diversified portfolio of financial assets (stocks, money market instruments, bonds, and loans). Individual investors can scarcely achieve such diversification on their own. Remember that a diversified portfolio reduces risk.

**Lower Transaction Cost** The average size of a transaction of a financial institution is much higher than that of an individual investor. The transaction cost in percentage terms tends to decrease as the transaction size increases. Hence, financial intermediaries, compared to individual investors, incur lower transaction costs.

**Economies of Scale** Buying and holding securities (or for that matter granting loans and supervising them) calls for information gathering and processing and regular monitoring. These functions entail cost. Financial intermediaries, thanks to their bigger size and professional resources, enjoy economies of scale in performing these functions and hence they have a comparative advantage over individual investors.

**Confidentiality** Companies seeking funds or the continuing support of existing investors are required to disclose information that they like to keep confidential for competitive reasons. They would feel more comfortable in dealing with a few financial intermediaries rather than numerous individual investors. Information shared with financial intermediaries may be kept confidential whereas information disclosed to numerous individual investors falls in the domain of public knowledge.

**Signaling** With greater professional expertise at their command, financial intermediaries can pick up and interpret signals and cues provided by companies which are likely to gravitate to them. In this manner, financial institutions perform a signaling function for the investing community.

## **Key Financial Intermediaries**

The key financial intermediaries in India are commercial banks, financial institutions, insurance companies, mutual funds, non-banking financial companies, and non-banking financial service companies.

**Commercial Banks** Commercial banks (public sector banks, foreign banks, and private sector banks) represent the most important financial intermediary in the Indian financial system.

Public sector banks, led by the State Bank of India, came into being largely on account of nationalisation of privately-owned commercial banks. Presently, they dominate the banking scene in the country. They have contributed immensely to wider geographical spread and deeper penetration in rural areas, higher mobilisation of deposits, and reallocation of bank credit to priority sectors.

Foreign banks, such as Citibank, have been in India for a long time and have been steadily expanding their operations. The newest entrants on the commercial banking scene have been the private sector banks like HDFC Bank and ICICI Bank which were set up in mid-1990s in the wake of banking liberalisation. This segment has shown remarkable growth and vitality since the beginning.

The banking sector in India has grown at a compound annual growth rate (CAGR) of about 20 percent in the first decade of this millennium. Total deposits have grown 4.8 times, assets 6.6 times, interest income 9.5 times, and net worth 4.5 times. Over the same period, the employee strength has grown by just 5 percent! This radical transformation has been facilitated by massive computerisation that has led to anywhere, anytime banking across various channels. Most reassuringly, this metamorphosis has been achieved at an incredibly low cost. According to RBI, the total cost of computerisation for PSU banks has been around ₹ 17,900 crore, or less than \$ 4 billion, an amount that a global tier-I bank spends annually.

**Financial Institutions** Since independence a number of financial institutions have been set up to cater to the long-term financing needs of the industrial sector and meet specialised financing requirements. An elaborate structure of financial institutions consisting of all-India term-lending institutions like IFCI, ICICI, and IDBI (the last two have transformed themselves into banks), State Financial Corporations, and State Industrial Development Corporations, has come into being.

There are many specialised financial institutions like Small Industries Development Bank of India (SIDBI), Export-Import Bank (EXIM Bank), National Bank for Agricultural and Rural Development (NABARD), Shipping Credit and Investment Corporation of India (SCICI), Power Finance Corporation (PFC), Rural Electrification Corporation (REC), and National Housing Bank (NHB).

**Insurance Companies** Till recently there were just two insurance companies in India: the Life Insurance Corporation of India (LIC) and the General Insurance Corporation of India (GIC). The GIC was initially a holding company with four fully owned subsidiaries. Subsequently, GIC was renominated as the Indian Reinsurer and it also ceased to be a holding company of its subsidiaries. With the liberalisation of the insurance sector, many private sector players like ICICI-Prudential, Tata AIG, Bajaj ALLIANZ, Birla Sunlife, and HDFC Standard have set up insurance business in India. Insurance companies, LIC in particular, have massive resources at their command because insurance policies usually have a substantial element of savings and insurance premiums are payable in advance.

**Mutual Funds** A mutual fund is a collective investment vehicle. It mobilises resources from investors and invests in various types of securities. While there was only one mutual fund in India, viz., the Unit Trust of India, till 1986, presently there are a number of mutual funds in public and private sector. In the last decade or so, private mutual funds like ICICI Prudential Mutual Fund, Reliance Mutual Fund, HDFC Mutual Fund and Templeton Mutual Fund have grown impressively.

**Non-Banking Financial Companies** From mid-1980s many non-banking financial companies have come into being in the public sector as well as the private sector. Some of the well-known names are HDFC, Sundaram Finance, Kotak Mahindra Finance, IDFC, ICICI Ventures, Infrastructure Leasing and Finance, and SBI Factors. These companies engage in a variety of activities like leasing finance, hire-purchase finance, housing finance, infrastructure finance, venture capital financing, factoring, and investment in securities.

**Non-Banking Financial Services Companies** This group consists of merchant banks, credit rating agencies, depositories, and others. **Merchant banks, also called investment banks**, are firms which help business, government, and other entities in raising finances. They also

facilitate mergers, acquisitions, and divestitures. Kotak Investment Banking, Axis Capital Limited, ICICI Securities, J P Morgan, and Citibank are among the leading merchant banks in India. **Credit rating** agencies rate debt and other instruments. CRISIL, CARE, and ICRA are the leading credit rating agencies in India. **Depositories** are institutions which dematerialise physical securities and effect transfer of ownership by electronic entries. Presently, there are two depositories in India, viz. the National Securities Depository Limited (NSDL) and the Central Securities Depository Limited (CSDL).

## 2.6 ■ REGULATORY INFRASTRUCTURE

There are five entities involved in regulating the financial sector: Ministry of Finance, Reserve Bank of India (RBI), Securities and Exchange Board of India (SEBI), Insurance Regulatory and Development Authority, and Pension Fund Regulatory and Development Authority (PFRDA).

The Financial Legislative Reforms Commission (FSLRC) has recommended the creation of a new financial regulatory structure where regulators SEBI, IRDA, FMC, and PFRDA are subsumed into a single agency. The FSLRC believes that the merger of various regulators will streamline regulations, resolve conflicts between regulators, and bring a holistic approach to issues.

From the point of view of corporates, RBI and SEBI are more important. A brief description of their functions follows:

**Reserve Bank of India** As the central banking authority of India, the Reserve Bank of India performs the following traditional functions of the central bank:

- It provides currency and operates the clearing system for the banks.
- It formulates and implements monetary and credit policies.
- It functions as the banker's bank.
- It supervises the operations of credit institutions.
- It regulates foreign exchange transactions.
- It moderates the fluctuations in the exchange value of the rupee.

In addition to the traditional function of the central banking authority, the Reserve Bank of India performs several functions aimed at developing the Indian financial system:

- It seeks to integrate the unorganised financial sector with the organised financial sector.
- It encourages the extension of the commercial banking system in the rural areas.
- It influences the allocation of credit.
- It promotes the development of new institutions.

**Securities and Exchange Board of India** The Securities and Exchange Board of India (SEBI) has been entrusted with the responsibility of dealing with various matters relating to the capital market. SEBI's principal tasks are to:

- Regulate the business in stock exchanges and any other securities markets.
- Register and regulate the capital market intermediaries (brokers, merchant bankers, portfolio managers, and so on).
- Register and regulate the working of mutual funds.
- Promote and regulate self-regulatory organisations.
- Prohibit fraudulent and unfair trade practices in securities markets.
- Promote investors' education and training of intermediaries of securities markets.
- Prohibit insider trading in securities.
- Regulate substantial acquisition of shares and takeovers of companies.
- Perform such other functions as may be prescribed.

### **Market-based Versus Bank-based Financial Systems**

The financial systems in U.K. and U.S. are more market-based whereas the financial systems in Germany and Japan are more bank-based.

Market-based systems appear to be more successful in spawning new industries. For example, the railways, first developed in U.K. in 19th century, were financed mainly through the stock market. Likewise, in the 20th century, the U.S. spearheaded the development of automobile industry, though the automobile was a German invention. Similarly, the U.S. led the development of commercial aircraft industry, computer industry, and more recently the Internet and biotechnology industries.

Bank-based financial systems are more successful in supporting established industries. For example, Germany and Japan have sustained their competitive advantages in automobiles (in both countries) and electronics (in Japan).

Why are financial markets more effective in nurturing innovative industries? As Brealey and Myers explain: "When new products or processes are discovered, there is a wide diversity of opinion about the prospects for a new industry and the best way to develop it. Financial markets accommodate this diversity." This enables young companies to find like-minded investors who share their vision. If financing is done by a few major banks, this is less likely.

Market-based systems seem to be equally effective in withdrawing capital from companies with declining fortunes. But in bank-based financial systems, unviable firms are often artificially supported for long periods.

## 2.7 ■ GROWTH AND TRENDS IN THE INDIAN FINANCIAL SYSTEM

The Indian financial system experienced an impressive growth in the post-1950 era. This is evident from the following:

- Emergence of a wide array of financial institutions to provide a variety of services.
- Significant expansion of the network of commercial banks and operations of the financial institutions.
- Introduction of a variety of schemes and instruments for mobilising savings.
- Remarkable growth in the primary as well as the secondary segments of the capital market.

In the wake of the significant growth that has occurred in the Indian financial system, the financial development measures improved substantially over the last few decades. Overall, one can conclude that the Indian financial system is widening, deepening, maturing, and gaining in sophistication.

**Financial Sector Reforms in India** Until the beginning of the 1990s, the Indian financial sector was characterised by administered interest rates, large pre-emption of resources, and extensive micro regulations. It was a classic example of “financial repression,” *a la* Mackinnon and Shaw.

The financial sector reforms initiated from the early 1990s have focused on the following objectives:

- Removal of financial repression.
- Creation of an efficient, productive, and profitable financial sector.
- Evolution of market-determined interest rates.
- Granting of operational and functional autonomy to institutions.
- Opening up of the external sector in a calibrated fashion.
- Maintenance of financial stability in face of domestic and external disturbances.

Thanks to the reform measures, the Indian financial sector has become fairly sophisticated, diverse, vibrant, responsive, and resilient. It must be emphasised that this transformation has been achieved through well sequenced and coordinated policy measures.

Notwithstanding these developments, there is a serious shortcoming in the Indian financial system. The government, through its regulation over banks and a number of special savings schemes, absorbs more than two-thirds of the savings in the economy. In addition, it directs banks to lend to what government deems priority areas. Such control over the flow of domestic savings hurts India's economy in two ways: (i) Capital is diverted from private sector, whose productivity and efficiency is higher than public sector. (ii) The development of corporate bond market has been stunted.

**Trends** The key trends discernible in the Indian financial system are as follows:

- The ambit of market-determined interest rates is increasing and correspondingly the domain of administered interest rates is shrinking. This is accompanied by greater volatility in interest rates.
- In the regulation of financial markets and financial intermediaries, prudential regulation and supervision (capital adequacy, disclosure, transparency, and so on) are being emphasised and product and price controls are being done away with.
- The Indian financial system is getting gradually integrated with the world financial system.
- Financial innovation (introduction of new financial instruments or processes) is gaining momentum. Options and futures have been introduced in India.

**Financial Development Measures** The financial development of a country is commonly assessed in terms of the following ratios.

$$\text{Finance ratio} = \frac{\text{Total finance claims}}{\text{National income}}$$

$$\text{Financial interrelations ratio} = \frac{\text{Total finance claims}}{\text{Net physical capital formation}}$$

$$\text{New issue ratio} = \frac{\text{Primary issues (claims created by non-financial sectors)}}{\text{Net physical capital formation}}$$

$$\text{Intermediation ratio} = \frac{\text{Issues of financial institutions}}{\text{Total financial issues in the economy}}$$

In terms of these ratios, India has steadily developed in the last six decades.

### Impact of Technology

While modern banking and finance still deal with the same functions that have been around thousands of years, what has changed is technology and, in response, the institutional structure.

Technological progress has (a) enriched the world so that more wealth has to be managed, creating economies of scale, (b) lowered the cost of communication which in turn has transformed local markets into national markets and, recently, into global markets, (c) reduced transaction costs, triggering massive increases in the volume of trading, and (d) reduced the costs of computing and tracking positions, leading to much greater sophistication in financial products.

## SUMMARY

- The **financial system** provides the principal means by which savings are transformed into investments.
- The financial system provides a **payment mechanism**, enables the **pooling of funds**, facilitates the **management of uncertainty**, generates information for **decentralised decision making**, and helps in dealing with **informational asymmetry**.
- **Financial assets** such as bonds and stocks represent claims against the future income and wealth of others. **Financial liabilities** are the counterparts of financial assets.
- A **financial market** is a market for the creation and exchange of financial securities. Financial markets facilitate price discovery, provide liquidity, and reduce the cost of transacting.
- The **interest rate** on a loan or fixed income security depends on factors like the unit of account, maturity, and default risk.
- The **real interest rate** is the **nominal interest rate** adjusted for the inflation factor.
- The key determinants of the rates of return in a market economy are: expected productivity of capital, degree of uncertainty characterising the productivity of capital, time preferences of people, and degree of risk aversion.
- **Financial intermediaries** are firms that provide services and products that customers may not be able to get efficiently by themselves in financial markets.
- Financial intermediaries seem to offer several advantages: diversification, lower transaction cost, economies of scale, confidentiality, and signaling benefits.
- The Reserve Bank of India (RBI) and the Securities and Exchange Board of India (SEBI) are the major regulators of the financial system.

## QUESTIONS

1. Discuss the functions performed by the financial system.

2. Give some examples of financial assets.
3. Discuss the important functions performed by financial markets.
4. What are the different ways of classifying financial markets?
5. Define the relationship between real rate, nominal rate, and inflation rate.
6. Discuss the factors that determine the rates of return in a market economy.
7. What is the rationale of financial intermediaries?
8. Describe briefly various financial intermediaries in India.
9. What functions are performed by the Reserve Bank of India?
10. What are the principal tasks of the Securities and Exchange Board of India?
11. What have been the key developments and reforms of the Indian financial sector since 1950s.

## PROBLEMS

**2.1 Nominal and Real Rates** As a rule of thumb, real rates of interest are calculated by subtracting the inflation rate from the nominal rate. What is the error from using this rule of thumb for calculating real rates of return in the following cases.

Nominal rate (%)	5	10	20	60
Inflation rate (%)	2	4	10	40

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<sup>1</sup> This section is based on Chapter 1 of the book *Cases in Financial Engineering* by Robert Merton et. al., published by the Harvard Business School Press in 1994.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter2/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter2/index.html)

- Additional Solved Problems



## **PART-II**

### **Financial Analysis and Planning**

**3** Financial Statements, Taxes, and Cash Flow

**4** Analysis of Financial Statements

**5** Financial Planning and Forecasting

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## Financial Statements, Taxes, and Cash Flow

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Explain the contents of the balance sheet.
- ✓ Describe the contents of the statement of profit and loss.
- ✓ Derive the statement of cash flows from the balance sheet and the statement of profit and loss.
- ✓ Distinguish between profit and cash flow.
- ✓ Discuss the devices commonly used for managing the bottom line.
- ✓ Discuss the key elements of corporate and individual income tax.
- ✓ Explain the concept of free cash flow.

Managers, shareholders, creditors, and other interested groups seek answers to the following important questions about a firm:

- *What is the financial position of the firm at a given point of time?*
- *How has the firm performed financially over a given period of time?*
- *What have been the sources and uses of cash over a given period of time?*

To answer the above questions, the accountant prepares two principal statements, the balance sheet and the statement of profit and loss and an ancillary statement, the cash flow statement. The balance sheet shows the financial position (or condition) of the firm at a given point of time. It provides a snapshot and may be regarded as a static picture. The statement of profit and loss reflects the performance of the firm over a period of time. Finally, the cash flow statement displays the sources and uses of cash during the period.

In India, the Companies Act 2013 lays down the form and content of financial statements of companies. These statements have to conform to Indian Accounting Standards (Ind AS) notified by the Ministry of Corporate Affairs under the Companies Act 2013. These standards are based on the

recommendations of the *National Financial Reporting Authority*, a body constituted by the central government. In addition, SEBI requires that listed companies should prepare cash flow statements, quarterly financial results, and consolidated financial statements.

Financial statements serve important functions: (a) They provide information on how the firm has performed in the past and what is its current financial position. (b) They are a convenient device for the stakeholders (shareholders, creditors, regulators, and others) to set performance norms and impose restrictions on the management of the firm. (c) They provide templates for financial forecasting and planning.

Financial statements are often an important source of information for financial decisions. So we examine financial statements in this chapter. Our emphasis is not on preparing financial statements—which is the job of accountants—but on understanding the kind of information found in these statements.

This chapter provides a primer on financial statements, distinguishes between profit and cash flow, briefly touches on taxation, and explains how you can cull cash flow information from financial statements.

## **3.1 ■ BALANCE SHEET**

The balance sheet shows the financial condition of a business at a given point of time. [Exhibit 3.1](#) shows the balance sheet of a hypothetical firm Horizon Limited as at March 31, 20X1, prepared as per the format prescribed under the Companies Act.

The format for the balance sheet under Companies (Indian Accounting Standards) Rules, 2015 is very detailed and elaborate. It is given in the Supplementary Notes. [Exhibit 3.1](#) shows the balance sheet of a hypothetical firm Horizon Limited as at March 31, 20X1, which reflects the most important items found commonly in balance sheets.

**Exhibit 3.1 | Balance Sheet of Horizon Limited as at March 31, 20X1**

	<i>₹ in million</i>	
	20X1	20X0
<b>ASSETS</b>		
Non-current Assets	600	550
■ Property, plant, and equipment	500	450
■ Investments	50	40
■ Long-term loans and advances	50	60
Current Assets	400	350
■ Inventories	20	20
■ Investments	160	140
■ Trade receivables	140	120
■ Cash and cash equivalents	60	50
■ Loans	20	20
	<u>1000</u>	<u>900</u>
<b>EQUITY AND LIABILITIES</b>		
Equity	500	450
■ Equity share capital (Par value ₹ 10)	100	100
■ Other equity	400	350
Non-current Liabilities	300	270
■ Borrowings	200	180
■ Provisions	50	45
■ Deferred tax liabilities (net)	50	45
Current Liabilities	200	180
■ Borrowings	40	30
■ Trade payables	120	110
■ Other current liabilities	30	30
■ Short-term provisions	10	10
	<u>1,000</u>	<u>900</u>

## Assets

Assets are resources ‘owned’ by the firm which are expected to provide the firm with future economic benefits, by way of higher cash inflows or lower cash outflows. Resources are recognised as assets in accounting when (a) the firm acquires rights over them as a result of a past transaction, and (b) the firm can quantify future economic benefits with a fair degree of accuracy.

Assets are classified as follows under the format prescribed by the Companies Act:

- Non-current assets
- Current assets

**Non-current Assets** Non-current assets are relatively long-lives assets. They are assets other than current assets. The important types of non-current assets are: property, plant, and equipment, capital work-in-progress, goodwill, other intangible assets, and financial assets. **Property, plant, and equipment**, often the most important non-current asset, comprises of land, buildings, plant and equipment, furnitures and fixtures, vehicles, office equipment, and so on. They are reported in the balance sheet at their net book value, which is simply the gross value (the cost of acquiring the asset) less accumulated depreciation.

**Capital work-in progress** reflects the value of plant and equipment which is under construction.

**Goodwill** arises when a company acquires another company and the purchase consideration is greater than the net book value of assets over liabilities. Goodwill has to be amortised over a period of time.

**Other intangible assets** include items like brands or trademarks, computer software, mining rights, copyrights, patents, and other intellectual property rights, licenses and franchises, and so on.

**Financial assets** comprise mainly of investments and loans. *Investments* consist mainly of equity and preference securities of associate companies, joint venture companies, and subsidiary companies. These investments are meant to be held for a long period and are made for the purpose of income and control. They are stated at cost less any diminution of value which is regarded as permanent in the opinion of management. *Loans* are usually loans and advances to associate companies, subsidiary companies, employees, and others for a period of more than one year.

**Current Assets** An asset is classified as a current asset when it satisfies any of the following criteria: (a) it is expected to be realised in, or is intended for sale or consumption in the company's normal operating cycle, (b) it is held primarily for the purpose of being traded, (c) it is expected to be realised within twelve months after the reporting date, or (d) it is cash or cash equivalent unless it is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting date. All other assets are classified as non-current.

Current assets include inventories, investments, trade receivables, cash and cash equivalents, loans, and other current assets. **Inventories** (also called stocks) comprise of raw materials, work-in-progress, finished goods, packing materials, and stores and spares. Inventories are generally valued at cost or net realisable value, whichever is lower. The cost of inventories includes purchase cost, conversion cost, and other costs incurred to bring them to their respective present location and condition. The cost of raw materials, stores and spares, packing materials, trading and other products is generally determined on a weighted average basis. The cost of work-in-progress and finished goods is generally determined on absorption costing basis—this means that the cost figure includes allocation of manufacturing overheads.

**Investments** consists of investments in equity instruments, investment in preference shares, investment in government securities, investment in debentures or bonds, investments in mutual funds, investments in partnership firms, and other investments. These investments are made primarily to generate income from short-term surpluses of the firm. Current investments are carried at cost or market (fair) value, whichever is lower.

**Trade receivables** (also called accounts receivable or sundry debtors) represent the amounts owed to the firm by its customers (who have bought goods and services on credit) and others. Trade receivables are classified into two categories viz., debts outstanding for a period exceeding six months and other debts. Further, trade receivables are classified as debts considered good and debts considered doubtful. Generally, firms make a provision for doubtful debts which is equal to debts considered doubtful. The net figure of trade receivables is arrived at after deducting the provision for doubtful debts.

**Cash and cash equivalents** comprise of cash on hand and credit balances with scheduled banks and non-scheduled banks.

**Short-term loans and advances** comprise of loans and advances given to suppliers, employees, and other companies that are recoverable within a

year. The net figure of short-term loans and advances is arrived at after deducting a provision for doubtful advances, if any.

**Other current assets** comprise of items such as interest accrued on investments, dividends receivable, and fixed assets held for sale (the last item is valued at net book value or estimated net realisable value, whichever is lower).

## **Equity and Liabilities**

Equity and liabilities represent what the firm ‘owes’ others. The format prescribed in the Companies Act classifies equity and liabilities as follows:

- Equity
- Non-current liabilities
- Current liabilities

**Equity** Equity represents the contributions made by shareholders in some form or the other. It includes equity share capital and other equity.

**Equity share capital** includes equity capital as well as preference capital.

**Other equity**, often the most significant item on the balance sheet, represents *reserves and surplus* (such as, securities premium reserve, retained earnings, capital reserve, and general reserve) and *other comprehensive income* (such as exchange differences on translating the financial statements of foreign operation and cash flow hedge reserve).

**Non-current Liabilities** Non-current liabilities are liabilities which are expected to be settled after one year of the reporting date. They include financial liabilities, provisions, deferred tax liabilities (net), and other non-current liabilities. **Financial liabilities** are obligations on account of borrowings, trade payable, and other non-current liabilities. *Borrowings* generally comprise of term loans from financial institutions and banks in India and abroad, rupee bonds (debentures) and foreign currency bonds, and public deposits. *Trade payables* are amounts owed to suppliers who have sold goods and services on credit.

**Deferred tax liabilities (or assets)** arise because of the temporary differences between taxable income and accounting profit. A deferred tax liability (asset) is recognised when the charge in the financial statements is less (more) than the amount allowed for tax purposes.

**Provisions** include provisions for employee benefits such as provident fund, gratuity, superannuation, and leave encashment and other provisions.

**Current Liabilities** Current liabilities are liabilities which are due to be settled within 12 months after the reporting date. They include financial liabilities, other current liabilities, provisions, and current tax liabilities (net).

**Financial liabilities** are obligations on account of borrowings, trade payables, and other financial liabilities. *Borrowings* are mainly in the form of working capital loans (rupee loans as well as well as foreign currency loans) and other loans and advances. *Trade payables* are amounts owed to

suppliers who have sold goods and services on credit. *Other financial liabilities* include current maturities of long-term debt, current maturities of finance lease obligation, interest accrued but not yet due, and so on.

**Other current liabilities** include items like statutory dues and advances from customers.

**Provisions** include items like provisions for employee benefits.

**Current tax liabilities (net)** represent items like income tax liabilities (net).

## **Accounting Values versus Economic Values**

Accounting values and economic values ought to be similar, at least in theory. In reality, however, the two diverge very often. There are three main reasons for such a discrepancy.

**Use of the Historical Cost Principle** For purposes of valuation, accountants often use the historical cost as the basis. The value of an asset is shown at its historical cost less accumulated depreciation. Likewise, the value of a liability reflects a historical number. Hence accounting values may differ significantly from current economic values.

**Exclusion of Intangible Assets** Intangible assets like technical know-how, brand equity, managerial capability, and goodwill with suppliers often have substantial economic value. Yet they are ignored in financial accounting because it is difficult to objectively value them.

**Understatement or Omission of Certain Liabilities** Firms usually understate or even wholly omit certain liabilities that are of a contingent nature. They may be mentioned by way of a footnote to the balance sheet but they are not recorded on the main balance sheet. Sometimes such liabilities can be substantial.

## 3.2 ■ STATEMENT OF PROFIT AND LOSS

The statement of profit and loss presents a summary of the operating and financial transactions which have contributed to the change in the owners' equity during the accounting period. Revenues are transactions that augment owners' equity and expenses are transactions that diminish owners' equity. Hence, the net change in owners' equity during an accounting period, called as profit after tax, is:

$$\text{Profit after tax} = \text{Revenues} - \text{Expenses}$$

This relationship is the basis for constructing the statement of profit and loss which first reports revenues, then expenses, and finally the profit after tax.

Among the various principles underlying the financial accounting model, two are of particular significance for understanding the statement of profit and loss, viz., the realisation principle and the matching principle.

According to the realisation principle, a revenue is recognised when the transaction generating the revenue takes place and not when the cash for the transaction is received. To illustrate this principle, let us consider an example. Suppose a firm sells goods worth ₹ 10,000 on credit to a customer. The revenue is recognised when the sale takes place even though cash may be received later. When the firm receives cash, it will adjust its balance sheet by decreasing the trade receivables and increasing the cash.

The matching principle says that the expenses associated with a product or service are recognised when the product or service is sold and not when the cash payment is made. For example, consider a retail firm that purchases an item from a wholesaler, stocks it, and finally sells it. The expense will be recognised when the item is sold, not when it is purchased or when it is paid for.

Together, the realisation and matching principles form the basis for what is called **accrual accounting**. Thanks to accrual accounting, the profit after tax of a firm is generally different from its net cash flow.

[Exhibit 3.2](#) shows the statement of profit and loss for Horizon Limited for the year ending March 31, 20X1, prepared as per the format prescribed by the Companies Act.

**Revenues from operations** represent revenues from (a) sales of products and services less excise duties, and (b) other operating income.

For a finance company, revenues from operations consist of revenues from interest and financial services.

**Other income** consists of the following: (a) interest income (in case of a company other than a finance company), (b) dividend income, (c) net gain/loss on sale of investments, and (d) other non-operating income (net of expenses directly attributable to such income).

**Expenses** comprise of material expenses, employee benefit expenses, finance costs, depreciation and amortisation expenses, and other expenses. **Material expenses** equal the cost 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.

**Exhibit 3.2 Statement of Profit and Loss for Horizon Limited for Year Ending March 31, 20X1**

	₹ in million	
	20X1	20X0
■ Revenues from Operations	1290	1172
■ Other Income	10	8
■ Total Income	1300	1180
■ Expenses		
■ Material expenses	600	560
■ Employee benefit expenses	200	180
■ Finance costs	30	25
■ Depreciation and amortisation expenses	50	45
■ Other expenses	240	210
■ Total Expenses	1120	1020
■ Profit before Exceptional Items and Tax	180	160
■ Exceptional Items	-	-
■ Profit Before Tax	180	160
■ Tax Expense	50	40
■ Profit (Loss) for the Period from Continuing Operation	130	120
■ Profit (Loss) from Discontinued Operations (after Tax)	-	-
■ Other Comprehensive Income	-	-
■ Total Comprehensive Income for the Year	130	120
■ Earnings Per Equity Share		
■ Basic	₹ 13	
■ Diluted	₹ 13	

**Employee benefit expenses** are classified as follows: (a) salaries and wages, (b) contribution to provident and other funds, (c) expenses on

employee stock option plan (ESOP) and employee stock purchase plan (ESPP), and (d) staff welfare expenses.

**Finance costs** are classified as follows: (a) interest, (b) dividend on redeemable preferences shares, (c) exchange differences regarded as an adjustment to borrowing costs, and (d) other borrowings costs.

**Depreciation** represents the allocation of the cost 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, and they have to be disclosed separately by virtue of their size and incidence, for financial statements to present a true and fair view. Schedule III requires the presentations of 'exceptional items' on the face of the statement of profit and loss, without defining that term. Generally, they include items of income and expenses such as write-down of inventories, litigation settlements, and restructuring.

**Tax expense** consists 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. For example, depreciation is charged as per the written down value for the taxable income but usually as per the straight line method for calculating the accounting profit. As a result, there are differences in the year-to-year depreciation charges under the two methods, but the total depreciation charges over the life of the asset would be the same under both the methods.

**Other comprehensive income** includes items like changes in revaluation surplus, fair value changes relating to own credit risk of financial liabilities designated at fair value through profit or loss, exchange differences in translating the financial statements of a foreign operation, the effective portion of gains and loss on hedging instruments in a cash loss on hedging instruments in a cash flow hedge, and share of comprehensive income in associates and joint ventures.

**Profit (Loss) from discontinued Operations (after tax)** If during the accounting period, the company has discontinued operations, the profit

(loss) from discontinued operations (after tax) has to be shown separately.

**Basic earnings per share** is the net profit or loss for the period attributable to equity shareholders divided by the weighted average number of equity shares during the period.

**Diluted earnings per share** is the net profit or loss for the period attributable to equity shareholders divided by the weighted average number of shares outstanding during the period, adjusted for the potential dilution arising from conversion of debt into equity, exercise of warrants and stock options, and so on.

When a company has some operations that have been discontinued during the period, the **profit (loss) from discontinued operations** have to be considered before arriving at the **profit (loss) for the period**.

## **Accounting Income versus Economic Income**

The economic income of a period is defined as the change in wealth during the period. Suppose you buy a share for ₹ 50 at the beginning of a year. If you receive a dividend of ₹ 2 and the price of the share moves up to ₹ 60 at the end of the year then the economic income from the share is ₹ 12, the increase in your wealth.

While it is easy to measure the change in the wealth of an investor, it is somewhat difficult to measure the change in the value of a firm. The statement of profit and loss represents the accountant's attempt to measure the change in the wealth of shareholders. Accounting income, however, diverges from economic income due to the following reasons:

**Use of the Accrual Principle** The accountant uses the accrual principle and not the cash principle. Hence the computation of accounting income is not based on cash flows, even though it is cash that really matters in the determination of economic income.

**Omission of Changes in Value** The accountant records only those changes in value which arise from definite transactions. He does not bother about things like development of new products, emergence of competition, and changes in regulation that significantly alter the future revenues and costs of the firm and, hence, its value.

**Depreciation** Economic depreciation represents the decline in the value of asset during the year. Since it is difficult to measure economic depreciation, the accountant often follows a fairly straight forward method for allocating the historical cost of the assets over its useful life. For example, under the straight line method-a commonly adopted method-the historical cost of the asset is allocated evenly over its life. Understandably, there is often a discrepancy between economic depreciation (loss of economic value) and accounting depreciation (allocation of historical cost using some arbitrary rule).

**Treatment of R&D and Advertising Expenditures** R&D expenditures increase a firm's technical know-how which enhances revenues and lowers costs in the future; likewise, advertising expenditures that build brand equity benefit the firm over a period of time. Hence these expenditures are akin to capital expenditures. Yet, for purposes of accounting, these expenditures are typically written off in the year in which

they are incurred. This naturally causes a discrepancy between accounting income and economic income.

**Inflation** Inflation raises the market value of the firm's assets. However, under historical cost accounting this is not acknowledged. Hence, the depreciation charge is based on the historical cost, and not the replacement cost, of assets. This leads to a divergence between accounting income and economic income.

**Creative Accounting** Firms may manage their accounting income by resorting to various creative accounting techniques like change in the method of stock valuation, change in the method and rate of depreciation, and sale and leaseback arrangement. Generally, the motive for creative accounting is to artificially boost the reported income. Obviously, such tactics cause a discrepancy between accounting income and economic income.

## **Unaudited Quarterly Financial Results**

Under the SEBI (Listing Obligations and Disclosure Requirements) regulations, 2015 listed companies are required to publish quarterly results and half-yearly statement of assets and liabilities/balance sheet. The formats for unaudited/audited quarterly results and the unaudited/audited half-yearly statement of assets and liabilities/balance sheet will have to conform to the formats for the balance sheet and statement of profit and loss (excluding notes and detailed sub-classification) prescribed in Schedule III of the Companies Act, 2013. (Banking and insurance companies are required to follow the formats prescribed under the acts/regulations specified by their respective regulators).

The extracts of Unaudited Financial results for the Quarter are presented in the following format.

1. Total Income from Operations (net)
2. Net Profit/(Loss) for the period (before tax, Exceptional and/or Extraordinary items)
3. Net Profit/(Loss) for the period before tax (after Exceptional and/or Extra-ordinary items)
4. Net Profit/(Loss) for the period after tax (after Exceptional and/or Extraordinary items)
5. Total Comprehensive Income for the period [Comprising Profit/(Loss) for the period (after tax) and Other Comprehensive Income (after tax)]
6. Equity Share Capital
7. Reserves (excluding Revaluation Reserve) as shown in the Audited Balance Sheet
8. Earnings per Share (for continuing and discontinued operations)
  - (a) Basic
  - (b) Diluted

The pro forma requires a company to give financial results for the quarter ended, for the corresponding quarter of the previous year, and for the previous accounting year.

### 3.3 ■ PROFITS VERSUS CASH FLOW

It is important to distinguish between profits and cash flow. There are several reasons why profits and cash flow are not the same.

1. When preparing the statement of profit and loss, the accountant does not simply count the cash receipts and cash payments. Instead, he starts with cash payments and then divides them into two parts, namely current expenditures (such as wages) and capital expenditures (such as purchase of machinery). While current expenditures are deducted from current revenues, capital expenditures are written off (depreciated) over the economic life of the assets (which is normally 3 to 15 years). This means that when calculating the profits of a given year, the accountant deducts depreciation applicable on capital assets purchased including those in previous years, even though no cash is paid out during the year. Therefore, to calculate the cash flow of the year, you have to add back the depreciation charge (which is not a cash payment) and deduct the expenditures on new capital equipments (which entail a cash payment).
2. Accounting is based on the accrual principle and the matching principle. According to the accrual principle (a) revenue is recognised when it is earned irrespective of when cash is received and (b) expenditure is recognised as an asset or as an expense, when it is incurred, irrespective of when cash is paid. According to the matching principle, expenses are matched to revenues.

To understand the difference between profit and cash flow, consider the following situation. In period 1, firm A produces goods that cost 150,000; in period 2 it sells the goods for 200,000 on credit; in period 3 it collects receivables. There are no other transactions. The profit and cash flow for the three year period are shown below:

	1	2	3
1 Sales	0	200,000	0
2 Change in accounts receivable	0	200,000	(200,000)
3 Cost of goods sold	0	150,000	0
4 Change in inventories	150,000	(150,000)	0
5 Profit: (1) – (3)	0	50,000	0
6 Cash inflow: (1) – (2)	0	0	200,000
7 Cash outflow: (3) + (4)	150,000	0	0
8 Net cash flow: (6) – (7)	(150,000)	0	200,000

## Net Cash Flow

When we looked at the statement of profit and loss, the emphasis was on profit after tax (also called the bottom line). In finance, however, the focus is on cash flow.

1. A firm's cash flow generally differs from its profit after tax because some of the revenues/expenses shown on its statement of profit and loss may not have been received/paid in cash during the year. The relationship between net cash flow and profit after tax is as follows:

$$\text{Net cash flow} = \text{Profit after tax} - \text{Non-cash revenues} + \text{Non-cash expenses}$$

An example of non-cash revenue is accrued interest income that has not yet been received. It increases the bottom line but is not matched by a cash inflow during the accounting period – the cash inflow would occur in a subsequent period. An example of a noncash expense is depreciation.

In practice, analysts generally define the net cash flow as:

$$\text{Net cash flow} = \text{Profit after tax} + \text{Depreciation} + \text{Amortisation}$$

However, note that the above expression will not reflect net cash flow accurately if there are significant noncash items beyond depreciation and amortisation.

### 3.4 STATEMENT OF CASH FLOW

From a financial point of view, a firm basically generates cash and spends cash. It generates cash when it issues securities, raises a bank loan, sells a product, disposes an asset, so on and so forth. It spends cash when it redeems securities, pays interest and dividends, purchases materials, acquires an asset, etc. The activities that generate cash are called sources of cash and the activities that absorb cash are called uses of cash.

To understand how a firm has obtained cash and how it has spent cash during a given period, we need to look at the changes in each of the items in the balance sheet over that period. As an illustration, [Exhibit 3.3](#) shows the balance sheets of Horizon Limited as on 31.3.20X0 and 31.3.20X1. The changes in various items of the balance sheet are noted in the last two columns of that exhibit.

Looking at [Exhibit 3.3](#) we find that a number of things have changed over the year. For example, long-term borrowings increased by ₹ 20 million and fixed assets (net) increased by ₹ 50 million. Which of these changes represents a source of cash and which a use of cash? Our common sense tells us that a firm generates cash when it increases its liabilities (as well as owners' equity); on the other hand it uses cash when it buys assets or reduces its liabilities (as well owners' equity). Thus, the following picture emerges.

<b>Sources of Cash</b>	<b>Uses of Cash</b>
■ Increase in liabilities and owners' equity	■ Decrease in liabilities and owners' equity
■ Decrease in assets (other than cash)	■ Increase in assets (other than cash)

Using the above framework we can summarise the sources and uses of cash from the balance sheet data as follows:

### **Exhibit 3.3 | Changes in Balance Sheet Items**

	₹ in million	20X1	20X0	Increase	Decrease
<b>ASSETS</b>					
Non-current Assets		600	550	-	-
■ Property, plant, and equipment	500	450	50	-	-
■ Investments	50	40	10	-	-
■ Long-term loans and advances	50	60	-	10	-
Current Assets	400	350	-	-	-
■ Inventories	160	140	20	-	-
■ Investments	20	20	-	-	-
■ Trade receivables	140	120	20	-	-
■ Cash and Cash equivalents	60	50	10	-	-
■ Loans	20	20			
	<u>1000</u>	<u>900</u>	-	-	-
<b>EQUITY AND LIABILITIES</b>					
Equity	500	450	-	-	-
■ Equity share capital (Par value ₹ 10)	100	100	-	-	-
■ Other equity	400	350	50	-	-
Non-current Liabilities	300	270	-	-	-
■ Borrowings	200	180	20	-	-
■ Provisions	50	45	-	-	-
■ Deferred tax liabilities	50	45	-	-	-
Current Liabilities	<u>200</u>	<u>180</u>	-	-	-
■ Borrowings	40	30	10	-	-
■ Trade payables	120	110	10	-	-
■ Other current liabilities	30	30	-	-	-
■ Short-term provisions	10	10	-	-	-
	<u>1,000</u>	<u>900</u>	-	-	-

Sources		Uses	
Increase in other equity	50	Increase in property, plant, and equipment	50
Increase in long-term borrowings	20	Increase in non-current investments	10
Increase in deferred tax liabilities	5	Increase in inventories	20
Increase in long-term provisions	5		
Increase in short-term borrowings	10	Increase in trade receivables	20
Increase in trade payables	10		
Decrease in long-term loans and advances	10		
Total sources	110	Total uses	100
		Net addition to cash	10

Note that the net addition to cash is ₹ 10 million and it tallies with the ₹ 10 million change shown on the balance sheet.

This simple statement tells us a lot about what happened during the year, but it does not convey the full story. For example, the increase in reserves and surplus is equal to: profit after tax—dividends. If these are reported separately it would be more informative. Likewise, it would be more illuminating to know the break-up of net fixed asset acquisition in terms of gross assets acquisition and depreciation charge.

To get these details, we draw on the statement of profit and loss of Horizon Limited as shown in [Exhibit 3.2](#). The amplified sources and uses of cash statement is given below:

Sources		Uses	
Net profit	130	Dividend payment	80
Depreciation and amortization	50	Purchase of fixed assets	100
Increase in long-term borrowings	20	Increase in non-current investments	10
Increase in deferred tax liabilities	5	Increase in inventories	20
Increase in long-term provisions	5		
Increase in short-term borrowings	10	Increase in trade receivables	20
Increase in trade payables	10		
Decrease in long-term loans and advances	10		
Total sources	240	Total uses	230
		Net addition to cash	10

## Cash Flow Statement

The statement presented above lumped together all sources of cash and uses of cash. To understand better how cash flows have been influenced by various decisions, it is helpful to classify cash flows into three classes viz., cash flows from operating activities, cash flows from investing activities, and cash flows from financing activities as shown in [Exhibit 3.4](#).

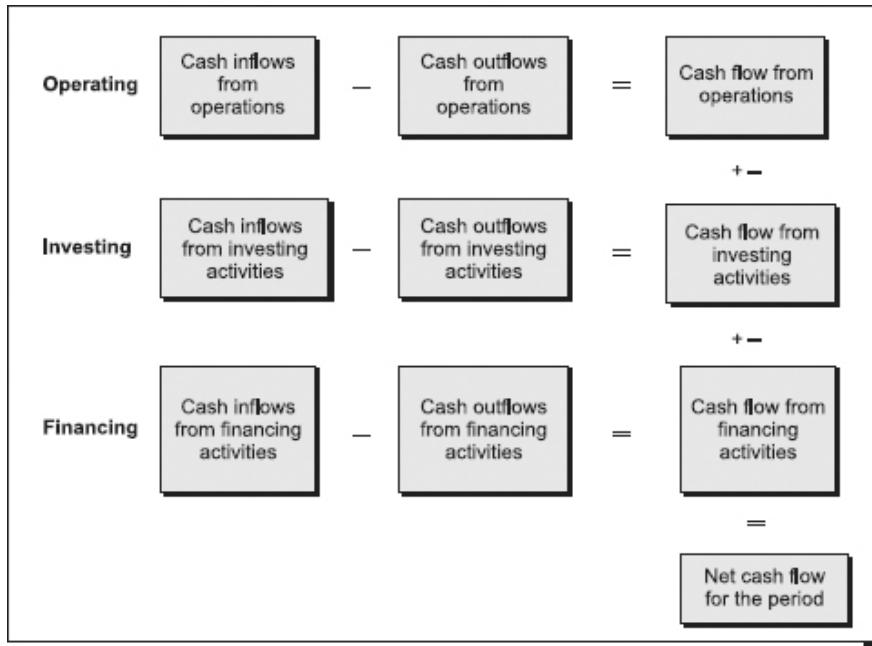
**Operating activities** involve producing and selling goods and services. Cash inflows from operating activities include monies received from customers for sales of goods and services. Cash outflows from operating activities include payments to suppliers for materials, to employees for services, and to the government for taxes.

**Investing activities** involve acquiring and disposing fixed assets, buying and selling financial securities, and disbursing and collecting loans. Cash inflows from investing activities include receipts from the sale of assets (real as well financial), recovery of loans, and collection of dividend and interest. Cash outflows from investing activities include payments for the purchase of assets (real and financial) and disbursement of loans.

**Financing activities** involve raising money from lenders and shareholders, paying interest and dividend, and redeeming loans and share capital. Cash inflows from financing activities include receipts from issue of securities and from loans and deposits. Cash outflows from financing activities include payment of interest on various forms of borrowings, payment of dividend, retirement of borrowings, and redemption of capital.

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## Exhibit 3.4 Components of Cash Flows



[Exhibit 3.5](#) shows the cash flow statement of Horizon Limited for the period 1.4.20X0 to 31.3.20X1 prepared in conformity with the format prescribed by the Accounting Principles Board of the Institute of Chartered Accountants of India.

## **Exhibit 3.5 | Cash Flow Statement**

<i>A. Cash Flow from operating Activities</i>	
Profit Before Tax	180
Adjustment for:	
■ Depreciation and amortization	50
■ Finance costs	30
■ Interest income*	(10)
Operating Profit Before Working Capital Charges	250
Adjustments for Changes in Working Capital:	
■ Trade receivables and short-term loan and advances	(20)
■ Inventories	(20)
■ Trade payables, short-term, provisions, and other current liabilities	10
Cash Generated from Operations	220
■ Direct taxes paid	(50)
<i>Net Cash from Operating Activities</i>	170
<i>B. Cash Flow from Investing Activities</i>	
■ Purchase of fixed assets	(100)
■ Increase of non-current investments	(10)
■ Reduction in long-term, loans and advances	10
■ Interest income	10
<i>Net Cash from Investing Activities</i>	(90)
<i>C. Cash Flow from Financing Activities</i>	
■ Increase in long term borrowings	20
■ Increase in short-term borrowings	10
■ Increase in deferred tax liabilities	5
■ Increase in long-term provisions	5
■ Dividend paid	(80)
■ Finance costs	(30)
<i>Net Cash from Financing Activities</i>	(70)
<i>Net Cash Generated (A+B+C)</i>	10
<i>Cash and Cash Equivalents at the beginning of Period</i>	50
<i>Cash and Cash Equivalents at the End of Period</i>	60

\* It is assumed that the entire other income is interest income.

### **3.5 ■ CONSOLIDATED FINANCIAL STATEMENTS**

Clause 32 of the listing agreement with the stock exchange(s) requires a company to provide consolidated financial statements (CFS) in addition to the stand-alone financial statements. CFS were not required under the companies Act, 1956. However, under the Companies Act 2013, all companies, listed or unlisted, are required to prepare CFS. The consolidated financial statements are prepared by consolidating the accounts of the parent company with those of its subsidiaries in accordance with Ind AS 110.

The consolidation of the financial statements has to be done on a line by line basis by adding together like items of assets, liabilities, income, and expenses after eliminating intra-group balances/transactions and resulting unrealised profits/losses in full. The amount shown in respect of reserves is the amount of the relevant reserves as per the balance sheet of the parent company and its share in the post-acquisition increase in the relevant reserves of the consolidated entities.

The consolidated financial statements are prepared using uniform accounting policies for like transactions and other events in similar circumstances. The consolidated financial statements are presented, to the extent possible, in the same format as that adopted by the parent company for its stand-alone financial statements.

It must be emphasised that internationally only consolidated financial statements are provided in the annual reports. In India, presently both the stand- alone as well as consolidated statements are provided. We too will gravitate toward the international practice. **In any case what really matters is the consolidated picture and not the stand-alone picture.**

### **3.6 ■ OTHER ITEMS IN THE ANNUAL REPORT**

The annual report of the company is perhaps the most important source of information about the affairs of the company.

In addition to the three financial statements, which form its core, the annual report contains the following:

- Auditor's Report
- Directors' Report
- Management Discussion and Analysis
- Report on Corporate Governance
- Notes Forming Part of the Financial Statements

**Auditor's Report** The financial statements of a joint stock company must be audited by an independent chartered account. After examining the accounting records of the company, the auditor renders an opinion as to whether the company's financial statements represent a "true and fair" view of its financial affairs and conform to Generally Accepted Accounting Principles (GAAP).

It must be emphasised that the auditor does not examine each and every transaction but examines evidence on a test basis using statistical sampling. Hence, audit is meant to provide "reasonable assurance" not "absolute assurance" about the fairness of financial statements.

**Directors' Report** The Directors' Report gives a summary of financial performance, recommends a dividend, provides information on appointment of directors, auditors, and cost auditors, and carries a Directors' Responsibility Statement. In addition, it contains information on credit rating, fixed deposits, employee stock option scheme, strategic acquisitions and alliances, human resources development, subsidiary companies, corporate social responsibilities, conservation of energy, technology absorption, and foreign exchange earnings and outgo.

**Management Discussion and Analysis** The section on Management Discussion and Analysis provides an overview of the industry, spells out the strategy and thrust areas of the company, dwells on the risks faced by the company and its risk mitigation initiatives, presents highlights of the company's financial performance, and gives an idea of its internal control system.

**Report on Corporate Governance** Required under Clause 49 of the Listing Agreement with stock exchanges, the corporate governance report gives information on the company's philosophy on corporate governance, board of directors, audit committee, shareholders/investors grievance committee, other board committees, remuneration of directors, and general shareholder information.

**Notes Forming Part of the Financial Statements** The financial statements, stand-alone as well as consolidated, are supported by notes which technically form part of them. These notes provide information on significant accounting policies and details relating to various items in the balance sheet and statement of profit and loss.

### 3.7 ■ MANIPULATION OF THE BOTTOM LINE

Within the provisions of GAAP, corporate managements have some discretion in influencing the occurrence, measurement, and reporting of various items. They may use this latitude to paint a desired (negative or positive, as the case may be) picture of a firm's finance. Put differently, they may resort to creative accounting which, unlike cooking the books, is generally legal. It is euphemistically also called financial engineering or earnings management. The devices commonly used for earnings management are as follows.

- Inflate the sales for the current year by advancing the sales from the following year.
- Sell an asset (whose market value is high but book value is low) to create non-operating profit that boosts the bottom line.
- Fiddle with the method and rate of depreciation. (A switch may be effected from the written down value method to the straight line method or vice versa).
- Change the method of stock valuation.
- Capitalise certain expenses like research and development costs and product promotion costs that are ordinarily written off in the statement of profit and loss.
- Defer discretionary expenditures (like repairs, advertising, research and development) to the following year.
- Make inadequate provision for certain known liabilities (gratuity, etc.) and treat certain liabilities as 'contingent liabilities.'
- Recognise the diminution in the carrying value of some investment in a period when the operating profit is high.
- Make extra provision during prosperous years and write them back in lean years.
- Revalue assets to create the impression of substantial reserves.
- Write off expenses directly from reserves. The Companies Act permits companies to write off expenses directly from share premium reserve, after seeking approval of the court.
- Lengthen the accounting year in an attempt to cover poor performance.

## **Accounting Manipulation: Some Examples**

Here are some conspicuous examples of accounting manipulation.

**Enron** Enron, which was involved in perhaps the most notorious accounting scandal of the early 2000s, filed for bankruptcy in December 2001-the largest bankruptcy filing in the U.S. history.

Starting as an operator of natural gas pipelines, Enron evolved into a global trader of gas, oil, electricity, and broad band internet capacity. Interestingly, during 1990s Enron was hailed as one of the most profitable and successful companies in the U.S. It was rated by *Fortune* magazine as 'The Most Innovative Company in America' for six consecutive years, from 1995 to 2000. While many facets of Enron's business were truly innovative and successful, Enron executives manipulated its financial statements to inflate the reported earnings-for example, in 2000, 96 percent of reported earnings were the result of accounting jugglery.

Enron employed sophisticated methods of accounting manipulation, but the essence of most of its deception was quite simple. Enron sold assets at inflated prices to other 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.

**WorldCom** On July 21, 2002, WorldCom filed for bankruptcy. It shocked investors because not long back WorldCom commanded a market capitalisation of \$120 billion. Beginning in 1998, WorldCom management resorted to a series of accounting manipulation which hid the firm's financial problems.

WorldCom's accounting fraud was in the form of reclassification of \$3.85 billion of operating expenses as long-term investment. It boosted WorldCom's reported earnings because while long-term investments are depreciated slowly over time, operating expenses are deducted from revenues immediately.

Some investors expressed concern over WorldCom's excessive investment relative to others in the industry. As Robert Olstein commented, "Red flags(were) things like big deviations between reported earnings and excess cash flow... (and) excessive capital expenditures for a long time."

**Satyam** On January 7, 2009, Ramalinga Raju, Chairman of Satyam Computer Services, the fourth largest Indian information technology company with sales of over ₹ 80 billion, sent a letter to the members of Satyam's board stating that over \$1 billion of cash on Satyam's balance sheet was fictitious and that the company had been, for several years overstating its earnings. Some speculate that perhaps the earnings may not have been overstated but pilfered from the company. On the same day, Satyam's market capitalisation fell from ₹ 12,068 crores to ₹ 2,689 crores, decimating the value of the firm by about 78 percent.

To save the company, the Government of India swiftly stepped in and appointed a new board to oversee the company. Backed by the government, the new board restored the confidence of customers and employees, invited bids from companies interested in acquiring a controlling stake in Satyam. On April 13, 2009 in less than 100 days after Ramalinga Raju's admission of fraud, Tech Mahindra emerged as the highest bidder. It paid ₹ 1,756 crore to acquire a 31 percent stake in the company (this was in the form to additional capital issued by the company). As per SEBI norms, Tech Mahindra made an open offer for another 20 percent at the bid price of ₹ 58. Finally, Tech Mahindra acquired 51 percent stake at a total cost of ₹ 2889 crore.

## **Why Do Companies Manipulate or Smoothen Earnings**

A variety of motives prompt firms to manipulate or smoothen earnings. The more common ones are:

- To project an image that the company is a low risk company (It is assumed that financial analysts regard earnings variability as a key factor in risk evaluation).
- To enhance managerial compensation, if the same is influenced in some way by reported earnings.
- To promote a perception that the management of the firm is competent.
- To communicate more meaningfully about the long-term prospects of the firm.

## **What Can You Do**

What can you do to read between the lines when corporate managements tend to manage the ‘bottom line’ by employing a variety of ingenious devices? Our suggestions are as follows:

- Acquire greater knowledge of how accountants prepare financial statements and what are the current financial reporting practices.
- Carefully peruse the notes to accounts in order to: (a) discover changes in accounting policies; and (b) learn about the nature and magnitude of contingent liabilities.
- Read the auditor’s report and understand the implications of the qualifications in that report.
- Look at the performance of the company over a period of time and do not attach much importance to the figures for one year. Remember that while manipulation may pay for a year or two, it tends to be a self-defeating exercise in the long run. This indeed is your best safeguard against corporate accounting gimmickry.

### **Potential Red Flags**

As an analyst, you should learn to identify potential red flags. Here is a list of common red flags.

- A qualified audit opinion.
- A change in accounting policy that is not satisfactorily explained.
- An unusual increase in accruals.
- A widening gap between reported income and cash flow from operations.
- Large adjustments in the fourth quarter.
- An abrupt change in the external or internal auditor.
- An increase in transactions with related parties.
- An unusual increase in short-term financing or lending.

## **3.8 ■ TAXES**

Taxes are often a major cash outflow for a firm. The magnitude of the tax burden is determined by the tax code, which is often amended. If the rules of taxation seem somewhat odd to you, remember that the tax code is significantly influenced by political forces. Hence it may not always make economic sense.

Taxes may be divided into two broad categories: direct taxes and indirect taxes. A tax is referred to as a direct tax if the impact and incidence of the tax is on the same person. Income tax, wealth tax, and gift tax are examples of direct taxes. A tax is regarded as an indirect tax if the impact and incidence of the tax is on different persons (the impact is on one person but through the process of shifting the incidence is on another). Excise duty, sales tax, and customs duty are the three important indirect taxes.

## **Corporate Income Tax**

A company's taxable income is determined after taking into account its revenues, expenses, and deductions on account of various incentives and reliefs. The taxable income is subject to a tax rate of 30 percent for domestic companies and 40 percent for foreign companies. In addition, there is a surcharge of 5 percent on such income tax and an educational cess on both the tax and surcharge (at present 3 percent).

**Depreciation** Depreciation is charged on blocks of assets which represent a group of assets, within the broad class of assets such as buildings, plant, machinery, and furniture, for which a common rate of depreciation is applicable. Depreciation is calculated by applying the prescribed rate (which varies between 5 percent and 100 percent) on the written down value (WDV) of the entire block. When an asset is sold the amount realised from the sale of that asset (after deducting expense on sales) will simply be deducted from the WDV of that block. If the amount realised is greater than the WDV of the block, the difference will be treated as a short term capital gain. In a case where all the assets in the block are disposed off and there is still a balance in the account of the block, such amount will be treated as short term capital loss.

It may be noted that when an asset is acquired and put to use during the previous year for a period less than 180 days then depreciation will be allowed only to the extent of 50 percent of the prescribed rate for that asset in the year of acquisition.

**Interest Expense versus Dividend Payment** While interest on borrowings is a tax-deductible expense, meaning that it can be deducted before determining the taxable income, dividend on share capital (equity as well as preference) is not a tax-deductible payment.

**Dividend Income** When a domestic company receives dividend from another domestic company, it is allowed a deduction of an amount equal to the amount of dividend received from another company provided it distributes that to its shareholders.

**Unabsorbed Business Loss and Depreciation** Unabsorbed business loss (other than speculation business loss) of any year can be carried forward and set off against income under the head of business income of subsequent years. Such carry forward can be done for eight subsequent years from the year in which the loss was computed.

Unabsorbed depreciation can be carried forward and set off against the income from any other head of subsequent years without any limitation as to the number of years.

**Exemptions and Deductions** A variety of exemptions and deductions are granted under the Income Tax Act. The important ones are: exemption of profits and gains from the export of articles or things or software from a unit established in a Free Trade Zone; exemption of profits and gains from the export of articles or things or computer software from a 100 percent exported oriented unit; deduction in respect of profits and gains from a new industrial undertaking; deduction in respect of profits from an industrial undertaking established in an industrially backward state.

**Minimum Alternate Tax** If the income tax payable on the total income of a company, as computed under the Income Tax Act, is less than 18.5 percent of its book profit, the tax payable shall be deemed to be 18.5 percent of such book profit. That is every company has to pay at least 18.5 percent of the book profit as tax. Book profit means the net profit shown in the profit and loss account prepared for company law purposes, subject to certain adjustments.

**Advance Tax** Advance tax is payable on the current income of the company in four instalments during the financial year. Specifically, companies are required to pay 15 percent of their estimated tax liability by June 15, 45 percent by September 15, 75 percent by December 15, and 100 percent by March 15.

## **Individual Income Tax**

Individuals pay taxes on salaries, investment income, and other incomes. The salient features of individual taxation are described below briefly.

**Progressive Tax structure** Tax rates on individual income are progressive, implying that the higher the income, the larger the percentage paid in taxes. For the assessment year 2020-21, the individual tax rates are as follows:

<b>Income Range</b>	<b>Tax Rate</b>
₹ 0 – ₹ 250,000	0%
₹ 250,001 – ₹ 500,000	5%
₹ 500,001 – ₹ 10,00,000	20%
₹ 1,000,000 and above	30%

**Interest and Dividend Income** Subject to certain exemptions and deductions, interest received by an individual from bank deposits, company debentures, government securities, and so on is added to other income for tax purposes. Likewise, dividend received by an individual from companies and mutual funds, subject to certain exemptions, is added to other income for tax purposes.

**Capital Gains** Assets such as shares, debentures, and real estate are called capital assets. If you buy a capital asset and later sell it at a price greater than your cost, the gain is called a capital gain; if you sell it at a loss, it is called a capital loss.

Capital gains are classified as long-term and short-term, depending on the period of holding of the capital asset. If the asset is held for more than 12 months in the case of listed shares and securities (or more than 36 months in the case of other assets), the gain is treated as a long-term capital gain; otherwise the gain is treated as a short-term capital gain.

Long-term capital gains, after the benefit of indexation, are taxed at a flat rate of 20 percent. However, long-term capital gains arising from the sale of equity shares or units of an equity-oriented mutual fund are exempt from tax, provided the transaction is chargeable to securities transaction tax.

Short-term capital gains from the sale of equity shares and units of an equity-oriented mutual fund are taxed at 15 percent provided the transaction

is chargeable to security transaction tax. Other short-term capital gains are taxed at the rate applicable to the assessee.

## **Indirect Taxes**

Historically, indirect taxes in India consisted of central excise duty, state level value added tax, octroi, and service tax. With the introduction of Goods and Services Tax (GST) from July 1, 2017, all these indirect taxes have been subsumed in GST. The salient features of the GST are:

- Barring some exceptions, the same commodity has the same rate, pan-India.
- Refund is given for taxes paid on input. This is done at each stage, so that there is no cascading tax on tax.
- For commodities, only two buckets are there to claim input tax credit —one for State GST and another for Central GST. For services there is only one bucket.
- There are five slabs for GST: 0%, 5%, 12%, 18%, and 28%. These rates are all-inclusive, except for the cess on demerit, luxury and polluting items such as tobacco, luxury cars, aerated drinks, and coal.
- Real estate (except for land leasing), alcohol, petroleum products, and electricity are not included in GST.
- The GST council is the body to recommend any changes in GST, including rates. It is chaired by the Union finance minister and has state finance ministers are members.

### **3.9 ■ MODIFYING ACCOUNTING DATA FOR MANAGERIAL DECISIONS**

So far we looked at financial statements as they are presented in the annual report. These statements are meant more for creditors and tax authorities and less for managers and equity investors. Hence, for corporate decision making and fundamental equity valuation, certain modifications are required.

## **Operating Assets and Net Operating Capital**

Firms differ in terms of their financial structures, tax situations, and the amounts of non-operating assets. These differences affect traditional performance measures such as profit after tax and return on equity. Thus, two firms (or two divisions within the same firm) which have similar operating performance and operating assets, may appear to perform differently. To assess managerial performance, we should look at the manager's ability to produce operating income (EBIT) with the operating assets controlled by them.

The first modification to the traditional accounting framework is to divide total assets into two categories, viz., operating assets and non-operating assets. Operating assets consist of assets necessary to operate the business, whereas non-operating assets consist of assets such as surplus land, excess cash, and investments in subsidiaries. Operating assets may be further divided into long-term operating assets (such as plant and equipments) and operating current assets (such as inventories, receivables, and so on).

While long-term operating assets are wholly supported by investor-supplied capital (share capital, debentures, and loans), operating current assets are partly supported by investor-supplied capital and partly supported by operating current liabilities (trade payables, accrued wages, accrued taxes). The difference between operating current assets and operating current liabilities is called net operating working capital:

Net operating working capital = Operating current assets – Operating current liabilities

Using the balance sheet data given in [Exhibit 3.1](#), we can calculate the long-term operating assets and net operating working capital.

Long-term operating assets = ₹ 550 million

Net operating working capital = (Cash + Trade receivables + Inventories + Advances given) – (Trade payables + Other current liabilities + Provisions)

$$= (60 + 140 + 160 + 20) - (120 + 30 + 10) = ₹ 220 \text{ million}$$

By definition,

Net operating capital = Long-term operating assets + Net operating working capital

So, Horizon's

$$\text{Net operating capital} = 550 + 220 = ₹ 770 \text{ million at the end of 20X1}$$

## **Net Operating Profit After Taxes (NOPAT)**

Net income is influenced by operating performance as well as capital structure. If two companies have identical operating performance, the company that has more debt (and consequently higher interest burden) will report a lower net income. While net income is important, it does not truly reflect the performance of operating managers. For judging the performance of operating managers, net operating profit after taxes, or NOPAT, is a better measure. NOPAT is the profit a company would generate if it had no debt and no excess liquidity. NOPAT may be defined as follows:

$$\text{NOPAT} = (\text{PBT} + \text{Interest} - \text{Other Income}) (1 - \text{Tax Rate})$$

Using data from the statement of profit and loss given in [Exhibit 3.2](#), Horizon's NOPAT for 20X1 is:

$$\text{NOPAT} = (180 + 30 - 10) (1 - 0.3) = ₹ 140 \text{ million}$$

## **Free Cash Flow**

Earlier we defined net cash flow as profit after tax plus adjustments for non cash items like depreciation and amortisation. One may be tempted to believe that management can dispose of the net cash flow in any manner it likes. However, this is not true because a company has to invest in fixed assets and net working capital on a continuing basis to sustain its operation. Considering this business reality, we now define another term, viz., free cash flow. It is the cash flow available for distribution to investors (lenders and shareholders) after the firm has made investments in fixed assets and net working capital to support its operations.

Note that the statement of cash flows, a standard financial accounting statement that we discussed earlier, is concerned with a different issue. It focuses on the net change in the cash and cash equivalent position of the firm. Don't confuse that with what is discussed in this section.

Free cash flow is defined as follows:

$$FCF = NOPAT - \text{Net investment in operating capital}$$

We know what NOPAT is. Net investment in operating capital is additional investment in operating capital made during the year. Looking at the balance sheet of Horizon Limited, we find that Horizon had total net operating capital of ₹ 690 million at the end of 20X0 and ₹ 770 million at the end of 20X1. Therefore, during 20X1, the company made a net investment in operating capital of ₹ 80 million.

Horizon's free cash flow in 20X1 was:

$$FCF = NOPAT - \text{Net investment in operating capital}$$

$$= ₹ 140 \text{ million} - ₹ 80 \text{ million}$$

$$= ₹ 60 \text{ million}$$

An equivalent way of expressing free cash flow is:

$$FCF = (NOPAT + \text{Depreciation}) - \text{Gross investment in operating capital}$$

## The Uses of FCF

FCF is the amount of cash available for distribution to all investors (shareholders and debt holders). So it can be used for:

- Interest payment on debt
- Repayment of debt
- Dividend payment on equity
- Share buyback
- Purchase of marketable securities and other nonoperating assets

Since FCF is the amount of cash available for distribution to all investors (shareholders and debt holders), the value of company (which is the same thing as the value of investor claims) is the present value of its expected future FCFs discounted at the company's weighted average cost of capital (WACC). Note that the WACC reflects the rate of return required by investors.

## Evaluating FCF

Should a negative free cash flow be always considered bad? It depends. If the negative free cash flow is caused by a negative operating cash flow it is bad because it suggests that the firm is experiencing operating problems. On the other hand, if the negative free cash flow is caused by investments in fixed assets and working capital, it need not cause concern as long as these investments are expected to earn satisfactory returns. Indeed, rapidly growing firms do have negative free cash flows as they require external infusion of funds to support growth.

To determine whether growth is profitable we examine the return on invested capital (ROIC) and compare it with the weighted average cost of capital (WACC).

ROIC is defined as:

$$\text{ROIC} = \frac{\text{NOPAT}}{\text{Operating capital}}$$

Horizon's ROIC for 20X1 was:  $140 / 770 = 0.182$  or 18.2 percent

This has to be compared with the weighted average cost of capital (WACC). We will discuss the calculation of WACC in a subsequent chapter.

## SUMMARY

- The **balance sheet** shows the financial position (or condition) of a firm at a given point of time. It provides a snapshot and may be regarded as a static picture. The income statement (referred to in India as **the statement of profit and loss**) reflects the performance of a firm over a period of time. The **cash flow statement** portrays the flow of cash through the business during a given accounting period.
- To understand how cash flows have been influenced by various decisions, it is helpful to classify cash flows into three categories: cash flows from operating activities, cash flows from investing activities, and cash flows from financing activities.
- Corporate managements have discretion in influencing the occurrence, measurement and reporting of revenues, expenses, assets and liabilities. They may use this latitude to manage the bottom line.
- **Taxes** can be one of the major cash outflows for a firm. The magnitude of the tax burden is determined by the tax code, which is subject to change.
- Taxes may be divided into two broad categories: **direct taxes** and **indirect taxes**. A tax is referred to as a direct tax if the impact and incidence of the tax is

on the same person. A tax is regarded as an indirect tax if the impact and incidence of the tax is on different persons.

- For corporate decision making and fundamental equity valuation, we have to work with modified accounting data and use measures like operating assets, NOPAT, and free cash flow.
- **Free cash flow** represents the cash available for distribution to investors after meeting the investment needs of the company.

## QUESTIONS

1. List the important functions performed by the financial statements.
2. Present the format of the balance sheet.
3. Describe the various asset accounts and liability accounts found on a company's balance sheet.
4. "Accounting and economic values tend to differ." Why?
5. Discuss the important items found on the statement of profit and loss.
6. Explain the sources of divergence between accounting income and economic income.
7. List the details provided in the unaudited quarterly results.
8. Why do profits and cash flow differ.
9. What are the sources of cash and what are the uses of cash?
10. Give the format for the cash flow statement.
11. What devices are commonly employed to manage the bottom line?
12. Why do companies manipulate earnings?
13. What are the salient features of corporate income tax?
14. What are the salient features of individual income tax?
15. Explain the following terms: operating capital, NOPAT, ROIC, and free cash flow.

## SOLVED PROBLEMS

3.1 The financial statements of Zenith Limited are shown below:

Balance Sheet of Zenith Ltd. as at March 31, 20X2

	₹ in Million	
	20X2	20X1
ASSETS		
Non-current assets	643	610

	<b>₹ in Million</b>	
Property, plant, and equipment	520	500
Investments	101	90
Long-term loans and advances	22	20
Current assets	1100	1030
Inventories	510	480
Investments	50	80
Trade receivables	480	420
Cash and cash equivalents	12	10
Loans	48	40
<b>Total</b>	<b>1743</b>	<b>1640</b>

#### EQUITY AND LIABILITIES

Equity	860	800
Equity share capital (Par value ₹ 10)	300	300
Other equity	560	500
Non-current liabilities	565	530
Borrowings	420	400
Provisions	70	60
Deferred tax liabilities (net)	75	70
Current liabilities	318	310
Borrowings	190	200
Trade payables	90	80
Other current liabilities	26	20
Short-term provisions	12	10
<b>Total</b>	<b>1743</b>	<b>1640</b>

Statement of Profit and Loss for Zenith Ltd. for the year ended March 31, 20X2

	<b>₹ in million</b>
Revenue from operations	1000
Other income@	30

	₹ in million
Total income	1030
Expenses	
Material expenses	420
Employee benefits expenses	300
Finance costs	70
Depreciation and amortization expenses	50
Other expenses	28
Total expenses	868
Profit before exceptional items and tax	162
Exceptional items	—
Profit before tax	162
Tax expenses	42
Profit (loss) for the period	120
Dividends	60

@ Consists entirely of interest income.

Prepare the cash flow statement for the period 1.4.20X1 to 31.3.20X2.

*Solution*

#### Cash Flow Statement

	₹ in million
<b>A. Cash Flow from Operating Activities</b>	
Profit before tax	162
Adjustments for:	
■ Depreciation and amortisation	50
■ Finance costs	70
■ Interest income	−30
Operating profit before working capital changes	252
Adjustments for changes in working capital:	
■ Trade receivables and short-term loan and advances	−68
■ Inventories	−30

	₹ in million
■ Trade payables, short-term provisions, and other current liabilities	18
Cash generated from operations	172
■ Direct taxes paid	-42
Net cash from operating activities	130
<b>B. Cash Flow from Investing Activities</b>	
■ Purchase of fixed assets	-70
■ Increase of non-current investments	-11
■ Increase in long-term loans and advances	-2
■ Interest income	30
Decrease in current investments	30
Net cash used in investing activities	-23
<b>C. Cash Flow from Financing Activities</b>	
■ Increase in long-term borrowings	20
■ Increase in short-term borrowings	-10
■ Increase in deferred tax liabilities	5
■ Increase in long-term provisions	10
■ Dividend paid	-60
■ Finance costs	-70
Net Cash from Financing Activities	-105
Net Cash Generated (A + B + C)	2
Cash and Cash Equivalents at Beginning of Period	10
Cash and Cash Equivalents at the End of Period	12

## PROBLEMS

**3.1 Cash Flow Statement** The comparative balance sheets of Laxmi Company are given below:

	₹ in million	
Assets	As on 31.3.20X0	As on 31.3.20X1
Property, plant, and equipment	280	300

Inventories	120	140
Trade receivables	80	100
Cash and cash equivalents	20	30
	500	570
<b><i>Equity and Liabilities</i></b>		
Equity share capital	100	120
Other equity	140	160
Borrowings	160	170
Trade payables	100	120
	500	570

The Statement of profit and loss of Laxmi Company is given below:

<b>20X0–20X1</b>	
Revenues from operation	1200
Total income	1200
<b>Expenses</b>	
Material and other expenses	1050
Finance costs	30
Depreciation and amortisation	30
Total expenses	1110
Profit before Tax	90
Tax expense	30
Profit (Loss) for the period	60
Dividends	40

Required: Prepare the Cash flow Statement for the period of 1.4.20X0 to 31.3.20X1

## PRACTICAL ASSIGNMENT

For the company you have chosen, examine the cash flow statements for the last three years. What inferences can you draw from them?

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter3/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter3/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Additional Solved Problems
- Excel on Solved Problems



## 4 CHAPTER

# Analysis of Financial Statements

## Learning Objectives

After studying this chapter you should be able to:

- ✓ Calculate and interpret various measures of liquidity, leverage, turnover, profitability, and valuation.
- ✓ Use the Du Pont formula to understand what determines the firm's return on assets and return on equity.
- ✓ Show how standardised financial statements are constructed and interpreted.
- ✓ Discuss the problems faced in financial statement analysis.
- ✓ Suggest guidelines for using financial statement analysis.

In the [previous chapter](#), we looked at the contents of the financial statements and pointed towards the danger of imputing economic significance to accounting numbers. Yet, financial analysts depend primarily on these statements to diagnose financial performance. Why? It appears that there are three principal reasons: (i) As long as the accounting biases remain more or less the same over time, meaningful inferences can be drawn by examining trends in raw data and in financial ratios. (ii) Since similar biases characterise various firms in the same industry, inter-firm comparisons are useful. (iii) Experience seems to suggest that financial analysis 'works' if one is aware of accounting biases and makes adjustments for the same.

While information found in published financial statements is often not enough to form conclusive judgments about firm performance, financial statements do provide important clues about what needs to be examined in greater detail. Analysis of financial statements is of interest to lenders (short-term as well as long-term), investors, security analysts, managers, corporate boards, regulators, and others. Financial statement analysis may be done for a variety of purposes, which may range from a simple analysis

of the short-term liquidity position of the firm to a comprehensive assessment of the strengths and weaknesses of the firm in various areas. It is helpful in assessing corporate excellence, judging creditworthiness, forecasting bond ratings, predicting bankruptcy, and assessing market risk.

## 4.1 ■ FINANCIAL RATIOS

A ratio is an arithmetical relationship between two figures. Financial ratio analysis is a study of ratios between various items or groups of items in financial statements. Financial ratios have been classified in several ways. For our purposes, we divide them into five broad categories as follows:

- Liquidity ratios
- Leverage ratios
- Turnover ratios
- Profitability ratios
- Valuation ratios

To facilitate the discussion of various ratios, the financial statements of Horizon Limited, shown in [Exhibit 4.1](#) and [4.2](#), will be used.

**Exhibit 4.1 | Balance Sheet of Horizon Limited as at March 31, 20X1**

	₹ in million	
	20X1	20X0
<b>ASSETS</b>		
Non-current Assets	600	550
■ Property, plant, and equipment	500	450
■ Investments	50	40
■ Long-term loans and advances	50	60
Current Assets	400	350
■ Inventories	20	20
■ Investments	160	140
■ Trade receivables	140	120
■ Cash and cash equivalents	60	50
■ Loans	20	20
	<u>1000</u>	<u>900</u>
<b>EQUITY AND LIABILITIES</b>		
Equity	500	450
■ Equity share capital (Par value ₹ 10)	100	100
■ Other equity	400	350
Non-current Liabilities	300	270
■ Borrowings	200	180
■ Provisions	50	45
■ Deferred tax liabilities (net)	50	45
Current Liabilities	200	180
■ Borrowings	40	30
■ Trade payables	120	110
■ Other current liabilities	30	30
■ Short-term provisions	10	10
	<u>1,000</u>	<u>900</u>

**Exhibit 4.2 | Statement of Profit and Loss for Horizon Limited  
for the Year Ending March 31, 20X1**

₹ IN MILLION		Previous Period
	Current Period	Previous Period
■ Revenues from Operations	1290	1172
■ Other Income	10	8
■ Total Income	1300	1180
■ Expenses		
■ Material expenses	600	560
■ Employee benefit expenses	200	180
■ Finance costs	30	25
■ Depreciation and amortisation expenses	50	45
■ Other expenses	240	210
■ Total Expenses	1120	1020
■ Profit Before Exceptional and Extraordinary Items and Tax	180	160
■ Exceptional Items	-	-
■ Profit Before Extraordinary Items and Tax	180	160
■ Extraordinary Items	-	-
■ Profit Before Tax	180	160
■ Tax Expense	50	40
■ Profit (Loss) for the Period	130	120
■ Dividend	80	
■ Earning Per Equity Share (in rupees)		
■ Basic	13	
■ Diluted	13	

## Liquidity Ratios

Liquidity refers to the ability of a firm to meet its obligations in the short run, usually one year. Liquidity ratios are generally based on the relationship between current assets (the sources for meeting short-term obligations) and current liabilities. The important liquidity ratios are: current ratio, acid-test ratio, and cash ratio.

**Current Ratio** A very popular ratio, the current ratio is defined as:

$$\frac{\text{Current assets}}{\text{Current liabilities}}$$

*Current assets* include cash, current investments, trade receivables, inventories (stocks), loans and advances, and pre-paid expenses. *Current liabilities* represent liabilities that are expected to mature in the next twelve months. These comprise of (i) loans, secured or unsecured, that are due in the next twelve months and (ii) current liabilities and provisions.

Horizon Limited's current ratio for 20X1 is  $400/200 = 2.00$

The current ratio measures the ability of the firm to meet its current liabilities - current assets get converted into cash during the operating cycle of the firm and provide the funds needed to pay current liabilities. Apparently, the higher the current ratio, the greater the short-term solvency. However, in interpreting the current ratio the composition of current assets must not be overlooked. A firm with a high proportion of current assets in the form of cash and trade receivables is more liquid than one with a high proportion of current assets in the form of inventories even though both the firms have the same current ratio.

The general norm for current ratio in India is 1.33. Internationally it is 2.

**Acid-test Ratio** Also called the quick ratio, the acid-test ratio is defined as:

$$\frac{\text{Quick assets}}{\text{Current liabilities}}$$

Quick assets are defined as current assets excluding inventories.

Horizon's acid-test ratio for 20X1 is:  $(400 - 160)/200 = 1.20$

The acid-test ratio is a fairly stringent measure of liquidity. It is based on those current assets which are highly liquid - inventories are excluded from the numerator of this ratio because inventories are deemed to be the least liquid component of current assets.

**Cash Ratio** Because cash and bank balances and short term marketable securities are the most liquid assets of a firm, financial analysts look at cash ratio, which is defined as:

$$\text{Cash ratio} = \frac{\text{Cash and bank balances} + \text{Current investments}}{\text{Current liabilities}}$$

Horizon's cash ratio for 20X1 is:

$$(60 + 20) / 200 = 0.40$$

Clearly, the cash ratio is perhaps the most stringent measure of liquidity. Indeed, one can argue that it is overly stringent. Lack of immediate cash may not matter if the firm can stretch its payments or borrow money at short notice. Aren't financial managers quite skillful at these things?

## Leverage Ratios

Financial leverage refers to the use of debt finance. While debt capital is a cheaper source of finance, it is also a riskier source of finance. Leverage ratios help in assessing the risk arising from the use of debt capital.

Two types of ratios are commonly used to analyse financial leverage: structural ratios and coverage ratios. *Structural ratios* are based on the proportions of debt and equity in the financial structure of the firm. The important structural ratios are: debt-equity ratio and debt-assets ratio. *Coverage ratios* show the relationship between debt servicing commitments and the sources for meeting these burdens. The important coverage ratios are: interest coverage ratio, fixed charges coverage ratio, and debt service coverage ratio.

**Debt-equity Ratio** The debt-equity ratio shows the relative contributions of creditors and owners. It is defined as:

$$\frac{\text{Total liabilities (Debt)}}{\text{Shareholders' funds (Equity)}}$$

The numerator of this ratio consists of all liabilities<sup>1</sup>, non-current and current, and the denominator consists of share capital and reserves and surplus<sup>2</sup>.

Horizon's debt-equity ratio for the 20X1 year-end is:

$$(300 + 200) / 500 = 1.0$$

In general, the lower the debt-equity ratio, the higher the degree of protection enjoyed by the creditors. In using this ratio, however, the following points should be borne in mind:

- The book value of equity often understates its market value. This happens because tangible assets are carried at their historical values less depreciation and many highly valuable intangible assets are not recorded on the balance sheet.
- Some forms of debt (like term loans, secured debentures, and secured short-term bank borrowing) are usually protected by charges on specific assets and hence enjoy superior protection.

**Debt-asset Ratio** The debt-asset ratio measures the extent to which borrowed funds support the firm's assets. It is defined as:

$$\frac{\text{Debt}}{\text{Assets}}$$

The numerator of this ratio includes all debt, short-term as well as long-term, and the denominator of this ratio is the total of all assets (the balance sheet total).

Horizon's debt- asset ratio for 20X1 is:  $500 / 1000 = 0.5$

This ratio is related to the debt-equity ratio as follows:

$$\frac{\text{Debt}}{\text{Assets}} = \frac{\text{Debt}/\text{Equity}}{1 + \text{Debt}/\text{Equity}} \quad (4.1)_3$$

**Interest Coverage Ratio** Also called the times interest earned, the interest coverage ratio is defined as:

$$\frac{\text{Profit before interest and taxes}}{\text{Interest}}$$

Horizon's interest coverage ratio for 20X1 is:  $210 / 30 = 7.0$

Note that profit before interest and taxes is used in the numerator of this ratio because the ability of a firm to pay interest is not affected by tax payment, as interest (or finance costs) on debt funds is a tax-deductible expense. A high interest coverage ratio means that the firm can easily meet its interest burden even if earnings before interest and taxes suffer a considerable decline. A low interest coverage ratio may result in financial embarrassment when earnings before interest and taxes decline. This ratio is widely used by lenders to assess a firm's debt capacity. Further, it is a major determinant of bond rating.

Though widely used, this ratio is not a very appropriate measure of interest coverage because the source of interest payment is cash flow before interest and taxes, not profit before interest and taxes. In view of this, we may use a modified interest coverage ratio:

$$\frac{\text{Profit before interest and taxes} + \text{Depreciation and amortisation}}{\text{Interest}}$$

For Horizon Limited, this ratio for 20X1 is:  $(210 + 50) / 30 = 8.67$

**Fixed Charges Coverage Ratio** This ratio shows how many times the cash flow before interest and taxes covers all fixed financing charges. It is defined as:

$$\frac{\text{Profits before interest and taxes} + \text{Depreciation and amortisation}}{\text{Interest} + \frac{\text{Repayment of loan}}{1 - \text{Tax rate}}}$$

In the denominator of this ratio the repayment of loan alone is adjusted upwards for the tax factor because the loan repayment amount, unlike interest, is not tax deductible.

Horizon's tax rate has been assumed to be 30 percent.  
Horizon's fixed charges coverage ratio for 20X1 is:

$$\frac{\frac{210 + 50}{50}}{30 + \frac{(1 - 0.3)}{}} = 2.56$$

This ratio measures debt servicing ability comprehensively because it considers both the interest and the principal repayment obligations. The ratio may be amplified to include other fixed charges like lease payment and preference dividends<sup>4</sup>.

**Debt Service Coverage Ratio** Used by financial institutions in India, the debt service coverage ratio is defined as:

$$\frac{\text{Profit after tax} + \text{Depreciation} + \text{Other non-cash charges} + \text{Interest on term loan}}{\text{Interest on term loan} + \text{Lease rentals} + \text{Repayment of term loan}}$$

Financial institutions calculate the average debt service coverage ratio for the period during which the term loan for the project is repayable. Normally, financial institutions regard a debt service coverage ratio of 1.5 to 2.0 as satisfactory.

## Turnover Ratios

Turnover ratios, also referred to as activity ratios or asset management ratios, measure how efficiently the assets are employed by a firm. These ratios are based on the relationship between the level of activity, represented by revenues or cost of goods sold, and levels of various assets. The important turnover ratios are: inventory turnover, average collection period, receivables turnover, fixed assets turnover, and total assets turnover.

**Inventory Turnover** The inventory turnover, or stock turnover, measures how fast the inventory is moving through the firm and generating sales. It is defined as:

$$\frac{\text{Revenues from operations}}{\text{Average inventory}}$$

Horizon's inventory turnover for 20X1 is:

$$\frac{1290}{(160 + 140)/2} = 8.6$$

The inventory turnover reflects the efficiency of inventory management. The higher the ratio, the more efficient the management of inventories and vice versa. However, this may not always be true. A high inventory turnover may be caused by a low level of inventory which may result in frequent stock outs and loss of sales and customer goodwill.

Note that as inventories tend to change over the year, we use the average of the inventories at the beginning and the end of the year. *In general, averages may be used when a flow figure (revenues from operations) is related to a stock figure (inventories).*

**Debtors' Turnover** This ratio shows how many times sundry debtors or trade receivables turn over during the year. It is defined as:

$$\frac{\text{Net credit sales}}{\text{Average trade receivables}}$$

If the figure for net credit sales is not available, one may have to make do with the revenues from operations.

Horizon's debtors' turnover for 20X1 is:

$$1290 \div [(140+120)/2] = 9.92$$

Obviously, the higher the debtors' turnover the greater the efficiency of credit management.

**Average Collection Period** The average collection period represents the number of days' worth of credit sales that is locked in trade receivables. It is defined as:

$$\frac{\text{Average trade receivables}}{\text{Average daily credit sales}}$$

If the figure for credit sales is not available, one may have to make do with the revenue from operations.

Horizon's average collection period for 20X1 is:

$$\frac{[(140 + 120)/2]}{(1290/365)} = 36.8 \text{ days}$$

Note that the average collection period and the debtors' turnover are related as follows:

$$\text{Average collection period} = \frac{365}{\text{Debtors' turnover}}$$

The average collection period may be compared with the firm's credit terms to judge the efficiency of credit management. For example, if the credit terms are 2/10, net 45, an average collection period of 85 days means that the collection is slow and an average collection period of 40 days means that the collection is prompt. An average collection period which is shorter than the credit period allowed by the firm needs to be interpreted carefully. It may mean efficiency in credit management or excessive conservatism in credit granting that may result in the loss of some desirable sales.

**Fixed Assets Turnover** This ratio measures sales per rupee of investment in fixed assets. It is defined as:

$$\frac{\text{Revenues from operations}}{\text{Average net fixed assets}}$$

Horizon's fixed assets turnover ratio for 20X1 is:

$$1290 \div [(500 + 450)/2] = 2.72$$

This ratio is supposed to measure the efficiency with which fixed assets are employed - a high ratio indicates a high degree of efficiency in asset utilisation and a low ratio reflects inefficient use of assets. However, in interpreting this ratio, one caution should be borne in mind. When the fixed assets of the firm are old and substantially depreciated, the fixed assets turnover ratio tends to be high because the denominator of the ratio is very low.

**Total Assets Turnover** Akin to the output-capital ratio in economic analysis, the total assets turnover is defined as:

$$\frac{\text{Total revenues}}{\text{Average total assets}}$$

Horizon's total assets turnover ratio for 20X1 is:

$$1300 \div [(1000+900)/2] = 1.37$$

This ratio measures how efficiently assets are employed, overall.

## Profitability Ratios

Profitability reflects the final result of business operations. There are two types of profitability ratios: profit margins ratios and rate of return ratios. *Profit margin ratios* show the relationship between profit and revenues. Since profit can be measured at different stages, there are several measures of profit margin. The most popular profit margin ratios are: gross profit margin ratio, operating profit margin ratio, and net profit margin ratio. *Rate of return ratios* reflect the relationship between profit and investment. The important rate of return measures are: return on assets, earning power, return on capital employed, and return on equity.

**Gross Profit Margin Ratio** The gross profit margin ratio is defined as:

$$\frac{\text{Gross profit}}{\text{Revenues from operations}}$$

Gross profit is defined as the difference between revenues from operations and cost of goods sold. Cost of goods sold is the sum of manufacturing costs relating to the operating revenues of the period. Manufacturing costs include material costs, employee benefit costs for manufacturing personnel, and manufacturing expenses. Since the published financial statements lump together employee benefit expenses for manufacturing personnel and non-manufacturing personnel and subsume manufacturing expenses under other expenses (a catch-all category that includes a lot of expenses relating to sales and general administration), it is not possible for the external analyst to estimate accurately the cost of goods sold. For our purposes, we will assume that one-half of employee benefit expenses and one-half of other expenses relate to manufacturing – this is indeed a heroic assumption. So, the estimated manufacturing costs are ₹ 820 million – material cost (600) + employee benefit cost (100) + other expenses (120). This means that the gross profit for 20X1 is:  $1290 - 820 = ₹ 470$  million. Hence, Horizon's gross profit margin ratio for 20X1 is:

$$470 / 1290 = 0.36 \text{ or } 36 \text{ percent}$$

This ratio shows the margin left after meeting manufacturing costs. It measures the efficiency of production as well as pricing. To analyse the factors underlying the variation in gross profit margin the proportion of various elements of cost (labour, materials, and manufacturing overheads) to sales may be studied in detail.

**EBITDA Margin** This is defined as:

$$\frac{\text{Earnings before interest, taxes, depreciation and amortisation}}{\text{Net sales}}$$

Horizon's EBITDA margin for 20X1 is:  $260 \div 1300 = 0.16$  or 16 percent.

This ratio measures the margin left after meeting manufacturing expenses and selling and general administration expenses. A popular ratio, it reflects the operating efficiency of the firm.

**Net Profit Margin Ratio** The net profit margin ratio is defined as:

$$\frac{\text{Profit after tax}}{\text{Total revenues}}$$

Horizon's net profit margin ratio for 20X1 is:

$$130 \div 1300 = 0.10 \text{ or } 10 \text{ percent}$$

This ratio shows the earnings left for shareholders (both equity and preference) as a percentage of total revenues. It measures the overall efficiency of production, administration, selling, financing, pricing, treasury, and tax management. Jointly considered, the gross and net profit margin ratios provide a valuable understanding of the cost and profit structure of the firm and enable the analyst to identify the sources of business efficiency/inefficiency.

**Return on Assets** The return on assets (ROA), also called return on investments, is defined as:

$$\text{ROA} = \frac{\text{Profit after tax}}{\text{Average total assets}}$$

Horizon's ROA for the year 20X1 is:

$$130 \div [(1000 + 900) / 2] = 13.7 \text{ percent}$$

Though widely used, ROA is an odd measure because its numerator measures the return to shareholders (equity and preference) whereas its denominator represents the contribution of all investors (shareholders as well as lenders).

**Earning Power** The earning power is defined as:

$$\text{Earning power} = \frac{\text{Profit before interest and tax}}{\text{Average total assets}}$$

Horizon's earning power for the year 20X1 is:

$$210 \div [(1000 + 900) / 2] = 22.1 \text{ percent}$$

Earning power is a measure of business performance which is not affected by interest charges and tax burden. It abstracts away the effect of capital structure and tax factor and focuses on operating performance. Hence it is eminently suited for inter-firm comparison. Further, it is internally consistent. The numerator represents a measure of pre-tax earnings belonging to all sources of finance and the denominator represents total financing.

**Return on Capital Employed** The return on capital employed is defined as:

$$\text{ROCE} = \frac{\text{Profit before interest and tax (1 - Tax rate)}}{\text{Average total assets}}$$

The numerator of this ratio viz., profit before interest and tax (1-tax rate) is also called net operating profit after tax (NOPAT). Note that the tax rate is the statutory tax rate which is currently 30 percent.

Horizon's ROCE for the year 20X1 is:

$$210 (1 - 0.3) / [(1000 + 900) / 2] = 15.5 \text{ percent}$$

ROCE is the post-tax version of earning power. It considers the effect of taxation, but not the capital structure. It is internally consistent. Its merit is that it is defined in such a way that it can be compared directly with the post-tax weighted average cost of capital of the firm.

**Return on Equity** A measure of great interest to equity shareholders, the return on equity is defined as:

$$\frac{\text{Equity earnings}}{\text{Average equity}}$$

The numerator of this ratio is equal to profit after tax less preference dividends. The denominator includes all contributions made by shareholders (paid-up capital + reserves and surplus). This ratio is also called the return on net worth or the return on shareholders' funds. For our purpose equity, net worth, and shareholders' funds are synonymous.

Horizon's return on equity for 20X1 is:

$$130 \div [(500 + 450) / 2] = 27.4 \text{ percent}$$

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. It is influenced by several factors: earning power, debt-equity ratio, average cost of debt funds, and tax rate. Because ROA and ROE are commonly used

measures, you must remember that they are accounting rates of return. Hence these measures may be properly referred to as return on book assets and return on book equity.

In judging all the profitability measures it should be borne in mind that the historical valuation of assets imparts an upward bias to profitability measures during an inflationary period. This happens because the numerator of these measures represents current values, whereas the denominator represents historical values.

## Valuation Ratios

Valuation ratios indicate how the company and its equity are assessed in the capital market. Since the market value of the company and its equity reflect the combined influence of risk and return, valuation ratios are the most comprehensive measures of a firm's performance. The important valuation ratios are: yield, price-earnings ratio, EV-EBITDA multiple, market value to book value ratio, and Q ratio.

**Yield** A measure of total return to equity shareholders, yield is defined as:

$$\frac{\text{Dividend} + \text{Price change}}{\text{Initial price}}$$

Horizon's dividend per share for 20X1 is ₹ 8. Its market price per share was ₹ 180 at the beginning of 20X1 and ₹ 200 at the end of 20X1. Hence, its yield for 20X1 was:

$$\frac{8 + (200 - 180)}{180} = 0.156 \text{ or } 15.6 \text{ percent}$$

Yield represents the rate of return actually earned by equity shareholders. It is compared with the rate of return required by equity shareholders.

**Price-earnings Ratio** Perhaps the most popular financial statistic in stock market discussion, the price-earnings ratio is defined as:

$$\frac{\text{Market price per share}}{\text{Earnings per share}}$$

The market price per share of Horizon as on 31<sup>st</sup> March 20X1 is ₹ 200. The earnings per share is simply: profit after tax less preference dividend divided by the number of outstanding equity shares.

Horizon's price-earnings ratio at the end of 20X1 is:

$$200 / 13 = 15.4$$

The price-earnings ratio (or the price-earnings multiple as it is commonly referred to) is a summary measure which primarily reflects the following factors: growth prospects, risk characteristics, shareholder orientation, corporate image, and degree of liquidity.

**EV-EBITDA Ratio** A widely used multiple in company valuation, the EV-EBITDA ratio is defined as:

$$\frac{\text{Enterprise value (EV)}}{\text{Earnings before interest, taxes, depreciation, and amortisation (EBITDA)}}$$

EV is the sum of the market value of equity and the market value of debt. The market value of equity is simply the number of outstanding equity shares times the price per share. As far as debt is concerned, its market value has to be imputed. Generally, a rupee of debt is deemed to have a rupee of market value.

Horizon's EV-EBITDA ratio for 20X1 is:

$$\frac{10 \times 200 + 500}{260} = \frac{2500}{260} = 9.62$$

EV-EBITDA is supposed to reflect profitability, growth, risk, liquidity, and corporate image.

**Market Value to Book Value Ratio** Another popular stock market statistic, the market value to book value is defined as:

$$\frac{\text{Market value per share}}{\text{Book value per share}}$$

Horizon's market value to book value ratio at the end of 20X1 was:

$$200 / 50 = 4.00$$

In a way, this ratio roughly reflects the contribution of a firm to the wealth of society. When this ratio exceeds 1 it means that the firm has contributed to the creation of wealth in the society - if this ratio is, say, 2, the firm has created a wealth of one rupee for every rupee invested in it. When this ratio is equal to 1, it implies that the firm has neither contributed to nor detracted from the wealth of society.

It may be emphasised here that if the market value to book value ratio is equal to 1, all the three ratios, namely, return on equity, earnings-price ratio (which is the inverse of the price-earnings ratio), and total yield, are equal<sup>5</sup>.

**Q Ratio** Proposed by James Tobin, the *q* ratio is defined as:

$$\frac{\text{Market value of equity and liabilities}}{\text{Estimated replacement cost of assets}}$$

The *q* ratio resembles the market value to book value ratio. However, there are two key differences: (i) The numerator of the *q* ratio represents the market value of equity as well as debt, not just equity. (ii) The denominator of the *q* ratio represents all assets. Further these assets are reckoned at their replacement cost, not book value.

## **Comparison with Industry Averages**

We have discussed a long list of financial ratios. For judging whether the ratios are high or low, one has to do comparative analysis such as cross-section analysis (in which the industry averages may be used as benchmarks) or time series analysis (in which the ratios of the firm are compared over time).

[Exhibit 4.3](#) shows the ratios of Horizon Limited along with industry averages. The industry averages often provide useful benchmarks for comparisons. Sometimes the ratios of a few competitor firms may be used as benchmarks.

Comparing the ratios of Horizon Limited with industry averages we find that:

- Horizon Limited has a favourable liquidity position. All the liquidity ratios of Horizon Limited are higher than the industry average.
- Leverage ratios of Horizon Limited are a shade better than the industry average.
- Turnover ratios of Horizon Limited are more or less comparable with the industry average.
- Profit margin ratios of Horizon Limited are somewhat higher than the industry average. The rate of return measures of Horizon Limited are also higher than the industry average.
- The valuation ratios of Horizon Limited compare slightly favourably in relation to industry average.

## Time Series of Financial Ratios

Besides looking at the ratios for one year, one would like to look at the ratios for several years. This will help in the detection of secular changes and avoidance of the bias introduced by transitory forces. [Exhibit 4.4](#) presents certain selected ratios for Horizon Limited for a period of five years (year 5 corresponds to 20X1). Looking at this exhibit we find that:

- The debt-equity ratio improved steadily for three years and increased slightly in the last year.
- The total assets turnover ratio remained more or less flat with minor fluctuations.
- The net profit margin improved steadily for three years but dipped marginally in the last year.
- The return on equity followed the pattern of the net profit margin.
- The price-earnings ratio improved steadily over time.



**Exhibit 4.3 | Comparison of Ratios of Horizon Limited with Industry Average**

<i>Ratio</i>	<i>Formula</i>	<i>Horizon Limited</i>	<i>Industry Average</i>
<b>Liquidity</b>			
■ Current ratio	$\frac{\text{Current assets}}{\text{Current liabilities}}$	2.00	1.80
■ Acid-test ratio	$\frac{\text{Quick assets}}{\text{Current liabilities}}$	1.20	1.05
<b>Leverage</b>			
■ Debt-equity ratio	$\frac{\text{Total liabilities}}{\text{Shareholders' funds}}$	1.00	1.10

■ Interest coverage ratio	$\frac{\text{PBIT}}{\text{Interest}}$	7.0	5.0
<b>Turnover</b>			
■ Inventory turnover	$\frac{\text{Revenues from operations}}{\text{Average inventory}}$	8.6	8.4
■ Debtors' turnover	$\frac{\text{Net credit sales}}{\text{Average trade receivables}}$	9.92	10.1
■ Fixed assets turnover	$\frac{\text{Revenues from operations}}{\text{Average net fixed assets}}$	2.72	2.75
■ Total assets turnover	$\frac{\text{Total revenues}}{\text{Average total assets}}$	1.37	1.40
<b>Profitability</b>			
■ Gross profit margin ratio	$\frac{\text{Gross profit}}{\text{Revenues from operations}}$	36.4%	34%
■ Net profit margin ratio	$\frac{\text{Net profit}}{\text{Total revenues}}$	10.0%	8.5%
■ Return on assets	$\frac{\text{Profit after tax}}{\text{Average total assets}}$	13.7%	12.5%
■ Earning power	$\frac{\text{PBIT}}{\text{Average total assets}}$	22.1%	19.3%
■ Return on capital employed	$\frac{\text{PBIT} (1 - T)}{\text{Average total assets}}$	15.5%	13.8%
■ Return on equity	$\frac{\text{Equity earnings}}{\text{Average equity}}$	27.4%	23.2%
<b>Valuation</b>			
■ Price-earnings ratio	$\frac{\text{Market price per share}}{\text{Earnings per share}}$	15.4	12.0
■ Yield	$\frac{\text{Dividend} + \text{Price change}}{\text{Initial price}}$	15.6%	14.1%
■ Market value to book value	$\frac{\text{Market price per share}}{\text{Book value per share}}$	4.0	3.2

#### Exhibit 4.4 Time Series of Certain Financial Ratios

	1	2	3	4	5
Debt-equity ratio	1.3	1.2	1.0	0.9	1.0
Total asset turnover ratio	1.34	1.41	1.35	1.39	1.37
Net profit margin (%)	8.0	9.0	10.2	10.5	10.0
Return on equity (%)	20.1	22.0	26.0	27.6	27.4
Price-earnings ratio	12.5	13.2	13.8	14.9	15.4

## 4.2 ■ DU PONT ANALYSIS

The Du Pont Company of the US pioneered a system of financial analysis which has received widespread recognition and acceptance. A useful system of analysis, which considers important interrelationships based on information found in financial statements, it has been adopted by many firms in some form or the other. [Exhibit 4.5](#) shows the Du Pont chart as applied to Horizon Limited.

At the left of the Du Pont chart is the return on assets (ROA), defined as the product of net profit margin (NPM) and the total assets turnover ratio (TAT):

$$\frac{\text{Net profit}}{\underbrace{\text{Average total assets}}_{\text{ROA}}} = \frac{\text{Net profit}}{\underbrace{\text{Total revenues}}_{\text{NPM}}} \times \frac{\text{Total revenues}}{\underbrace{\text{Average total assets}}_{\text{TAT}}} \quad (4.2)$$

Such decomposition helps in understanding how return on assets is influenced by net profit margin and total assets turnover.

The upper right side of the Du Pont chart shows the details underlying the net profit margin ratio. An examination of this side may indicate areas where cost reductions may be effected to improve the net profit margin. If this is supplemented by comparative common size analysis, it becomes relatively easier to understand where cost control efforts should be directed.

The lower right side of the Du Pont chart throws light on the determinants of the assets turnover ratio. If this is supplemented by a study of component turnover ratios (inventory turnover, debtors' turnover, and fixed assets turnover), a deeper insight can be gained into efficiencies/inefficiencies of asset utilisation.

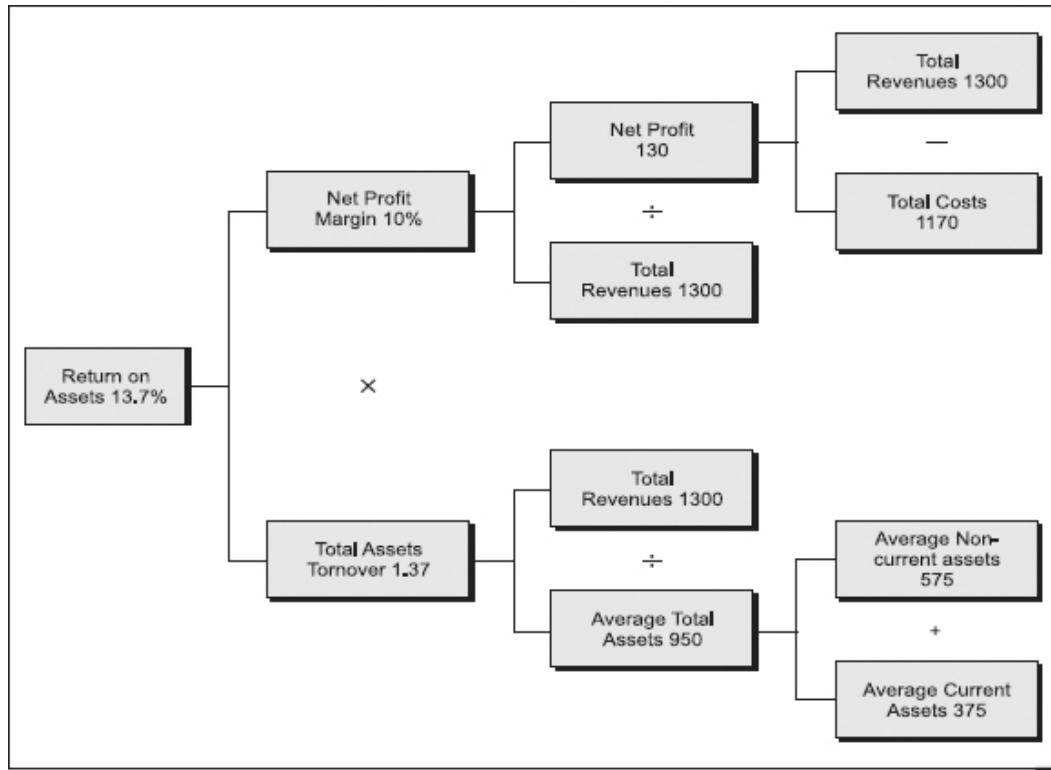
The basic Du Pont analysis may be extended to explore the determinants of return on equity (ROE).

$$\frac{\text{Net profit}}{\underbrace{\text{Average Equity}}_{\text{ROE}}} = \frac{\text{Net profit}}{\underbrace{\text{Total revenues}}_{\text{NPM}}} \times \frac{\text{Total revenues}}{\underbrace{\text{Average total assets}}_{\text{TAT}}} \times \frac{\text{Average total assets}}{\underbrace{\text{Average equity}}_{\text{EM}}} \quad (4.3)$$

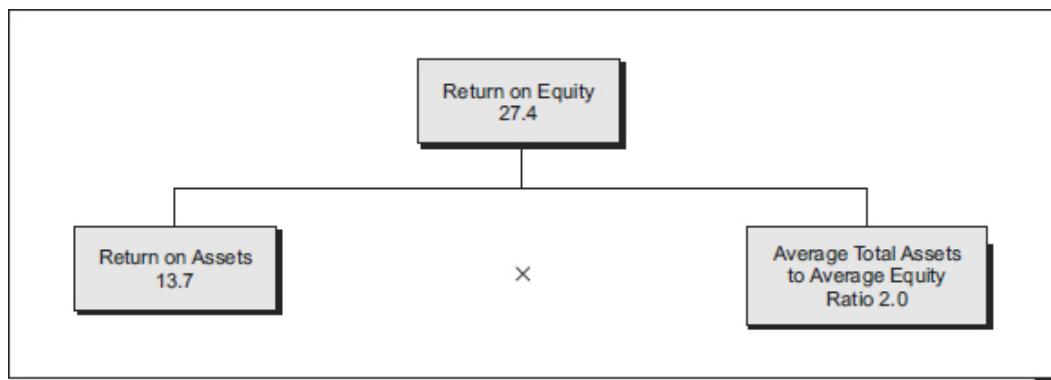
Note that the third component on the right hand side of [Eq. \(4.3\)](#) is referred to as the equity multiplier (EM).

The extension of Du Pont chart as applied to Horizon Limited is shown in [Exhibit 4.6](#).

## Exhibit 4.5 | Du Pont Chart Applied to Horizon Limited



## Exhibit 4.6 | Extension of Du Pont Chart



## 4.3 ■ STANDARDISED FINANCIAL STATEMENTS

As an analyst, you would like to compare the financial statements of Horizon Limited to those of other companies. You would have a problem, however, because companies often differ considerably in size. For example, Hindustan Unilever and Nirma are very different in size, so it is difficult to compare their financial statements directly. Even for the same company, if its size changes over time, it is difficult to compare financial statements at different times.

For meaningful comparison, you can standardise the financial statements. A simple way to do this is to work with percentages, rather than rupees. We discuss below some ways of doing this.

**Common Size Statements** A useful and convenient way of standardising financial statements is to express each item on the profit and loss statement as a percentage of sales and each item on the balance sheet as a percentage of total assets. The resulting financial statements are called common size statements.

The common size statement of profit and loss and the common size balance sheet of Horizon Limited are shown in Part A and Part B of [Exhibit 4.7](#).

## Exhibit 4.7 | Common Size Statements

<i>Part A : Statement of Profit and Loss</i>				
	<i>Regular (in million)</i>		<i>Common Size (%)</i>	
	<i>20X1</i>	<i>20X0</i>	<i>20X1</i>	<i>20X0</i>
■ Total income	₹ 1300	₹ 1180	100	100
■ Total expenses other than finance cost	1090	995	84	84
■ PBIT	210	185	16	16
■ Interest (Finance costs)	30	25	2	2
■ PBT	180	160	14	14
■ Tax	50	40	4	4
■ PAT	130	120	10	10

<i>Part B : Balance Sheet</i>				
	<i>Regular (in million)</i>		<i>Common Size (%)</i>	
	<i>20X1</i>	<i>20X0</i>	<i>20X1</i>	<i>20X0</i>
■ Non-current assets	600	550	60	61
■ Current assets	400	350	40	39
■ Total	<u>1000</u>	<u>900</u>	<u>100</u>	<u>100</u>
■ Equity	500	450	50	50
■ Non-current liabilities	300	270	30	30
■ Current liabilities	200	180	20	20
Total	<u>1000</u>	<u>900</u>	<u>100</u>	<u>100</u>

**Common Base Year Financial Statements** Suppose you are looking at the financial statements of a company over a period of time and trying to figure out trends in revenues, profits, net worth, debt, and so on. A useful way of doing this is to select a base year and then express each item relative to the amount in the base year. The resulting statements are called common base year statements.

Exhibit 4.8 presents the common base year statement of profit and loss and balance sheet of Horizon Limited. For example, the common base year value for total revenues for year 20X1 is 110. This means that total revenues have increased 10 percent over their base-year (20X0) value. Other numbers can be similarly interpreted.

## **Exhibit 4.8 | Common Base year Financial Statements**

<i>Part A: Statement of Profit and Loss</i>				
	<i>Regular (in million)</i>		<i>Common Size (%)</i>	
	<i>20X1</i>	<i>20X0</i>	<i>20X1</i>	<i>20X0</i>
■ Total income	₹ 1300	₹ 1180	110	100
■ Total expenses other than finance cost	1090	995	110	100
■ PBIT	210	185	114	100
■ Interest (Finance costs)	30	25	120	100
■ PBT	180	160	113	100
■ Tax	50	40	125	100
■ PAT	130	120	108	100

<i>Part B: Balance Sheet</i>				
	<i>Regular (in million)</i>		<i>Common Size (%)</i>	
	<i>20X1</i>	<i>20X0</i>	<i>20X1</i>	<i>20X0</i>
■ Non-current assets	600	550	109	100
■ Current assets	400	350	114	100
■ Total	<u>1000</u>	<u>900</u>	<u>111</u>	<u>100</u>
■ Equity	500	450	111	100
■ Non-current liabilities	300	270	111	100
■ Current liabilities	200	180	111	100
Total	<u>1000</u>	<u>900</u>	<u>111</u>	<u>100</u>

## 4.4 ■ APPLICATIONS OF FINANCIAL STATEMENT ANALYSIS

Having learnt how to compute and interpret a number of financial ratios, let us now examine how a set of financial ratios may be combined to answer some questions that are commonly raised by financial managers and others.

**Assessing Corporate Excellence** Every year, the *Economic Times* gives corporate excellence award for the Company of the year and the Emerging Company of the year. For the Company of the Year Award, companies which cross a certain threshold level of market capitalisation and revenues are considered.

The following financial indicators are used in the quantitative evaluation for judging corporate excellence.

- Net sales
- Net profit
- Market capitalisation
- Return on equity
- Share price return over one year
- Compound annual growth rate in revenue over the past three years
- Compound annual growth rate in net profit over the past three years

To judge corporate excellence, other studies have employed different sets of financial indicators.

**Judging Creditworthiness** For assessing the credit worthiness of a potential customer or client, a number of ad hoc scoring models employing several financial variables have been used. One such model is shown in [Exhibit 4.9](#). In this model you assess a client on various factors by assigning points in the range of 0-15. By looking at the total points you judge the creditworthiness of the client.

**Forecasting Bankruptcy** A multivariate model of the kind displayed in [Exhibit 4.9](#) represents a distinct improvement over a single ratio analysis. It seems to comprehensively consider almost all the key factors relevant for credit evaluation. A critical look at this model, however, raises several issues: Why should the model have eleven factors? What is the sanctity about the scale of rating? Why should the factors be regarded equally

important? Is there any conceptual framework or theory that supports such scoring? In sum, the approach seems to be ad hoc.

To overcome some of these limitations, the modern approach to financial analysis employs multivariate statistical techniques. What is the key difference between scientific multivariate analysis and ad hoc multivariate analysis? In scientific multivariate analysis, the selection of variables, the form of the model, the scheme of weighting, and the determination of cut off levels (wherever it is done) are guided largely by objective statistical methodology, not subjective managerial judgement.

### **Exhibit 4.9 A Credit Scoring Model**

				Points
<b>Character</b>				
■ Average past payment	Up to 60 days late	Up to 30 days late	On time	—
<b>Capacity</b>				
■ Profit margin	0-5%	6-10%	>10%	—
■ Quick ratio	< 0.75	0.75 - 1.25	> 1.25	—
■ Cash flow	Low	Average	High	—
<b>Capital</b>				
■ Current ratio	< 1	1 - 1.15	> 1.5	—
■ Debt-equity ratio	< 1	1 - 2	> 2	—
■ Interest earned	< 2X	2X - 3X	> 3X	—
<b>Collateral</b>				
■ Net worth	Low	Average	High	—
■ Percent assets free	Low	Average	High	—
■ Market value to net worth	Low	Average	High	—
<b>Conditions</b>	Recession	Average	Prosperity	—
			Total	—

A widely cited example of scientific multivariate analysis is the classic study by Altman<sup>6</sup> on prediction of corporate bankruptcy. In this study Altman found that a linear function of working capital to total assets, retained earnings to total assets, EBIT to total assets, market value of equity to book value of debt, and sales to total assets discriminated best between the bankrupt and non-bankrupt firms.

**Valuing Equity Shares** Numerous studies have been conducted to empirically relate the price-earnings multiple to key financial variables. Typically these studies have employed cross-section regression analysis. For example, in one of the pioneering studies conducted in the US, Whitbek and Kisor found the following relationship:

$$\begin{aligned} \text{Price-earnings multiple} &= 8.2 + 1.5 \text{ Growth rate in earnings} \\ &\quad + 6.7 \text{ Payout ratio} - 0.2 \text{ Variability in earnings} \end{aligned} \quad (4.4)$$

**Predicting Bonds Ratings** In the US, Moody's bond ratings and Standard and Poor's bond ratings are most widely used. Naturally, financial managers are interested in guessing the ratings the bonds of their firms would get from these agencies. Hence, a question that concerns them is: Can financial ratios be used for predicting bond ratings? Empirical research suggests that the answer to this question is a 'yes'.

In a path-breaking study Kaplan and Urwitz<sup>7</sup> found that, in general, a lower debt ratio, a higher interest coverage ratio, a higher return on assets ratio, a larger size, a lower market risk, and a lower unique risk had a favourable influence on bond ratings. They combined these variables into a single measure of bond quality and examined how well it could predict Moody's ratings. They found a very close correspondence between predicted ratings and actual ratings for a sample of newly issued bonds.

**Estimating Market Risk** The market risk of a company's stock, as measured by beta, is an important determinant of the return required by investors. To estimate a stock's beta you need sufficient history of stock price data. Since this may not always be available, financial economists examined whether accounting data can be used to get a handle over equity beta. For example, economic logic tells us that if the debt-equity ratio is high, other things being equal, equity beta is also high. No wonder, empirical evidence supports such a relationship.

You can also calculate the "accounting beta" of a firm. It reflects the sensitivity of the firm's earnings changes to changes in the aggregate earnings of all firms.

Instead of looking at one measure at a time, you can look at a combination of several of them. For example, Hochman found that the debt ratio, dividend yield, and accounting beta when combined provide an estimate of a stock's equity beta which is as good as that obtained from stock's price history.

## **4.5 ■ USING FINANCIAL STATEMENT ANALYSIS**

Financial statement analysis can be a very useful tool for understanding a firm's performance and condition. However, there are certain problems and issues encountered in such analysis which call for care, circumspection, and judgment.

## **Problems in Financial Statement Analysis**

You have to cope with the following problems while analysing financial statements.

**Lack of an Underlying Theory** The basic problem in financial statement analysis is that there is no theory that tells us which numbers to look at and how to interpret them. In the absence of an underlying theory, financial statement analysis appears to be ad hoc, informal, and subjective. As Horrigan put it: "From a negative viewpoint, the most striking aspect of ratio analysis is the absence of an explicit theoretical structure." He added "As a result the subject of ratio analysis is replete with untested assertions about which ratios should be used and what their proper levels should be."

**Conglomerate Firms** Many firms, particularly the large ones, have operations spanning a wide range of industries. Given the diversity of their product lines, it is difficult to find suitable benchmarks for evaluating their financial performance and condition. Hence, it appears that meaningful benchmarks may be available only for firms which have a well-defined industry classification.

**Window Dressing** Firms may resort to window dressing to project a favourable financial picture. For example, a firm may run down its inventory on the last day of its financial year. As a result, it may appear that the firm has a very comfortable liquidity position and a high turnover of inventories. When window dressing of this kind is suspected, the financial analyst should look at the average level of inventory over a period of time and not the level of inventory at just one point of time.

**Price Level Changes** Financial accounting, as it is currently practised in India and most other countries, does not take into account price level changes. As a result, balance sheet figures are distorted and profits misreported. Hence, financial statement analysis can be vitiated.

**Variations in Accounting Policies** Business firms have some latitude in the accounting treatment of items like depreciation, valuation of stocks, research and development expenses, foreign exchange transactions, installment sales, preliminary and pre-operative expenses, provision of reserves, and revaluation of assets. Due to diversity of accounting policies found in practice, comparative financial statement analysis may be vitiated.

This problem has become more acute in the wake of globalisation as major competitors may be found overseas. Due to differences in accounting standards, it is difficult to compare financial statements across countries. Hopefully, as accounting standards converge globally, this problem will be mitigated.

**Interpretation of Results** Though industry averages and other yardsticks are commonly used in financial ratios, it is somewhat difficult to judge whether a certain ratio is 'good' or 'bad'. A high current ratio, for example, may indicate a strong liquidity position (something good) or excessive inventories (something bad). Likewise, a high turnover of fixed assets may mean efficient utilisation of plant and machinery or continued flogging of more or less fully depreciated, worn out, and inefficient plant and machinery.

Another problem in interpretation arises when a firm has some favourable ratios and some unfavourable ratios – and this is rather common. In such a situation, it may be somewhat difficult to form an overall judgment about its financial strength or weakness. Multiple discriminant analysis, a statistical tool, may be employed to sort out the net effect of several ratios pointing in different directions.

**Correlation among Ratios** Notwithstanding the previous observation, financial ratios of a firm often show a high degree of correlation. Why? This is because several ratios have some common element (sales, for example, is used in various turnover ratios) and several items tend to move in harmony because of some common underlying factor. In view of ratio correlations, it is redundant and often confusing to employ a large number of ratios in financial statement analysis. Hence it is necessary to choose a small group of ratios from a large set of ratios. Such a selection requires a good understanding of the meaning and limitations of various ratios and an insight into the economics of the business.

## **Guidelines for Financial Statement Analysis**

From the foregoing discussion, it is clear that financial statement analysis cannot be treated as a simple, structured exercise. When you analyse financial statements bear in mind the following guidelines.

1. **Use ratios to get clues to ask the right questions:** By themselves ratios rarely provide answers, but they definitely help you to raise the right questions.
2. **Be selective in the choice of ratios:** You can compute scores of different ratios and easily drown yourself into confusion. For most purposes a small set of ratios – three to seven – would suffice. A few ratios, aptly chosen, would capture most of the information that you can derive from financial statements.
3. **Employ proper benchmarks:** It is a common practice to compare the ratios (calculated from a set of financial statements) against some benchmarks. These benchmarks may be the average ratios of the industry or the ratios of the industry leaders or the historic ratios of the firm itself.
4. **Know the tricks used by accountants:** Since firms tend to manipulate the reported income, you should learn about the devices employed by them.
5. **Read the notes to financial statements:** Notes to financial statements often contain valuable information. They may reveal things that management may try to hide. The more difficult it is to read a note, the more information – laden it may be.
6. **Remember that financial statement analysis is an odd mixture of art and science:** Financial statement analysis cannot be regarded as a simple, structured exercise. It is a process requiring care, thought, common sense, and business judgement – a process for which there are no mechanical substitutes.

## 4.6 ■ GOING BEYOND THE NUMBERS

The tools of analysis discussed in this chapter are helpful in making business decisions, evaluating performance, and forecasting future developments.

Comprehensive business analysis, however, calls for going beyond the conventional financial measures to consider qualitative factors relevant for evaluating the performance and prospects of a company. The American Association of Individual Investors (AAII) has summarised these factors as follows:

1. *Are the company's revenues tied to one key customer?* If so, the company's performance may decline dramatically if the customer goes elsewhere. On the other hand, if the relationship is firmly entrenched, this might actually stabilise sales.
2. *To what extent are the company's revenues tied to one key product?* Companies that rely on a single product may be more efficient and focused, but a lack of diversification increases risk. If revenues come from several different products, the overall bottom line will be less affected by a drop in the demand for any one product.
3. *To what extent does the company rely on a single supplier?* Depending on a single supplier may lead to unanticipated shortages, which investors and potential creditors should consider.
4. *What percentage of the company's business is generated overseas?* Companies with a large percentage of overseas business are often able to realise higher growth and larger profit margins. However, firms with large overseas operations find that the value of their operations depends in large part on the value of the local currency. Thus, fluctuations in currency markets create additional risks for firms with large overseas operations. Also, the potential stability of the region is important.
5. *Competition.* Generally, increased competition lowers prices and profit margins. In forecasting future performance, it is important to assess both the likely actions of the current competition and the likelihood of new competitors in the future.
6. *Future prospects.* Does the company invest heavily in research and development? If so, its future prospects may depend critically on the success of new products in the pipeline. For example, the market's

assessment of a computer company depends on how next year's products are shaping up. Likewise, investors in pharmaceutical companies are interested in knowing whether the company has developed any potential blockbuster drugs that are doing well in the required tests.

7. *Legal and regulatory environment.* Changes in laws and regulations have important implications for many industries. For example, when forecasting the future of tobacco companies, it is crucial to factor in the effects of proposed regulations and pending or likely lawsuits. Likewise, when assessing banks, telecommunications firms, and electric utilities, analysts need to forecast both the extent to which these industries will be regulated in the years ahead, and the ability of individual firms to respond to changes in regulation.

## SUMMARY

- **Financial ratio analysis**, the principal tool of financial statement analysis, is a study of ratios between items or groups of items in financial statements.
- Financial ratios may be divided into five broad types: liquidity ratios, leverage ratios, turnover ratios, profitability ratios, and valuation ratios.
- **Liquidity** refers to the ability of the firm to meet its obligations in the short run, usually one year. **Current ratio** and **acid-test ratio** are the important liquidity ratios.
- **Leverage** refers to the use of debt finance. **Debt-equity ratio**, **interest coverage ratio**, and **fixed charges coverage ratio** are the important leverage ratios.
- **Turnover** refers to the efficiency of asset use. **Inventory turnover ratio**, **receivables turnover ratio**, **fixed assets turnover ratio**, and **total assets turnover ratio** are the important turnover ratios.
- **Profitability** reflects the final result of business operations. **Gross profit margin ratio**, **net profit margin ratio**, **return on assets**, **earning power**, **return on capital employed**, and **return on equity** are the most important profitability ratios.
- **Valuation** refers to the assessment of the firm by the capital market. **Price-earnings ratio** and **market value – book value** ratio are the most important valuation ratios.
- For judging whether the ratios are high or low, **cross-section analysis** and **time-series analysis** are used.
- In **common size analysis**, the items in the balance sheet are stated as percentages of total assets and the items in the profit and loss statement are stated as percentages of sales.

- According to **Du Pont analysis**, return on equity is expressed as a product of net profit margin, total asset turnover, and asset-equity ratio.
- Properly combined, financial ratios may be used to assess corporate excellence, judge creditworthiness, predict bankruptcy, value equity shares, predict bond ratings, and measure market risk.
- While financial statement analysis can be a very useful tool, there are certain problems and issues encountered in such analysis that call for care, circumspection, and judgment.
- Comprehensive business analysis calls for going beyond conventional financial measures to consider qualitative factors relevant for evaluating the performance and prospects of a company.

## QUESTIONS

1. What are the different types of financial ratios?
2. Discuss the important liquidity ratios.
3. Define and evaluate various leverage ratios.
4. Discuss the important turnover ratios.
5. Explain the important profit margin ratios.
6. Compare the following rate of return ratios: return on assets, earning power, return on capital employed, and return on equity.
7. Discuss the key valuation ratios.
8. “If the market price per share is equal to the book value per share, the following are equal: return on equity, earnings price ratio, and total yield.” Prove.
9. What is the difference between common size analysis and common base year analysis?
10. Discuss the Du Pont analysis.
11. Carry out the Du Pont analysis for a company of your choice.
12. Describe the Altman model for predicting corporate bankruptcy.
13. Discuss the problems and issues faced in financial statement analysis.
14. What guidelines would you follow in financial statement analysis?
15. What issues are regarded as important by the American Association of Individual Investors?

## SOLVED PROBLEMS

- 4.1** A firm's current assets and current liabilities are 1,600 and 1,000 respectively. How much can it borrow on a short-term basis without reducing the current ratio below 1.25.

**Solution** Let the maximum short-term borrowing be B. The current ratio with this borrowing should be 1.25.

$$\frac{1,600 + B}{1,000 + B} = 1.25$$

Solving this equation, we get  $B = 1,400$ . Hence the maximum permissible short-term borrowing is 1,400.

**4.2** Determine the sales of a firm given the following information:

Current ratio	= 1.4
Acid-test ratio	= 1.2
Current liabilities	= 1,600
Inventory turnover ratio	= 8

**Solution** The sales figure may be derived as follows:

$$\begin{aligned}\text{Current assets} &= \text{Current liabilities} \times \text{Current ratio} \\ &= 1,600 \times 1.4 = 2,240\end{aligned}$$

$$\begin{aligned}\text{Current assets} - \text{Inventories} &= \text{Current liabilities} \times \text{Acid-test ratio} \\ &= 1,600 \times 1.2 = 1,920\end{aligned}$$

$$\text{Inventories} = 2,240 - 1,920 = 320$$

$$\begin{aligned}\text{Sales} &= \text{Inventories} \times \text{Inventories turnover ratio} \\ &= 320 \times 8 = 2,560\end{aligned}$$

**4.3** The following ratios are given for Mintex Company

Net profit margin ratio	4 percent
Current ratio	1.25
Return on net worth	15.23 percent
Total debt to total assets ratio	0.40
Inventory turnover ratio	25

Complete the following statements

**Profit and Loss Account**

₹

Sales	.....
Cost of goods sold	.....
Operating expenses	700
Profit before interest and tax	.....
Interest	45
Profit before tax	.....
Tax provision (50 percent)	.....
Profit after tax	.....

**Balance Sheet**

Net worth	.....	Fixed assets	.....
Long-term debt (15 percent interest)	.....	Current assets	180
Accounts payable	.....	Cash	.....
		Receivables	60
		Inventory	.....

**Solution** The blanks in the above statements may be filled as follows:

- (a) *Accounts payable* The value of accounts payable – the only current liability – is derived as follows.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = 1.25$$

$$\text{Current liabilities} = \frac{\text{Current assets}}{\text{Current ratio}} = \frac{180}{1.25} = 144$$

So accounts payable are 144

- (b) *Long-term debt* The only interest-bearing liability is the long-term debt which carries 15 percent interest rate. Hence the long-term debt is equal to

$$\frac{\text{Interest}}{0.15} = \frac{45}{0.15} = 300$$

- (c) *Total assets* As the ratio of total debt to total assets is 0.4, total assets (the total of the balance sheet) is simply:

$$\frac{\text{Total debt}}{0.4} = \frac{144 + 300}{0.4} = 1110$$

- (d) *Net worth* The difference between total assets and total debt represents the net worth. Hence, it is equal to:

$$1110 - 444 = 666$$

- (e) *Fixed assets* The difference between total assets and current assets represents fixed assets. So,

$$\text{Fixed assets} = 1110 - 180 = 930$$

- (f) *Profit after tax* This is equal to:

$$(\text{Net worth}) (\text{Return on net worth}) = (666) (0.1523) = 101.4$$

- (g) *Tax* As the tax rate is 50 percent, the tax provision is simply equal to the profit after tax, i.e., 101.4

- (h) *Profit before tax* The sum of the profit after tax and the tax provision is equal to the profit before tax. So, it is equal to:

$$101.4 + 101.4 = 202.8$$

- (i) *Profit before interest and taxes* (PBIT) This is equal to the profit before tax plus the interest payment. Hence, it is equal to:

$$202.8 + 45 = 247.8$$

- (j) *Sales* The figure of sales may be derived as follows:

$$\frac{\text{Profit after tax}}{\text{Net profit margin ratio}} = \frac{101.4}{0.04} = 2535$$

- (k) *Cost of goods sold* This figure of cost of goods sold may be derived from the following accounting identity:

$$\text{Sales} - \text{Cost of goods sold} - \text{Operating expenses} = \text{PBIT}$$

$$2535 - \text{Cost of goods sold} - 700 = 247.8$$

Hence the cost of goods sold figure is 1587.2

(I) *Inventory* This is equal to:

$$\frac{\text{Sales}}{\text{Inventory turnover ratio}} = \frac{2535}{25} = 101.4$$

(m) *Cash* This may be obtained as follows:

$$\text{Current assets} - \text{receivables} - \text{inventory} = 180 - 60 - 101.4 = 18.6$$

**4.4** The financial statements of Matrix Limited are given below:

Matrix Limited: Profit and Loss Account for the Year Ending 31st March 20X1

	₹ in million	
	20X1	20X0
Revenues from operations	1065	950
Other income	—	—
Total income	1065	950
Cost of goods sold	805	720
Stocks	600	520
Wages and salaries	120	110
Other manufacturing expenses	85	90
Gross profit	260	230
Operating expenses	90	75
Depreciation	50	40
Selling and general administration	40	35
Profit before interest and tax	170	155
Interest	35	30
Profit before tax	135	125
Tax	50	45
Profit after tax	85	80
Dividends	35	30
Retained earnings	50	50

Matrix Limited: Balance Sheet as at March 31, 20X1

	₹ in million	
	20X1	20X0
<b>Assets</b>		

• Non-current Assets	570	515
■ Property, plant and equipments	550	495
■ Investments	20	20
■ Long-term loans and advances	-	-
• Current Assets	<u>365</u>	<u>338</u>
■ Inventories	160	138
■ Investments	10	5
■ Trade receivables	120	115
■ Cash and Cash equivalents	25	20
■ Loans	50	60
	<u>935</u>	<u>583</u>
<b>Equity and Liabilities</b>		
• Equity	505	455
■ Equity share capital (Par value ₹ 10)	125	125
■ Other equity	380	330
• Non-current liabilities	<u>190</u>	<u>205</u>
■ Borrowings	190	205
■ Deferred tax liabilities (net)	-	-
■ Provisions		
• Current Liabilities	240	193
■ Borrowings	90	55
■ Trade payables	100	90
■ Other current liabilities	20	18
■ Provisions	30	30
	<u>935</u>	<u>853</u>

(a) Calculate the following ratios: current ratio, acid-test ratio, cash ratio, debt-equity ratio, interest coverage ratio, inventory turnover ratio, debtors turnover ratio, fixed assets turnover, total assets turnover, gross profit margin, net profit margin, return on assets, earning power and return on equity.

(b) Set up the DuPont equation.

*Solution*

(a) Current ratio =  $\frac{\text{Current assets}}{\text{Current liabilities}}$

$$= \frac{365}{240} = 1.52$$

Acid-test ratio =  $\frac{\text{Quick assets}}{\text{Current liabilities}} = \frac{365 - 160}{240} = 0.85$

Cash ratio =  $\frac{\text{Cash and cash equivalents} + \text{Current investments}}{\text{Current liabilities}} = \frac{25 + 10}{240} = 0.15$

Debt-equity ratio =  $\frac{\text{Total liabilities}}{\text{Shareholders' funds}} = \frac{430}{505} = 0.85$

Interest coverage ratio =  $\frac{\text{PBIT}}{\text{Interest}} = \frac{170}{35} = 4.9$

Inventory turnover =  $\frac{\text{Revenues from operations}}{\text{Average inventory}} = \frac{1065}{(160 + 138)/2} = 7.15$

Debtors turnover =  $\frac{\text{Net credit sales}}{\text{Average trade receivables}} = \frac{1065}{(120 + 115)/2} = 9.06$

Fixed assets turnover =  $\frac{\text{Revenues from operations}}{\text{Average net fixed assets}} = \frac{1065}{(550 + 495)/2} = 2.04$

Total assets turnover =  $\frac{\text{Total revenues}}{\text{Average total assets}} = \frac{1065}{(935 + 853)/2} = 1.19$

Gross profit margin =  $\frac{\text{Gross profit}}{\text{Revenue from operations}} = \frac{260}{1065} = 24.4\%$

Net profit margin =  $\frac{\text{Profit after tax}}{\text{Total revenues}} = \frac{85}{1065} = 7.98\%$

Return on assets =  $\frac{\text{Profit after tax}}{\text{Average total assets}} = \frac{85}{(935 + 853)/2} = 9.5\%$

Earning power =  $\frac{\text{PBIT}}{\text{Average total assets}} = \frac{170}{(935 + 853)/2} = 19.0\%$

Return on equity =  $\frac{\text{Equity earnings}}{\text{Average equity}} = \frac{85}{(505 + 455)/2} = 17.7\%$

(b) DuPont equation

Return on equity = Net profit margin × Total assets turnover ratio × Equity multiplier

$$\begin{aligned} &= \frac{\text{Net profit}}{\text{Total revenue}} \times \frac{\text{Total revenues}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average equity}} \\ &= \frac{85}{1065} \times \frac{1065}{(935 + 853)/2} \times \frac{(935 + 853)/2}{(505 + 455)/2} \\ &= 7.98\% \times 1.19 \times 1.86 \\ &= 17.7\% \end{aligned}$$

## PROBLEMS

**4.1 DuPont Identity** Premier's net profit margin is 5 percent, total assets turnover ratio is 1.5 times, debt to total assets ratio is 0.7. What is the return on equity for Premier?

**4.2 Interest Charge** McGill Inc. has profit before tax of ₹ 40 million. If the company's times interest earned ratio is 6, what is the total interest charge?

**4.3 Times Interest Earned Ratio** The following data applies to a firm:

Interest charges	₹ 150,000
Sales	₹ 7,000,000
Tax rate	60 percent
Net profit margin	6 percent

What is the firm's times interest earned ratio?

**4.4 Borrowings** A firm's current assets and current liabilities are 1,500 and 600 respectively. How much can it borrow from bank without reducing the current ratio below 1.5?

**4.5 Accounts Receivable** A firm has total annual sales (all credit) of 1,000,000 and accounts receivable of 160,000. How rapidly (in how many days) must accounts receivable be collected if management wants to reduce the accounts receivable to 120,000?

**4.6 Determining Sales** Determine the sales of a firm with the following financial data:

Current ratio	= 1.5
Acid-test ratio	= 1.2
Current liabilities	= 800,000
Inventory turnover ratio	= 5 times

**4.7 Completing the Balance Sheet** Complete the balance sheet and sales data (fill in the blanks) using the following financial data:

Debt/equity ratio	= 0.60
Acid-test ratio	= 1.2
Total assets turnover ratio	= 1.5
Average collection period	= 40 days
Gross profit margin	= 20 percent
Inventory turnover ratio	= 5

<i>Balance Sheet</i>			
Equity capital	50,000	Plant and equipment	....
Retained earnings	60,000	Inventories	....
Debt	....	Accounts receivable	....
		Cash	....
	....		....
Sales	....		....
Cost of goods sold	....		....

- 4.8 The 20X0 Balance Sheet and Profit and Loss Account for Omex Limited are given below. Compute the financial ratios for Omex. Evaluate Omex's performance with reference to the standards.

*Balance Sheet as on December 31, 20X0*

*Assets*

Fixed assets (PPE)	₹ 30,000,000
Current assets	
Inventories	20,000,000
Cash and bank	5,000,000
Trade receivables	15,000,000
Pre-paid expenses	2,500,000
Others	2,500,000
Total	<u>75,000,000</u>

*Equity and Liabilities*

Share capital	₹ 10,000,000
Other equity	22,500,000
Long-term debt	12,500,000
Short-term bank borrowing	15,000,000
Trade payables	10,000,000
Provisions	5,000,000
Total	<u>75,000,000</u>

*Statement of Profit and Loss for the Year Ending,  
December 31, 20X0*

Net sales	₹ 95,000,000
Cost of goods sold	72,000,000
Gross profit	23,000,000
Operating expenses	10,500,000
Operating profit	12,500,000
Non-operating surplus	2,600,000
Profit before interest and tax	15,100,000
Interest	5,000,000

Profit before tax	10,100,000
Tax	5,000,000
Profit after tax	5,100,000
Dividends	1,800,000
Retained earnings	3,300,000

	<i>Omex</i>	<i>Standard</i>
Current ratio	1.5	
Acid-test ratio	0.80	
Debt-equity ratio	1.5	
Times interest earned ratio	3.5	
Inventory turnover ratio	4.0	
Average collection period	60 days	
Total assets turnover ratio	1.0	
Net profit margin ratio	6%	
Earning power	18%	
Return on equity	15%	

- 4.9** The comparative Balance Sheets and comparative Profit and Loss accounts for MM Limited, a machine tool manufacturer are given below:

	<i>Comparative Balance Sheets, MM Limited</i>				
	₹ in million)				
	20X1	20X2	20X3	20X4	20X5
<i>Assets</i>					
Fixed assets (PPE)	2.5	3.2	4.4	4.7	4.8
<i>Current assets</i>					
Cash and bank	0.5	0.6	0.7	0.8	0.7
Receivables	1.5	1.6	2.3	2.6	3.2
Inventories	2.0	2.2	3.0	3.7	4.2
Other assets	0.2	0.3	0.3	0.4	0.6
	6.7	7.9	10.7	12.2	13.5
<i>Liabilities and Equity</i>					
Share capital	2.4	2.4	3.0	3.0	3.2
Other equity	0.6	1.0	1.5	2.0	2.5
Long-term debt	1.2	1.3	2.0	2.3	2.6
Short-term bank borrowing	1.2	1.4	2.1	2.5	2.6
	1.3	1.8	2.1	2.4	2.6
	6.7	7.9	10.7	12.2	13.5

*Comparative Statement of Profit and Loss, MM Limited*

₹ in million

	20X1	20X2	20X3	20X4	20X5
Net sales	4.0	6.1	7.8	9.1	11.2
Cost of good sold	3.2	4.7	6.0	7.2	8.5
Gross profit	0.8	1.4	1.8	1.9	2.7
Operating expenses	0.4	0.5	0.9	0.8	1.0
Operating profit	0.4	0.9	0.9	1.1	1.7
Non-operating surplus deficit	0.1	0.2	0.1	0.2	0.3
Profit before interest and tax	0.5	1.1	1.0	1.3	2.0
Interest	0.2	0.3	0.4	0.5	0.6
Profit before tax	0.3	0.8	0.6	0.8	1.4
Tax	0.1	0.4	0.3	0.3	0.7
Profit after tax	0.2	0.4	0.3	0.5	0.7

Required: Compute the important ratios for MM Limited for the years 20X1-20X5

- Current ratio
- Debt-equity ratio
- Total assets turnover ratio
- Net profit margin
- Earning power
- Return on equity

## MINICASE-I

Reliance Industries Limited is a Fortune 500 company and the largest private sector company in India with a market capitalisation of over seven trillion rupees (in July 2018). Its chairman and main shareholder Mukesh Ambani is the richest Indian for more than a decade. After establishing world class facilities in refining and petrochemicals, the company has since diversified into retail and recently telecom sectors.

Extracts from the balance sheets and statements of profit and loss of the company for the past few years are as under:

As on	Balance Sheet			₹ in crore
	31-3-2015	31-3-2016	31-3-2017	31-3-2018
<b>Assets</b>				
Non-current assets	358,469	471,312	565,526	632,562
Fixed Assets	248,679	328,222	420,860	482,251
Investments	28,951	41,512	25,639	25,259
Other non-current assets	80,839	101,578	119,027	125,052
Current assets	137,549	127,785	146,813	183,786
Inventories	53,244	46,486	48,951	60,837
Investments	52,421	42,503	57,260	57,603
Trade receivables	4,902	4,465	8,177	17,555
Cash & Bank balances	12,357	11,028	3,023	4,255
All other current assets	14,625	23,303	29,402	43,536
<b>Total</b>	<b>496,018</b>	<b>599,097</b>	<b>712,339</b>	<b>816,348</b>

<b>Equity and Liabilities</b>				
<i>Equity</i>	<u>212,033</u>	<u>234,912</u>	<u>266,626</u>	<u>297,045</u>
Equity Share capital	2,943	2,948	2,959	5,922
Others	209,090	231,964	263,667	291,123
<i>Non-current liabilities</i>	<u>149,604</u>	<u>178,931</u>	<u>210,398</u>	<u>205,451</u>
Borrowings	120,453	141,647	152,148	144,175
Deferred tax liabilities	19,204	20,494	26,735	29,618
All other non-current liabilities	9,947	16,790	31,515	31,658
<i>Current liabilities</i>	<u>134,381</u>	<u>185,154</u>	<u>235,315</u>	<u>313,852</u>
Borrowings	27,642	23,545	31,528	37,429
Trade payables	58,548	60,296	76,595	106,861
All other current liabilities	48,191	101,313	127,192	169,562
<b>Total</b>	<b>496,018</b>	<b>598,997</b>	<b>712,339</b>	<b>816,348</b>

*Statement of Profit and Loss for Year Ended*

	31-3-2016	31-3-2017	31-3-2018
Revenue from Operations	293,298	330,180	408,265
Other Income	12,053	9,443	9,949
<b>Total Income</b>	<b>305,351</b>	<b>339,623</b>	<b>418,214</b>
<b>Expenses</b>			
Cost of materials consumed	158,199	175,087	207,448
Purchases of Stock-in-Trade	28,055	42,431	68,628
Changes in inventories	2,560	-5,218	-8,610
Excise duty	19,299	24,798	16,588
Employee benefits expense	7,407	8,388	9,523
Finance costs	3,691	3,849	8,052
Depreciation and amortization expense	11,565	11,646	16,706
Other expenses	35,838	38,608	50,453
<b>Total expenses</b>	<b>266,614</b>	<b>299,589</b>	<b>368,788</b>
Profit before exceptional items and tax	38,737	40,034	49,426
Exceptional Items			
Profit before tax	38,737	40,034	49,426
<i>Tax expense:</i>			
Current Tax	8,042	8,880	10,098
Deferred Tax	834	1,321	3,248
<b>Profit for the year</b>	<b>29,861</b>	<b>29,833</b>	<b>36,080</b>

Prepare the common size and common base statements and calculate the key ratios. Give your observations on the trend in the financial position of the company based on these statements and ratios.

**MINICASE-II**

Dabur India Limited is a leading consumer goods company in India with a number of popular brands of Ayurvedic and other healthcare products to its credit. Set up way back in 1884, it has grown manifold and has markets now in as many as 60 countries. The balance sheets and statements of profit and loss of Dabur India Limited for the financial years 2017 and 2018 are given below.

Balance Sheet as on		
	31-3-2017	31-3-2018
<b>Assets</b>		
<i>Non-current assets</i>	4,618	5,262
Fixed Assets	1,576	1,648
Investments	2,499	3,092
Other non-current assets	542	522
<i>Current assets</i>	<u>3,114</u>	<u>3,440</u>
Inventories	1,107	1,256
Investments	741	713
Trade receivables	650	706
Cash & Bank balances	305	306
All other current assets	312	458
<b>Total</b>	<b>7,732</b>	<b>8,702</b>
<b>Equity and Liabilities</b>		
<i>Equity</i>	4,872	5,733
Equity Share capital	176	176
Others	4,696	5,557
<i>Non-current liabilities</i>	636	534
Borrowings	470	364
Deferred tax liabilities	108	109
All other non-current liabilities	57	61
<i>Current liabilities</i>	<u>2,225</u>	<u>2,434</u>
Borrowings	440	464
Trade payables	1,310	1,410
All other current liabilities	474	560
<b>Total</b>	<b>7,732</b>	<b>8,702</b>

*Statement of Profit and Loss for year ended*

	31-3-2017	31-3-2018
Revenue from Operations	7,701	7,748
Other income	298	305
Total income	8,000	8,054

**Expenses**

Cost of materials consumed	3,025	3,220
Purchases of Stock-in-Trade	754	666
Changes in inventories	-23	-66
Excise duty	88	26
Employee benefits expense	790	793
Finance costs	54	53
Depreciation and amortization expense	143	162
Other expenses	1,559	1,491
Total expenses	6,389	6,346
Profit before exceptional items and tax	1,611	1,708
Exceptional items		15
Profit before tax	1,611	1,693
<i>Tax expense:</i>		
Current Tax	344	371
Deferred Tax	-14	-36
Profit for the year	1,280	1,358
	(amount in ₹)	
No. of equity shares	176	176
Dividend per share	2.3	2.3
Market price per share	277	328
Par value per share	1	1

- (a) Compute the key ratios for Dabur Limited for the year 2018.
- (b) Prepare the DuPont Chart for the year 2018.
- (c) Prepare the common size and common base financial statements for Dabur.
- (d) Identify the financial strengths and weaknesses of Dabur Limited.

**PRACTICAL ASSIGNMENT**

Select a company of your choice and (a) prepare its common size financial statements for the past three years, (b) compute 7 key ratios of your choice, (c) develop the DuPont chart for the last year, and (d) comment on its strengths and weaknesses.

- 1 Alternatively, the ratio of non-current liabilities to equity may be calculated. What is important is that the same ratio is used consistently when comparisons are made.
- 2 For the sake of simplicity, preference capital is subsumed under equity. Since preference capital is usually a very minor source of finance, its inclusion or exclusion hardly makes any difference.
- 3 Equation (4.1) is derived as follows:

Since assets are equal to equity plus debt

$$\frac{\text{Debt}}{\text{Assets}} = \frac{\text{Debt}}{\text{Equity} + \text{Debt}}$$

Dividing both the numerator and the denominator of the right hand side of this equation by equity,

$$\frac{\text{Debt}}{\text{Assets}} = \frac{\frac{\text{Debt}}{\text{Equity}}}{\frac{\text{Equity}}{\text{Equity}} + \frac{\text{Debt}}{\text{Equity}}} = \frac{\frac{\text{Debt}}{\text{Equity}}}{1 + \frac{\text{Debt}}{\text{Equity}}}$$

- 4 A ratio along these lines is:

$$\text{Profit before depreciation interest taxes and lease payments} / \{(\text{Debt interest} + \text{Lease payments} + (\text{Loan repayment installment} / (1 - \text{Tax rate})) + (\text{Preference dividends} / (1 - \text{Tax rate})))\}$$

- 5 The following analysis proves this point:

Let  $B_0$  = book value per share at the beginning of the year

$E_1$  = earnings per share for the year

$D_1$  = dividends per share for the year

$R_1$  = retained earnings per share for the year =  $E_1 - D_1$

$B_1$  = book value per share at the end of the year =  $B_0 + E_1 - D_1$

$M_0$  = market price per share at the beginning of the year =  $B_0$

$M_1$  = market price per share at the end of the year =  $B_1$

Return on equity =  $E_1/B_0$

Earnings – price ratio =  $E_1/M_0 = E_1/B_0$

$$\begin{aligned}\text{Market yield} &= \frac{D_1 + (M_1 - M_0)}{M_0} = \frac{D_1 + B_1 - B_0}{B_0} \\ &= \frac{D_1 + (B_0 + E_1 - D_1) - B_0}{B_0} = \frac{E_1}{B_0}\end{aligned}$$

- 6 Edward I. Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *Journal of Finance* (September 1968).
- 7 R.S. Kaplan and G. Urwitz, "Statistical Models of Bond Ratings: A Methodological Inquiry," *Journal of Business*, Vol. 52, (April 1979).

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter4/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter4/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Mini Cases
- Additional Solved Problems
- Excel on Solved Problems
- Answer Key



## Financial Planning and Forecasting

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe certain common elements of financial plans.
- ✓ Explain the percent of sales method and the budgeted expense method for preparing the *pro forma* statement of profit and loss.
- ✓ Discuss the formula for calculating additional funds needed.
- ✓ Explain what is sustainable growth rate.

Chapters 3 and 4 discussed what financial statements are and how they are analysed to assess a firm's past performance. While historical evaluation is important, anticipating what is likely to happen in the future is even more important. So you should know how to develop a financial plan.

The financial manager prepares pro forma, or projected, financial statements to (a) assess whether the firm's forecasted performance squares with its own targets and with the expectation of investors, (b) examine the effect of proposed operating changes, (c) anticipate the financing needs of the firm, and (d) estimate the future free cash flows that determine the firm's value.

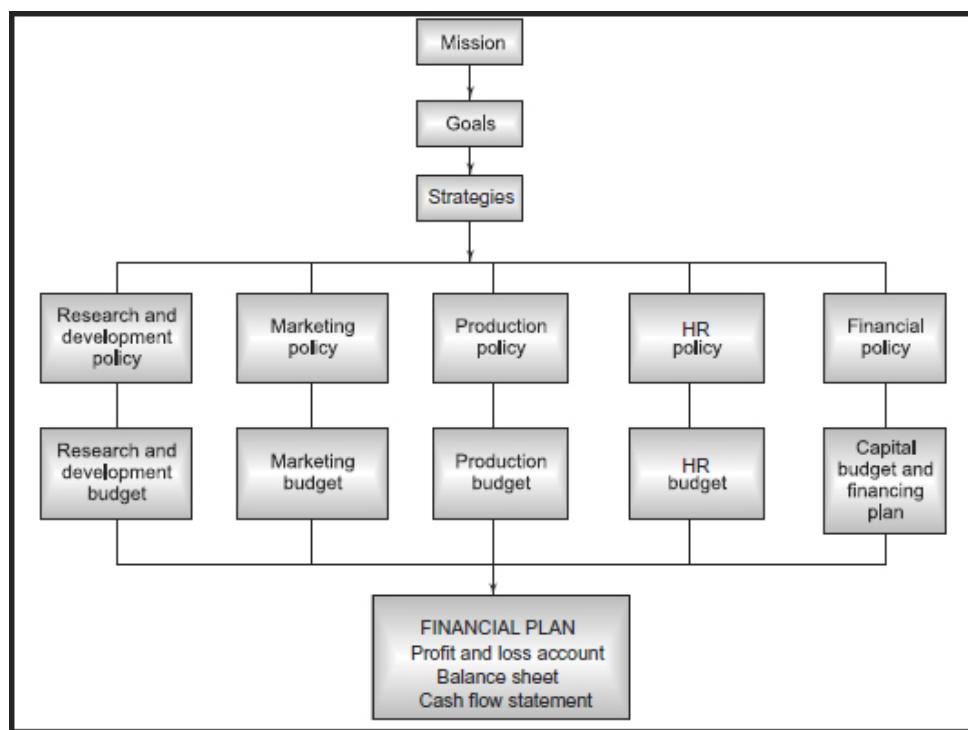
The financial plan is part of a larger planning system in the firm. The planning process is guided by the firm's mission, which reflects what the firm stands for. For example, the mission statement of Hindustan Unilever is: "To make sustainable living commonplace." While the mission statement reflects the *raison d'être* of the firm, corporate objectives spell out the specific goals sought by the firm. For example, a firm may seek to achieve a market share of 30 percent, a growth rate of 18 percent, and a return on equity of 20 percent. Corporate strategies or policies are the instruments of achieving the corporate goals. For example, a firm may simultaneously pursue expansion, diversification, and vertical integration. To support the chosen strategies, policies and budgets are developed in various areas

such as research and development, production, marketing, HR, and finance. [Exhibit 5.1](#) shows schematically the planning system of the firm.

## 5.1 ■ WHAT AND WHY OF FINANCIAL PLANNING

A long-term financial plan represents a blueprint of what a firm proposes to do in the future. Typically it covers a period of three to ten years – most commonly it spans a period of five years. Naturally, planning over such an extended time horizon tends to be in fairly aggregative terms. While there is considerable variation in the scope, degree of formality, and level of sophistication in financial planning across firms, most corporate financial plans have certain common elements. These are:

**Exhibit 5.1** The Planning System



- 1. Economic assumptions** The financial plan is based on certain assumptions about the economic environment (interest rate, tax rate, inflation rate, growth rate, exchange rate, and so on).
- 2. Sales forecast** The sales forecast is typically the starting point of the financial forecasting exercise. Most financial variables are related to the sales figure.
- 3. Pro forma statements** The heart of a financial plan are the *pro forma* (forecast) statement of profit and loss and balance sheet.

- 4. Asset requirements** Firms need to invest in plant and equipment and working capital. The financial plan spells out the projected capital investments and working capital requirements over time.
- 5. Financing plan** Suitable sources of financing have to be thought of for supporting the investment in capital expenditure and working capital. The financing plan delineates the proposed means of financing.

Thus, the capital budgeting decision, working capital decision, capital structure decision, and dividend decision have to be established for developing an explicit financial plan. These decisions will be examined in detail in the chapters ahead. For our present discussion, however, they are assumed to be given.

Companies spend considerable time and resources in financial planning. Hence, it is reasonable to ask: What are the benefits of financial planning? *Inter alia*, financial planning:

- Identifies advance actions to be taken in various areas.
- Seeks to develop a number of options in various areas that can be exercised under different conditions.
- Facilitates a systematic exploration of interaction between investment and financing decisions.
- Clarifies the links between present and future decisions.
- Forecasts what is likely to happen in future and hence helps in avoiding surprises.
- Ensures that the strategic plan of the firm is financially viable.
- Provides benchmarks against which future performance may be measured.

In defence of planning, Eisenhower, former U.S. President remarked: "In preparing for battle, I always found that plans are useless but planning is indispensable...Planning forces you to think deeply and futuristically in a more systematic manner."

## 5.2 ■ SALES FORECAST

The sales forecast is typically the starting point of the financial forecasting exercise. Most of the financial variables are projected in relation to the estimated level of sales. Hence, the accuracy of the financial forecast depends critically on the accuracy of the sales forecast. Although the financial manager may participate in the process of developing the sales forecast, the primary responsibility for it typically vests with the marketing department or the planning group.

Sales forecasts may be prepared for varying planning horizons to serve different purposes. A sales forecast for a period of 3–5 years, or for even longer durations, may be developed mainly to aid investment planning. A sales forecast for a period of one year (and in some cases two years) is the primary basis for the financial forecasting exercise discussed in this chapter.

Sales forecasts for shorter durations (six months, three months, one month) may be prepared for facilitating working capital planning and cash budgeting.

A wide range of sales forecasting techniques and methods are available. They may be divided into three broad categories:

- **Qualitative Techniques** These techniques rely essentially on the judgement of experts to translate qualitative information into quantitative estimates.
- **Time Series Projection Methods** These methods generate forecasts on the basis of an analysis of the past behaviour of time series.
- **Causal Models** These models seek to develop forecasts based on cause-effect relationships expressed in explicit, quantitative manner.

Each technique has its own advantages and limitations. Often, exclusive reliance on a single technique is somewhat dangerous. Practical wisdom suggests that at least two techniques, which seem to make sense in the specific circumstances of the firm, may be employed to hammer out the sales forecast.

## 5.3 ■ PRO FORMA STATEMENT OF PROFIT AND LOSS

There are two commonly used methods for preparing the *pro forma* statement of profit and loss – the percent of sales method and the budgeted expense method.

**Percent of Sales Method** The percent of sales method for preparing the *pro forma* statement of profit and loss is simple. Basically, this method assumes that the future relationship between various elements of costs to sales will be similar to their historical relationship. When using this method, a decision has to be taken about which historical cost ratios to be used: Should these ratios pertain to the previous year, or the average of two or more previous years?

[Exhibit 5.2](#) illustrates the application of the percent of sales method of preparing the *pro forma* statement of profit and loss of Spaceage Electronics for the year 20X3. In this table, historical data are given for two previous years, 20X1 and 20X2. For projection purposes, a ratio based on the average of two previous years has been used. The forecast value of each item is obtained as the product of the estimated sales and the average percent of sales ratio applicable to that item. For example, the average percent of sales ratio for cost of goods sold is 65.0 percent. This is calculated as  $(775 + 837)/(1200 + 1280)$ . Multiplying the estimated sales of 1400 by 65.0 percent, the projected value of cost of goods sold has been calculated. Likewise, the projected values of other items in the income statement have been calculated. Although, in practice, some deviation from a mechanical application of this method is unavoidable, for the sake of illustration, the projections shown in [Exhibit 5.2](#) are based on a strict application of this method, except for dividends and retained earnings. Remember that the distribution of earnings between dividends and retained earnings reflects a managerial policy which is not easily expressible in mechanistic terms.

**Budgeted Expense Method** The percent of sales method, though simple, is too rigid and mechanistic. For deriving the *pro forma* profit and loss account shown in [Exhibit 5.2](#), we assumed that all elements of costs and expenses bore a strictly proportional relationship to sales. The budgeted expense method, on the other hand, calls for estimating the value

of each item on the basis of expected developments in the future period for which the *pro forma* profit and loss account is being prepared. Obviously, this method requires greater effort on the part of management because it calls for defining likely developments.

**A Combination Method** It appears that a combination of the two methods described above often works best. For certain items, which have a fairly stable relationship with sales, the percent of sales method is quite adequate. For other items, where future is likely to be very different from the past, the budgeted expense method, which calls for managerial assessment of expected future developments, is eminently suitable. A combination method of this kind is neither overly simplistic as the percent of sales method nor unduly onerous as the budgeted expense method.

---

**Exhibit 5.2 | Pro Forma Statement of Profit and Loss for Spaceage Electronics for 20X3 Based on Percent of Sales Method**

	<i>Historical data</i>		<i>Average percent of sales</i>	<i>Pro forma statement of profit and loss of 20X3 assuming revenues from operations of 1400</i>
	<i>20X1</i>	<i>20X2</i>		
Revenues from Operations	1200	1280	100	1400
Other Income	8	10	0.72	10
Total Income	1208	1290	100.72	1410
Expenses				
Material expenses	547	590	45.84	642
Employee benefit expenses	274	295	22.94	321
Finance costs	60	65	5.04	71
Depreciation and amortisation expenses	75	80	6.25	88
Other expenses	98	103	8.11	113
Total Expenses	1054	1133	88.17	1234
Profit before Exceptional Items and Tax	154	157	12.55	176
Exceptional Items	30	32	2.50	35
Profit before Tax	184	189	15.05	211
Tax Expense	82	90	6.93	97
Profit (Loss) for the Period from Continuing Operation	102	99	8.12	114
Other Comprehensive Income				
Total Comprehensive Income for the Year	102	99	8.12	
Dividends	60	63		
Retained Earnings	42	36		

Exhibit 5.3 presents the 20X3 *pro forma* statement of profit and loss for Spaceage Electronics, constructed by using a combination of the percent of sales and the budgeted expense methods. Other income, material expenses, employee benefit expenses, finance costs and exceptional items are assumed to change proportionally with sales, the proportions being the average of the two preceding years. All the remaining items have been budgeted on some specific basis.

## 5.4 PRO FORMA BALANCE SHEET

The projections of various items on the assets side and liabilities side of the balance sheet may be derived as follows:

1. Employ the percent of sales method to project the items on the assets side, except 'noncurrent investments' and 'long-term loans and advances.'
2. Estimate the expected values for 'non-current investments' and 'long-term loans and advances', using specific information applicable to them.
3. Use the percent of sales method to derive the projected values of all other balance sheet items.
4. Obtain the projected value of reserves and surplus by adding the projected retained earnings (from the *pro forma* statement of profit and loss) to the reserves and surplus figure of the previous period.

**Exhibit 5.3 | Pro Forma Statement of Profit and Loss for Spaceage Electronics for 20X3 Combination Method**

	<i>Historical data</i>		<i>Average percent of sales</i>	<i>Pro forma statement of profit and loss of 20X3 assuming revenues from operations of 1400</i>
	<i>20X1</i>	<i>20X2</i>		
Revenues from Operations	1200	1280	100	1400
Other Income	8	10	0.72	10
Total Income	1208	1290	@	1410
Expenses				
Material expenses	547	590	45.84	642
Employee benefit expenses	274	295	22.94	321
Finance costs	60	65	5.04	71
Depreciation and amortisation expenses	75	80	Budgeted	85
Other expenses	98	103	Budgeted	107
Total Expenses	1054	1133	@	1225
Profit before Exceptional Items and Tax	154	157	@	185
Exceptional Items	30	32	2.50	35
Profit before Tax	184	189	@	220
Tax Expense	82	90	Budgeted	90
Profit (Loss) for the Period from continuing operation	102	99	@	130
Other Comprehensive income	-	-		
Total Comprehensive Income for the Year				
Dividends	60	63	Budgeted	70
Retained Earnings	42	36	@	60

@These items are obtained using accounting identities.

5. Set the projected values for equity and preference capital to be tentatively equal to their previous values.

**Exhibit 5.4 | Pro Forma Balance Sheet of Spaceage Electronics  
for December 31, 20X2**

	Historical data		Average percent of sales	Pro forma balance sheet of 20X3 assuming revenues from operations of 1400
	20X1	20X2		
Revenues from Operations	1200	1280	100	1400
<b>ASSETS</b>				
Non-current Assets				
Property, plant, and equipment	750	775	61.52	861
Investments	40	40	Budgeted	60
Long-term loans and advances	60	60	Budgeted	70
Current Assets				
Inventories	375	380	30.47	427
Investments	30	33	2.54	36
Trade receivables	200	212	16.61	233
Cash and cash equivalents	25	28	2.14	30
Short-term loans and advances	20	22	1.69	24
				1740
<b>EQUITY AND LIABILITIES</b>				
Equity				
Equity share capital (Par value ₹ 10)	300	300	No change	300
Other equity	250	286	Pro forma statement of P&L	346
Non-current Liabilities				
Borrowings	500	505	40.56	568
Provisions	55	50	4.24	59
Deferred tax liabilities (net)	45	50	3.83	54
Current Liabilities				
Borrowings	200	200	16.15	226
Trade payables	100	112	8.54	120
Other current liabilities	20	30	2.01	28
Short-term provisions	30	17	1.91	27
External funds requirement				13
				1740

6. Compare the total of the assets side with that of the liabilities side and determine the balancing item (If assets exceed liabilities, the balancing item represents the 'external funds required'. If the liabilities exceed assets, the balancing item represents the 'surplus available funds').

**Illustration** To illustrate the preparation of the *pro forma* balance sheet, let us continue the example of Spaceage Electronics. [Exhibit 5.4](#) shows the balance sheets of Spaceage for 20X1 and 20X2.

The *pro forma* balance sheet for 20X3 is derived as follows:

<i>Item</i>	<i>Basis of Projection</i>
■ Current assets	■ Percent of sales method wherein the proportions are based on the average for the previous two years.
■ Fixed assets	■ - do -
■ Investments	■ Assumption of no change
■ Miscellaneous expenditures and losses	■ - do -
■ Current liabilities and provisions	■ Percent of sales method wherein the proportions are based on the average for the previous two years.
■ Equity and preference capital	■ Previous values
■ Reserves and surplus	■ <i>Proforma</i> profit and loss account
■ Secured loans: Debentures	■ Previous values
■ Secured loans: Bank borrowings	■ Percent of sales method wherein the proportions are based on the average for the previous two years.
■ Unsecured loans	■ - do -
■ External funds required	■ Balancing item

**Circularity Problem** A circularity problem arises when the *pro forma* financial statements are prepared because the profit and loss account and the balance sheet are interrelated. The *pro forma* balance sheet cannot be prepared unless the *pro forma* profit and loss account, showing the amount of retained earnings to be carried to the balance sheet, is ready. At the same time, without the *pro forma* balance sheet, we cannot figure out the interest expense associated with the amount of external financing, an item required to prepare the *pro forma* profit and loss account.

## 5.5 ■ FINANCIAL MODELING USING SPREADSHEET

We have worked out the financial projections above with a set of simple arithmetic relationships among the various items, based on some key assumptions. It would indeed be convenient if we could create a template for these statements where all the calculations are done automatically every time we change any of the input variables.

Fortunately, many commonly available spreadsheet packages like Microsoft Excel™ are available for this purpose. Excel has cells for inputting data. Each cell is uniquely specified by reference to the row and column on which it lies. The rows are numbered 1,2,3,4, from top to bottom and the columns have the headings A, B, C, D....from left to right. Thus A1 is the very first cell. The one immediately to its right is B1, the one immediately below it is A2 etc.

To illustrate the application of spreadsheets in financial projections in a simple way, we will assume that the source of additional funds needed for the ensuing year, over and above the retained earnings, is increase in non-current borrowings. For this we will use the data in [Exhibit 5.3](#) and [5.4](#).

First, input all the financial statement variables as text, one below the other, starting from Revenues from Operations in A5, as shown in [Exhibit 5.5](#). In the adjacent columns B and C, input the respective values against each of these variables for the years 20X0 and 20X1 and give the year references in B4 and C4. In D5, type 100. Select D6 and type out a formula  $=(B6/\$B\$5+C6/\$C\$5)/2*100$ . Note that whenever a formula is entered in a cell, it should start with =. The \* within the formula stands for multiplication. This formula is nothing but the calculation of the average percent of other income for the two years using the cell references in place of the actual numbers, as Excel will use the value inside these cells to do the calculation. Press enter and you will get the value calculated, viz. 0.72 inside the cell (The purpose of the mysterious \$ sign will become clear later). When the worked out value is shown in D6, the corresponding formula  $=(B6/\$B\$5+C6/\$C\$5)/2*100$  can be seen in the formula bar.

Are we going to type such long formula each time to calculate the average percent of sales for the other items? No!, instead we will copy the formula itself to the other cells where we want such values. Thus, select D6, click on the icon for copy and select D9 and paste it just as you do in a word document. Excel will copy the formula onto D9, changing the cell references

relatively and will show the corresponding worked out value, viz., 45.84. While the worked out value is shown in D9 the corresponding formula = (B9/\$B\$5+C9/\$C\$5)/2\*100 can be seen in the formula bar. Note that in the copied formula, the cell references B6 and C6 have correctly changed to B9 and C9 respectively and the other cell references, viz., B5 and C5 have remained unchanged. This is the handiwork of the \$ sign. If you put this sign before the row and column notation of a cell, that cell reference will not change during any copying act. This is called making a cell reference absolute (as against relative). To make a cell reference absolute, just press F4 immediately after typing the cell reference and the two \$ signs will appear automatically. Now, copy this formula onto all the other cells where you need to enter the average percent of sales, viz. D10, D17, D29, D33, D34, D35, D36, D37, D45, D46, D48 to D51. Do not fill in the cells D11 and D44 at this stage, as we wish to keep the non-current borrowing and finance cost related items out of the percentage method.

We will use column E to show the formulae used or the assumptions based on which we are going to get the pro forma statement values in the adjacent cells in column F. Note that this is done only for your ready reference. Begin filling in column F by first going to F5 and typing 1400. Other income is 0.72 percent of revenue from operations. So the formula for it in terms of the cell references is = \$F\$5\*D6/100. Type this formula in F6 and press enter; you will get the corresponding value, viz., 10 in F6. The formula used is displayed in the formula bar and the same has been typed out in E6. The use of the \$ sign in this formula foretells you that we are going to make further use of this formula for subsequent copying. Here one more point that may be noted is that while typing out the formula as a text (for reference purposes) in E6, you must first put an inverted comma(‘) before typing =. Otherwise, when you press enter, the text will vanish and the formula value will appear. Also note that when you press enter the inverted comma will disappear and the formula beginning with = will appear. Now that you have mastered the art of copying, fill in the values of all pro forma statement items that are based only on a percentage of sales, by copying the formula used in F6. Values in F12, F14, F19, F24, F30, and F31 are budgeted values and as such their absolute numerical values, as given, should be typed in. You may type the word Budgeted in the respective preceding cells, viz. E12, E14, E19, E24, E30, and E31 for our later reference. When you come to F7, type out the corresponding accounting identity in terms of cell references, viz. =F5 + F6 and press enter; the numerical value will appear therein. The formula used here may be typed

out in E7 for future reference (This procedure of noting down the formula in the corresponding cell in column E may be followed throughout this exercise). Be ready to face the circularity problem mentioned earlier, when you come to filling in the pro forma finance costs on loans value in F11, as there is circularity between interest in the income statement and borrowings in the balance sheet.

Excel has a built-in arrangement to tackle this. To start with, as a first guess, calculate the interest (i.e. finance cost) on the existing borrowings. In our example, it is 9.2 percent on (505 + 200) and, therefore, enter the formula = (C44+C48)\*0.092 in F11 and press enter. Fill in the total expenses in F15, profit before exceptional items and tax in F16, profit before tax in F18, profit(loss) for the period from continuing operations in F20, total comprehensive income for the year in F22, and retained earnings in F25 by typing in the respective account identity formulae shown in their adjacent cells to the left. Fill in the total of assets in F38 by typing = SUM(F29:F37). As we have assumed that there is no change in share capital, type the formula =C42 in F42 and press enter. To fill in the other equity figure in F42, use the formula =C42+ F25. As the total of liabilities should be equal to the total of assets, we know that F52=F38. So copy the value in F38 to F52 and fill in F44 as the balancing figure by using the formula= F52-F41-F42-F45-F46-F48-F49-F50-F51.

Now, go to the menu File > Options > Formulas > Calculation options and check the Enable iterative calculation box (may choose to go for a maximum of say 100 iterations) and click OK. Then make a second pass by changing the formula for finance costs from = (C44+C48)\*0.092 to = (F44+F48)\*0.092 and press enter. Excel will automatically do the iterations required instantaneously and the finance costs in F11, projected non-current borrowing figure in F44 and all other account identity values below the cell F11 will automatically change such that everything is once again exactly balanced. In [Exhibit 5.5](#) a separate column G is shown which gives the final values after iteration. (All other columns remaining unchanged.) The beauty of this template is that you can easily make a sensitivity analysis by changing the input values of any of the variables, say revenues from operations, and both the pro forma statements automatically get suitably altered.

	A	B	C	D	E	F	G
1	Exhibit 5.5 A Spreadsheet Template for Financial Statements						
2		Historical data		Average percent of sales	Formulae	Before iteration	After iteration
3						Pro forma statement of profit and loss	Pro forma statement of profit and loss
4		20X0	20X1			20X2	20X2
5	Revenues from operations	1200	1280	100.00		1400	1400
6	Other income	8	10	0.72	=\$F\$5*D6/100	10	10
7	Total income	1208	1290	@	=F5+F6	1410	1410
8	Expenses						
9	Material expenses	547	590	45.84	=\$F\$5*D9/100	642	642
10	Employee benefit expenses	274	295	22.94	=\$F\$5*D10/100	321	321
11	Finance costs	60	65		=(C44+C48)*0.092	65	75
12	Depreciation and	75	80	Budgeted		85	85
13	amortisation expenses						
14	Other expenses	98	103	Budgeted		107	107
15	Total expenses	1054	1133	@	=SUM(F9:F14)	1220	1229
16	Profit before exceptional items and tax	154	157	@	=F7-F15	190	181
17	Exceptional Items	30	32	2.50	=\$F\$5*D17/100	35	35
18	Profit Before Tax	184	189	@	=F16+F17	225	216
19	Tax Expense	82	90	Budgeted		90	90
20	Profit (Loss) for the period from continuing operation	102	99	@	=F18-F19	135	126

21	Profit (Loss) from discontinued operations(after tax)						
22	Other compreh- ensive income						
23	Total compreh- ensive income for the year	102	99	@	=F20+F21+F22	135	126
24	Dividends	60	63	Budgeted		70	70
25	Retained earn- ings	42	36	@	=F23-F24	65	56
26	BALANCE SHEET					Pro forma balance sheet of 20X3	Pro forma balance sheet of 20X3
27	ASSETS						
28	Non-current Assets						
29	Property, plant, and equipment	750	775	61.52	=\$F\$5*D29/100	861	861
30	Investments	40	40	Budgeted		60	60
31	Long-term loans and ad- vances	60	60	Budgeted		70	70
32	Current Assets						
33	Inventories	375	380	30.47	=\$F\$5*D33/100	427	427
34	Investments	30	33	2.54	=\$F\$5*D34/100	36	36
35	Trade receiv- ables	200	212	16.61	=\$F\$5*D35/100	233	233
36	Cash and cash equivalents	25	28	2.14	=\$F\$5*D36/100	30	30
37	Loans	20	22	1.69	=\$F\$5*D37/100	24	24
38	Total				=SUM(F29:F37)	1740	1740
39	EQUITY AND LIABILITIES						

<b>40</b>	<b>Equity</b>						
<b>41</b>	Equity share capital (Par value ₹ 10)	300	300	No change	=C41	300	300
<b>42</b>	Other equity	250	286	Pro forma statement of P&L	=C42+F25	351	342
<b>43</b>	Non-current Liabilities						
<b>44</b>	Borrowings	500	505		=F52-F41-F42-F45-F46-F48-F49-F50-F51	575	584
<b>45</b>	Provisions	55	50	4.24	=\$F\$5*D45/100	59	59
<b>46</b>	Deferred tax liabilities (net)	45	50	3.83	=\$F\$5*D46/100	54	54
<b>47</b>	Current Liabilities						
<b>48</b>	Borrowings	200	200	16.15	=\$F\$5*D48/100	226	226
<b>49</b>	Trade payables	100	112	8.54	=\$F\$5*D49/100	120	120
<b>50</b>	Other current liabilities	20	30	2.01	=\$F\$5*D50/100	28	28
<b>51</b>	Short-term provisions	30	17	1.91	=\$F\$5*D51/100	27	27
<b>52</b>	Total				=SUM(F41:51)	1740	1740

## 5.6 ■ GROWTH AND EXTERNAL FINANCING REQUIREMENT

When ratios remain constant, financing requirement may be estimated as follows:

$$EFR = \frac{A}{S} (\Delta S) - \frac{L}{S} (\Delta S) - m S_1 (1 - d) + (\Delta I/M + SR) \quad (5.1)$$

where  $EFR$  is external funds requirement,  $A/S$  is the assets-to-sales ratio,  $\Delta S$  is the expected increase in sales,  $L/S$  is the ratio of current liabilities and provisions (spontaneous liabilities) to sales,  $m$  is the net profit margin,  $S_1$  is the projected sales for next year,  $d$  is the dividend payout ratio,  $\Delta I/M$  is the expected change in the level of ‘investments’ and ‘miscellaneous expenditures and losses’ put together, and  $SR$  is the scheduled repayment of term loans and debentures.

If we assume that the last term on the right hand side of Eq. (5.1) viz.,  $(\Delta I/M + SR)$ , is zero, the external funds requirement is:

$$EFR = A / S (\Delta S) - L / S (\Delta S) - m S_1 (1 - d) \quad (5.2)$$

Manipulating Eq. (5.2) a bit, we get:

$$\frac{EFR}{\Delta S} = \frac{A}{S} - \frac{L}{S} - \frac{m(1+g)(1-d)}{g} \quad (5.3)$$

To illustrate the calculation, let us consider the following information available for Pioneer Limited:  $A/S = 0.90$ ,  $\Delta S = ₹ 6$  million,  $L/S = 0.40$ ,  $m = 0.05$ ,  $S_1 = ₹ 46$  million, and  $d = 0.6$ . What is Pioneer’s external funds requirement for the forthcoming year? The external funds requirement of Pioneer is:

$$\begin{aligned} EFR &= (0.90) (6) - (0.4) (6) - (0.05) (46) (0.4) \\ &= ₹ 2.08 \text{ million} \end{aligned}$$

From Eq. (5.3) it is clear that, given  $A/S$ ,  $L/S$ ,  $m$ , and  $d$ , the external funds requirement as a ratio of increase in sales, i.e.,  $EFR/\Delta S$  is a function of  $g$ , the growth rate. For Pioneer, the relationship between  $EFR/\Delta S$  and  $g$  is as follows:

$$\begin{aligned} \frac{EFR}{\Delta S} &= 0.50 - \frac{0.05 (1+g) (1-0.60)}{g} \\ &= 0.50 - \frac{0.02 (1+g)}{g} \end{aligned}$$

The value of  $EFR / \Delta S$  for various values of  $g$  is shown below:

$g(\%)$	5	10	15	20	25
$EFR / \Delta S$	0.08	0.28	0.35	0.38	0.40

## Forecasting When the Balance Sheet Ratios Change

In our discussion so far we assumed that the ratios of assets and liabilities to sales ( $A/S$  and  $L/S$ ) remain constant over time. This implies that each ‘spontaneous’ asset and liability account changes at the same rate as sales. Graphically, it means that the relationship is linear and passes through the origin as shown in [Exhibit 5.6\(a\)](#).

The assumption of constant ratios and identical growth rates may be appropriate sometimes, but not always. In particular, its applicability is suspect in the following situations,

**Economies of Scale** In the use of many kinds of assets, economies of scale occur. This means that the ratios change over time as the size of the firm increases. For example, as sales expand inventories grow less rapidly than sales and hence the ratio of inventory to sales falls. Here we find that the inventory-to-sales ratio is 0.5 or 50 percent, when sales are ₹ 200 million, but the ratio declines to 0.45 or 45 percent when sales rise to ₹ 400 million.

The relationship depicted in [Exhibit 5.6\(b\)](#) is linear, but not one that passes through the origin. Often, however, a curvilinear relationship of the kind shown in [Exhibit 5.6\(c\)](#) obtains. In such a situation, larger increases in sales can be supported by smaller increases in inventories.

**Lumpy Assets** In many industries, fixed assets have to be added in large, discrete units due to technological reasons. Due to such lumpy increments of fixed assets, the relationship between fixed assets and sales is as shown in [Exhibit 5.6\(d\)](#).

**Forecasting Errors and Excess Assets** The relationships depicted in [Exhibit 5.6](#) reflect target, or projected, relationship between sales and assets. Actual sales often differ from projected sales and hence the actual asset/sales ratio may differ from the planned ratio. To illustrate, suppose that a firm has a fixed assets to sales ratio of 1:2 and, in anticipation of an increase in sales from ₹ 200 million to ₹ 300 million, it increases its fixed assets from ₹ 100 million to ₹ 150 million. However, if the sales remain stagnant at ₹ 200 million, it will have an excess capacity which can support a sales increase of ₹ 100 million. In such a situation, if the firm were to prepare its forecast for the following year it should recognise that additional sales of ₹ 100 million will require no further investment in fixed assets.

## 5.7 ■ KEY GROWTH RATES

Growth is often the central theme of corporate planning. Firms generally state corporate goals in terms of growth rates. Given our emphasis on maximising shareholder value as the principal goal of the firm, the preoccupation of planners with growth seems puzzling. One way to explain this is to assume that growth is an intermediate goal which, in turn, contributes to value creation.

While firms are interested in growth, they may be reluctant to raise external equity. Given this reluctance, it is useful to calculate two growth rates in the context of long-term financial planning: the internal growth rate and the sustainable growth rate.

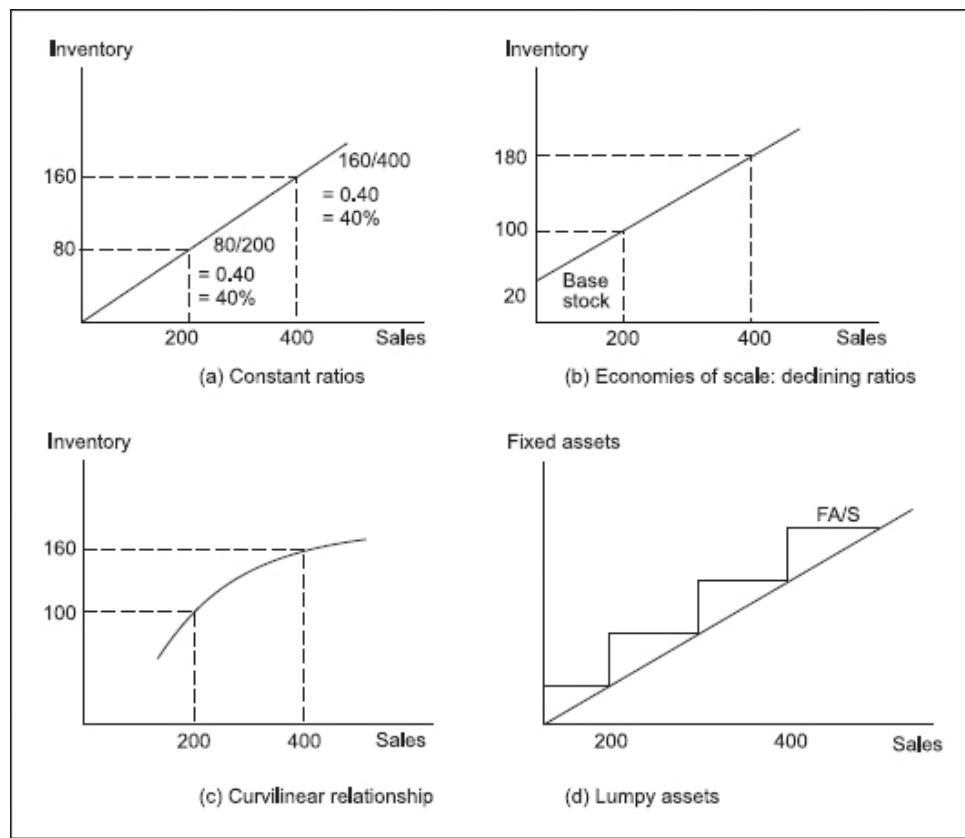
## The Internal Growth Rate (IGR)

The **internal growth rate** is the maximum growth rate that can be achieved with no external financing whatsoever. Put differently, this is the growth rate that can be sustained with retained earnings, which represent internal financing.

To determine the internal growth rate, we will make the following assumptions:

- The assets of the firm will increase proportionally to sales.
- The net profit margin (net profit to sales) is constant.
- The dividend payout ratio (and the ploughback ratio) is given.
- The firm will not raise external finance.

### Exhibit 5.6 Various Possible Ratio Relationships ( $\text{₹ in million}$ )



Given these assumptions, the internal growth rate is a *plug variable*. To derive the plug variable, remember that the change in assets must be equal to the retained earnings:

$$\text{Addition to assets} = \text{Addition to retained earnings}$$

We can now write the conditions that satisfy this equality and solve for the growth rate. To do this, we will employ the following variables.

$m$  = net profit margin on sales

$b$  = ploughback ratio

$A_0$  = current total assets of the firm

$S_0$  = sales for the current year

$S_1$  = sales for the next year

$g$  = growth rate in sales as well as assets

Given the above assumptions and symbols, we get the following.

Net profit for the next period :  $mS_1 = mS_0 (1+g)$

Addition to retained earnings :  $mS_0 (1 + g) b$

Addition to assets :  $A_0 g$

Since the addition to assets equals the addition to retained earnings we have:

$$A_0 g = mS_0 (1 + g) b \quad (5.4)$$

Juggling this a bit, we get:

$$g = \frac{mS_0 b}{A_0 - mS_0 b} \quad (5.5)$$

Dividing both the numerator and the denominator of the right hand side of Eq. (5.5) by  $A_0$ , we get:

$$g = \frac{m(S_0/A_0)b}{A_0/A_0 - m(S_0/A_0)b} \quad (5.6)$$

In words,

$$\text{Internal growth rate} = \frac{\text{Net profit margin} \times \text{Asset turnover} \times \text{Ploughback ratio}}{1 - \text{Net profit margin} \times \text{Asset turnover} \times \text{Ploughback ratio}}$$

Recall from the previous chapter that:

$$\text{Return on assets} = \text{Net profit margin} \times \text{Asset turnover}$$

Thus,

$$\text{Internal growth rate} = \frac{\text{Return on assets} \times \text{Ploughback ratio}}{1 - \text{Return on assets} \times \text{Ploughback ratio}}$$

To illustrate, suppose the return on assets and ploughback ratio for Acme Chemicals are 12 percent and 60 percent respectively. What is the

internal growth rate? The internal growth rate is:

$$\frac{0.12 \times 0.6}{1 - 0.12 \times 0.6} = 0.78 \text{ or } 7.8 \text{ percent}$$

## The Sustainable Growth Rate (SGR)

The **sustainable growth rate** is the maximum growth rate that a firm can achieve without resorting to external equity finance. This is the growth rate that can be sustained with the help of retained earnings matched with debt financing, in line with the debt-equity policy of the firm.

This is an important growth rate because firms are reluctant to raise external equity finance (even though they may not mind raising debt finance, in line with their debt – equity policy) for the following reasons: (i) The dilution of control, consequent to the external equity issue, may not be acceptable to the existing controlling interest. (ii) There may be a significant degree of underpricing when external equity is raised. (iii) The cost of issue tends to be high.

The sustainable growth rate is calculated the way in which the internal growth rate is calculated, except for one difference: To calculate the sustainable growth rate we have to consider retained earnings plus matching debt, in line with the firm's debt equity (D/E) ratio. Thus:

$$\text{Addition to assets} = \text{Additional retained earnings} + \text{Additional debt}$$

$$A_0g = mS_0(1+g)b + mS_0(1+g)b(D/E) \quad (5.7)$$

Juggling this equation a bit, we get

$$g = \frac{m(S_0 / A_0)(1+D/E)b}{1 - m(S_0 / A_0)(1+D/E)b} \quad (5.8)_2$$

In words,

$$\begin{aligned} \text{Sustainable growth rate} &= \frac{\text{Net profit margin} \times \text{Asset turnover}}{1 - \text{Net profit margin} \times \text{Asset turnover}} \\ &\quad \times \frac{(1 + \text{Debt-equity ratio}) \times \text{Ploughback ratio}}{(1 + \text{Debt-equity ratio}) \times \text{Ploughback ratio}} \end{aligned}$$

Recall from the [previous chapter](#) that:

Return on equity = Net profit margin × Asset turnover × (1 + Debt-equity ratio)

Thus,

$$\text{Sustainable growth rate} = \frac{\text{Return on equity} \times \text{Ploughback ratio}}{1 - \text{Return on equity} \times \text{Ploughback ratio}}$$

To illustrate, suppose the return on equity and ploughback ratio for Zenith Electronics are 15 percent and 70 percent. What is the sustainable growth rate? The sustainable growth rate is:

$$\frac{0.15 \times 0.7}{1 - 0.15 \times 0.7} = 0.117 \text{ or } 11.7 \text{ percent}$$

Examining Eq. (5.8) we find that other things being equal.

- The higher the net profit margin, the higher the sustainable growth rate.
- The higher the asset turnover, the higher the sustainable growth rate.
- The higher the debt-equity ratio, the higher the sustainable growth rate.
- The higher the ploughback ratio, the higher the sustainable growth rate.

Thus, the sustainable growth rate can be increased, by effecting one or more of the following changes:

- Increase in the net profit margin
- Increase in the asset turnover ratio
- Increase in the debt-equity ratio
- Increase in the ploughback ratio

Though the above-mentioned changes enhance the sustainable growth rate, management may not have equal influence over them. Further, these changes do not always have a favourable overall impact on the firm. For example, it may be possible for the management to change the payout ratio and the financial leverage ratio more easily than to change the net profit margin or the asset turnover ratio. In effecting these changes their other implications have to be taken into account. For example, a decrease in the dividend payout ratio may have an unfavourable effect on the stock price and an increase in financial leverage may raise the total risk of the firm beyond acceptable limits.

## SUMMARY

- The long-term financial plan represents a blueprint of what the firm proposes to do in future. Most corporate financial plans have the following elements: economic assumptions, sales forecast, *pro forma* financial statements, asset requirements, financing plan, and cash budget.
- *Inter alia*, financial planning identifies advance actions, develops options, forecasts what is likely to happen, and provides benchmarks against which future performance may be measured.
- The **sales forecast** is typically the starting point of the financial forecasting exercise as most of the financial variables are projected in relation to the estimated level of sales.
- A wide range of sales forecasting methods are available. They may be divided into three broad categories: qualitative techniques, time series projection methods, and causal models.

- There are two commonly used methods for preparing the *pro forma* profit and loss account: **the percent of sales method** and **the budgeted expense method**.
- The percent of sales method assumes that the future relationship between various elements of costs to sales will be similar to their historical relationship. The budgeted expense method calls for estimating the value of each item on the basis of expected developments in the future period. It appears that a combination of the two methods often works best.
- The **external funds requirement** may be estimated as follows:

$$EFR = A/S (\Delta S) - L/S (\Delta S) - mS_1 (1 - d) - (\Delta IM + SR)$$

- The **internal growth rate** is the growth rate that can be achieved with no external financing whatsoever.
- The **sustainable growth rate** is the growth rate that can be sustained with the help of retained earnings matched with debt financing, in line with the debt equity policy of the firm.

## QUESTIONS

1. Show schematically the planning system of a firm.
2. What are the elements of a corporate financial plan?
3. What are the benefits of financial planning?
4. Describe briefly the types of sales forecasting techniques and methods.
5. Explain the following methods for preparing the *pro forma* profit and loss statement: (i) the percent of sales method, (ii) the budgeted expense method, and (iii) the combination method.
6. Describe the procedure for preparing the *pro forma* balance sheet.
7. Comment on the circularity problem because the profit and loss statement and the balance sheet are interrelated.
8. Discuss the formula for estimating the external funds requirement.
9. State some of the reasons why firms may be disinclined to raise external equity capital.
10. Develop the formula expressing the growth rate ( $g$ ) sustainable with internal equity in terms of (i) the net profit margin ratio ( $m$ ), (ii) the target dividend payout ratio ( $d$ ), (iii) the assets-to-equity ratio ( $A / E$ ), and (iv) the assets-to-sales ratio ( $A / S$ ).

## SOLVED PROBLEMS

- 5.1 The financial statements of Deepam Silks for years 1 and 2 are as follows:

---

### Statement of Profit and Loss

	Year 1	Year 2
■ Revenues from Operations	600	720
■ Expenses		
Material expenses	300	344
Employee benefit expenses	150	172
Finance costs	10	12
Depreciation and amortisation expenses	30	40
Other expenses	86	100
■ Total expenses	576	668
■ Profit before exceptional items and other income	24	52
■ Exceptional items	10	8
■ Profit before extraordinary items and tax	34	60
■ Extraordinary items		
Profit before tax	34	60
Tax expense	14	26
Profit (Loss) for the period	20	34
Dividends	12	15
Retained earnings	8	19

<i>Balance Sheet</i>		
	Year 1	Year 2
<b>ASSETS</b>		
<i>Non-current Assets</i>		
■ Property, plant, and equipment (net)	240	270
■ Non-current Investments	7	8
■ Long-term loans and advances	20	18
<i>Current Assets</i>		
■ Inventories	125	144
■ Current Investments	3	2

■ Trade receivables	80	90
■ Cash and cash equivalents	5	6
■ Loans and advances	20	22
	500	560

## EQUITY AND LIABILITIES

### *Equity*

■ Equity share capital (Par value ₹ 10)	120	120
■ Other equity	150	169

### *Non-current Liabilities*

■ Borrowings	35	58
■ Long-term provisions	5	11
■ Deferred tax liabilities (net)		

### *Current Liabilities*

■ Short-term borrowings	20	22
■ Trade payables	125	130
■ Other current liabilities	5	5
■ Short-term provisions	40	45
	500	560

Prepare the *pro forma* statement of profit and loss for year 3 and the *pro forma* balance sheet as at the end of year 3, based on the following assumptions:

- (a) The projected sales for year 3 are 850.
- (b) The forecast values for the following items may be derived using the percent of sales method (for this purpose, assume that the average of the percentages for years 1 and 2 is applicable).  
Material expenses, employee benefit expenses, finance costs, other expenses and exceptional items.
- (c) The forecast values for the other items of the statement of profit and loss are as follows.

■ Depreciation	:	45
■ Tax	:	50 percent of earnings before tax
■ Dividends	:	16

- (d) The forecast values of various balance sheet items may be derived as follows:

- Fixed assets (net) : Budgeted at 300
- Non-current investments : No change over year 2
- Current assets : Percent of sales method wherein the percentages are based on the average for the previous two years.
- Share capital : No change over year 2
- Reserves and surplus : *Pro forma* income statement
- Non-current and current liabilities and provisions : Percent of sales method wherein the percentages are based on the average for the previous two years.
- External fund required : Balancing item

### Solution

The *pro forma* income statement and the *pro forma* balance sheet are shown below:

Statement of Profit and Loss for Deepam Silks for Year 3				
	Historical data		Average percent of sales	Pro forma income statement for year 3
	Year 1	Year 2		
■ Revenues from operations	600	720	100%	850
■ Expenses				
Material expenses	300	344	48.89	416
Employee benefit expenses	150	172	24.44	208
Finance costs	10	12	1.67	14
Depreciation and amortisation expenses	30	40	budgeted	45
Other expenses	86	100	14.11	120
■ Total expenses	576	668	@	803
■ Profit before exceptional items and other income	24	52	@	47
■ Exceptional items	10	8	1.39	12
■ Profit before extraordinary items and tax	34	60	@	59
■ Profit before tax	34	60	@	59
■ Tax expense	14	26	@50% of PBT	30
■ Profit (Loss) for the period	20	34	@	29
Dividends	12	15	budgeted	16
Retained earnings	8	19	@	13

Pro forma Balance Sheet for Deepam Silks for Year 3				
	Historical data		Average percent of sales or some other basis	Projection for year 3 based on a fore- cast sales of 850
	Year 1	Year 2		
<b>Revenues from Operations</b>	600	720	100	850
<b>ASSETS</b>	500	560		647
■ Non-current assets				
■ Property, plant, and equipment	240	270	Budgeted	300
■ Non-current investments	7	8	No change	8
■ Long-term loans and advances	20	18	No change	18
■ Current assets				
■ Inventories	125	144	20.42	174
■ Current investments	3	2	0.39	3
■ Trade receivables	80	90	12.92	110
■ Cash and cash equivalents	5	6	0.83	7
■ Short-term loans and advances	20	22	3.19	27
	500	560		647
<b>EQUITY AND LIABILITIES</b>				
■ Equity				
■ Equity share capital (Par value ₹ 10)	120	120	No change	120
■ Other equity	150	169	Pro forma state- ment of P & L	182
■ Non-current liabilities				
■ Long-term borrowings	35	58	6.94	59
■ Long-term provisions	5	11	1.18	10
■ Deferred tax liabilities (net)				
■ Current liabilities				
■ Short-term borrowings	20	22	3.19	27
■ Trade payables	125	130	19.44	165
■ Other current liabilities	5	5	0.76	6
■ Short-term provisions	40	45	6.46	55
■ External funds requirement				23

- 5.2 The following information is available for Olympus Limited:  $A/S = 0.8$ ,  $\Delta S = ₹ 20$  million,  $L/S = 0.40$ ,  $m = 0.06$ ,  $S_1 = ₹ 100$  million and  $d = 0.4$ . What is the external funds requirement for the forthcoming year?

*Solution*

The external funds requirement of Olympus is:

$$\begin{aligned}
 EFR &= A^*/S_0 (\Delta S) - L^*/S (\Delta S) - mS_1 (r) \\
 &= 0.8 \times 20 - 0.4 \times 20 - 0.06 \times 100 \times 0.6 \\
 &= ₹ 4.4 \text{ million}
 \end{aligned}$$

- 5.3 The following information is available for Signal Corporation:  $m = 0.05$ ,  $d = 0.30$ ,  $A/E = 2.4$ ,  $A/S_0 = 1.0$ . What rate of growth can be sustained with internal equity?

*Solution*

The sustainable growth rate for Signal is:

$$g = \frac{m(1-d)A/E}{A/S_0 - m(1-d)A/E} = \frac{0.05(1-0.3)2.4}{1-0.05(1-0.3)2.4}$$

$$= 9.17 \text{ percent}$$

## PROBLEMS

**5.1 Proforma Statement** The statement of Profit and Loss of A for years 1 and 2 is as follows:

	Year	
	1	2
■ Revenues from operations	800	890
■ Expenses		
Material expenses	407	453
Employee benefit expenses	203	227
Finance costs	10	11
Depreciation and amortisation expenses	50	64
Other expenses	120	117
■ Total expenses	790	872
■ Profit before exceptional items and other income	10	18
■ Exceptional items	8	10
■ Profit before extraordinary items and tax	18	28
■ Extraordinary items		
■ Profit before tax	18	28
■ Tax expense	7	10
■ Profit (Loss) for the period	11	18
Dividends	6	7
Retained earnings	5	11

Using the percent of sales method, prepare the *pro forma* statement of profit and loss for year 3. Assume that the sales will be 1020 in year 3. If dividends are raised to 8, what amount of retained earnings can be expected for year 3.

**5.2 Reworking** Rework Problem 5.1 assuming the following budgeted amounts.

Other expenses	124
Depreciation and amortisation expenses	60
Finance costs	12
Dividends	8

**5.3 EFR** The balance sheet of Modern Electronics Ltd. as of the end of years 1 and 2 is given below:

	Year	
	1	2
<b>ASSETS</b>		
<i>Non-current Assets</i>		
Property, plant, and equipment	300	380
Non-current investments	20	20
Long-term loans and advances	15	14
<i>Current Assets</i>		
Inventories	173	192
Current investments	21	20
Trade receivables	180	200
Cash and cash equivalents	12	14
Short-term loans and advances	20	25
	741	865
<b>EQUITY AND LIABILITIES</b>		
<i>Equity</i>		
Equity share capital (Par value ₹ 10)	150	150
Other equity	118	129
<i>Non-current Liabilities</i>		
Long-term borrowings	144	175
Long-term provisions	13	19
Short-term borrowings	10	180
Trade payables	126	167
Short-term provisions	40	45
	741	865

As in Problem 5.1, assume that sales will grow to 1020 in year 3. For the year 3, on the asset side assume that current and non – current investments would remain unchanged and on the equities and liabilities assume that the share capital and long-term provisions would remain unchanged. Other items in the balance sheet would change in proportion to sales.

Obtain the estimated value of retained earnings from the *pro forma* income statement developed in problem 5.2 Finally estimate the amount of external financing needed for year 3.

**5.4 EFR** The balance sheet of Deepak Cables Limited on December 31, 20X0 is shown below:

Equity share capital	150	Property, plant, and equipment	400
Other equity	180	Inventories	200
Term loans	80	Trade receivables	150
Short-term bank borrowings	200	Cash	50
Trade payables	140		
Provisions	50		
	<u>800</u>		<u>800</u>

The sales of the firm for the year ending on December 31, 20X0 were 1,000. Its profit margin on sales was 6 percent and its dividend payout ratio was 50 percent. The tax rate was 60 percent. Deepak Cables expects its sales to increase by 30 percent in the year 20X1. The ratio of assets to sales and spontaneous current liabilities to sales would remain unchanged. Likewise the profit margin ratio, the tax rate, and the dividend payout ratio would remain unchanged.

- Required:
1. Estimate the external funds requirement for the year 20X1.
  2. Prepare the following statements, assuming that the external funds requirement would be raised equally from term loans and short-term bank borrowings: (i) projected balance sheet and (ii) projected statement of profit and loss.

**5.5 EFR** The balance sheet of Elgin Corporation as on 31<sup>st</sup> December 20X0 is shown below:

Equity share capital	30	Property, plant, and equipments	60
Other equity	40	Inventories	50
Term loans	20	Trade receivables	30
Short-term bank borrowings	30	Cash	10
Trade payables	25		
Provisions	5		
	<u>150</u>		<u>150</u>

Sales for 20X0 were 160, while net profit after taxes was 10. Elgin paid dividend of 5 to equity shareholders.

- (a) If sales increase by 50 percent (80) during 20X1, what will be Elgin's external funds requirement? Assume that profit margin ratio and dividend payout ratio would remain unchanged.

- (b) Prepare Elgin's projected balance sheet as on 31<sup>st</sup> December 20X1. Assume that the external fund requirement will be raised equally from term loans and fresh issue on equity capital.
- (c) Calculate the following ratios for 20X0 and 20X1: current ratio, debt to total assets ratio, and return on equity.
- (d) Assume, now, that the sales growth of 80 occurs evenly over a period of 4 years (20 per year) rather than in just one year. (i) Calculate the total external fund requirement over the four-year period, (ii) Construct a pro forma balance sheet as on December 31, 20X4.

**5.6 IGR** The following information is given for MCI Company:

Assets to sales ratio	= 0.80
Spontaneous liabilities to sales ratio	= 0.50
Profit margin	= 5 percent
Dividend payout ratio	= 0.6
Previous year's sales	= 1200

What is the maximum sales growth rate that can be financed without raising external funds?

**5.7 EFR** The balance sheet of Pradhan Company at the end of year 20X0, which is just over, is given below:

Equity share capital	50	Fixed assets	130
Other equity	60	Inventories	90
Long-term borrowings	80	Trade receivables	80
Short-term borrowings	60	Cash	20
Trade payables	50		
Provisions	20		
	<hr/>		<hr/>
	320		320

The sales for the year just ended were 400. The expected sales for the year 20X1 are 500. The profit margin is 5 percent and the dividend payout ratio is 50 percent.

Required:

- (a) Determine the external funds requirement for Pradhan for the year 20X1.
- (b) How should the company raise its external funds requirement, if the following restrictions apply? (i) Current ratio should not be less than 1.25. (ii) The ratio of fixed assets to long-term loans should be greater than 1.25. Assume that the company wants to tap external funds in the following order: short-term bank borrowing, long-term loans, and additional equity issue.

**5.8 Level of Assets** The following information is available about Videosonics Limited:

Sales of this year	= 10,000
Projected sales increase for next year	= 10 percent
Profit after tax this year	= 600
Dividend payout ratio	= 60 percent
Projected surplus funds available next year	= 150
Present level of spontaneous current liabilities	= 3,000

What is the level of total assets for Videosonics now?

**5.9 IGR** Chronomatics Limited has the following financial ratios:

$$m = \text{net profit margin ratio} = 5 \text{ percent}$$

$$d = \text{target dividend payout ratio} = 60 \text{ percent}$$

$$A/E = \text{assets-to-equity ratio} = 2.5$$

$$A/S = \text{assets-to-sales ratio} = 1.4$$

- (a) What is the rate of growth that can be sustained with internal equity?
- (b) If Chronomatic Limited wants to achieve a 5 percent growth rate with internal equity, what change must be made in the dividend payout ratio, other ratios remaining unchanged?
- (c) If Chronomatic Limited wants to achieve a 5 percent growth rate with internal equity, what change must be made in the assets-to-equity ratio, other ratios remaining unchanged?
- (d) If Chronomatic Limited wants to achieve a 6 percent growth rate with internal equity, what should be the improvement in the profit margin, other ratios remaining unchanged?
- (e) If Chronomatic Limited wants to achieve a 6 percent growth rate with internal equity, what change must occur in the assets-to-sales ratio, other ratios remaining unchanged?

### MINICASE

It was after two years of normal but lacklustre operations that Kohinoor Garments found itself facing a windfall of an opportunity as their main competitor had started facing some major problems. When their MD consulted an industry expert on this matter he was told that there was scope for them to as much as double their sales in just two years—twenty percent growth in the first year and the balance in the second year. Before formally discussing the opportunity with the other directors, he wants you,

their finance manager, to give him a possible plan of action on how to mobilise the funds for such an expansion.

You are well aware that your bank is very strict on certain lending norms, particularly the leverage ratio. They wouldn't consider a debt-equity ratio (defined by them as interest bearing debt to equity) of more than 1. Knowing the current financial position, you plan to use only the internal generation to build the capacity for achieving the first year growth and if necessary to suitably reduce the dividend payout. For the second year, on the strength of the improved performance, you plan to seek an additional term loan from your bank and also to restore the dividend payout ratio to its regular level of forty percent. The additional loan would be limited to the maximum amount consistent with the bank's norm and the balance needed funds would be met by additional equity from the promoters.

You decide to prepare abridged tentative projected statements of profit and loss and balance sheets for the next two years reflecting your plan. For this purpose you decide to assume that the ratio of assets and spontaneous liabilities to sales, the net profit margin ratio, and the tax rate would remain unchanged and all loan repayments would be deferred by three years. The actual figures for the previous financial year that ended only a couple of days back are as follows:

Equity share capital	100	Fixed assets	620
Retained earnings	290	Inventories	360
Term loan	150	Receivables	170
Short-term bank Borrowings	360	Cash	90
Accounts payable	250		
Provisions	90		
	1240		1240

Total revenues for the year = 2400, tax rate = 30%, Net profit = 192

Show the projected statements prepared by you.

## Appendix 5A

### Financial Planning and Forecasting at General Electric

General Electric (GE) is a large, complex, global enterprise. The main objective of forecasting at GE is to make sure that the management understands how various businesses are expected to perform so that it can allocate capital more efficiently.

To develop financial forecasts, GE has two main planning events each year. Starting in spring the company develops a strategic plan called “growth playbook,” which is a three to five-year plan for each of its businesses. Using its own variant of Michael Porter’s “five-factor” model, it asks its business teams to analyse and understand the environments they compete in. It’s a bottoms-up process that starts in April and about 45 profit and loss centres go through this process. The analysis ends up in producing a “base case,” which represents the most probable outcome. It also produces a distribution and range of outcomes, including worst-case and best-case scenarios. From this exercise a three-year financial model that encompasses a full balance sheet, an income statement, and a cash flow statement for the entire company emerges. In July, a presentation is made to the board of directors in which separate financial statements on each of the 12 main business segments are reported. Based on this board presentation and the ensuing discussion, a list of seven to ten strategic priorities are identified for each business segment and for the company as a whole.

The second main planning event is the formulation of the budget. In the fall, the spring forecasts in the playbook are updated by the finance and operating teams using another six months of data. Along with updated forecasts, they provide detailed budgets for every operating business. The updated forecasts and budgets are presented in a summary form to the board. The budgets serve as the basis of the annual update with investors that take place each December. A lot of thought and effort goes into in these exercises.

The company also produces short-term as well as long-term outlooks. In the middle of every quarter, financial teams prepare financial statements (income statement, cash flow statement, and balance sheet) for the current quarter, the following quarter, and the entire year. In other words, the company has a system of preparing rolling forecasts.

There is a continual process of discussion and review. As Keith Sherman put it, “During the second and third months of each quarter, we have operating reviews of each of our businesses in which the CEO, the CFO, and their operating leaders spend a day reviewing their business operations without corporate leadership team.” He added “And at the end of each quarter, we have a major performance update with our investor relations team to prepare for our quarterly earnings release.”

GE has some 3,000 finance professionals who are part of this financial analysis and planning process, getting real-time feedback for comparing performance against

targets, and dealing with changes in the environment, and then trying to make adjustments.

To provide consistency in forecasting the corporate office provides exchange rates for translating projected overseas revenues into dollars as well as forecast commodity prices.

**1** Dividing both the sides of Eq. (5.2) by  $\Delta S$  we get:

$$\frac{EFR}{\Delta S} = \frac{A}{S} - \frac{L}{S} - \frac{mS_1(1-d)}{\Delta S} \quad (1)$$

Since  $S_1$  is equal to  $S_0(1+g)$  – here  $g$  is the growth rate in sales – and  $\Delta S$  is  $S_0g$ , the above simplifies to:

$$\frac{EFR}{\Delta S} = \frac{A}{S} - \frac{L}{S} - \frac{m(1+g)(1-d)}{g} \quad (2)$$

**2** The steps involved here are as follows:

$$A_0g = mS_0(1+g)b + mS_0(1+g)b(D/E) \quad (1)$$

$$g = m(S_0/A_0)(1+g)b + m(S_0/A_0)(1+g)b(D/E) \quad (2)$$

$$g = m(S_0/A_0)b + m(S_0/A_0)gb + m(S_0/A_0)b(D/E) + m(S_0/A_0)gb(D/E) \quad (3)$$

$$g = m(S_0/A_0)b(1+D/E) + m(S_0/A_0)gb(1+D/E) \quad (4)$$

$$g - m(S_0/A_0)gb(1+D/E) = m(S_0/A_0)b(1+D/E) \quad (5)$$

$$g[1 - m(S_0/A_0)b(1+D/E)] = m(S_0/A_0)b(1+D/E) \quad (6)$$

$$g = \frac{m(S_0/A_0)b(1+D/E)}{1 - m(S_0/A_0)b(1+D/E)} \quad (7)$$

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter5/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter5/index.html)

- Additional Self-Test Problems
- Additional Solved Problems
- Chapters Excel
- Excel on Solved Problems
- Answer Key



## **PART-III**

### **Fundamental Valuation Concepts**

- 6** The Time Value of Money
  - 7** Valuation of Bonds and Stocks
  - 8** Risk and Return
  - 9** Risk and Return: Portfolio Theory and Asset Pricing Models
  - 10** Options and Their Valuation
-

## The Time Value of Money

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Calculate the future value and present value of a single amount.
- ✓ Calculate the future value and present value of an annuity.
- ✓ Set up a loan amortisation table.
- ✓ Explain how compounding frequency impacts on the effective rate of interest.

Money has time value. A rupee today is more valuable than a rupee a year hence. Why? There are several reasons:

- Individuals, in general, prefer current consumption to future consumption.
- Capital can be employed productively to generate positive returns. An investment of one rupee today would grow to  $(1 + r)$  a year hence ( $r$  is the rate of return earned on the investment).
- In an inflationary period, a rupee today represents a greater real purchasing power than a rupee a year hence.

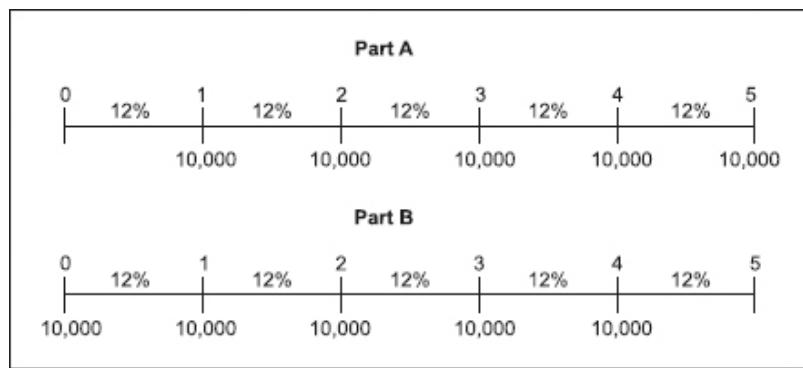
Most financial problems involve cash flows occurring at different points of time. These cash flows have to be brought to the same point of time for purposes of comparison and aggregation. Hence you should understand the tools of compounding and discounting which underlie most of what we do in finance - from valuing securities to analysing projects, from determining lease rentals to choosing the right financing instruments, from setting up the loan amortisation schedules to valuing companies, so on and so forth.

## 6.1 TIME LINES AND NOTATION

When cash flows occur at different points in time, it is easier to deal with them using a **time line**. A time line shows the timing and the amount of each cash flow in a cash flow stream. Thus, a cash flow stream of ₹ 10,000 at the end of each of the next five years can be depicted on a time line like the one shown in Part A of [Exhibit 6.1](#).

In [Exhibit 6.1](#), 0 refers to the present time. A cash flow that occurs at time 0 is already in present value terms and hence does not require any adjustment for time value of money. You must distinguish between a *period of time* and a *point of time*. Period 1 which is the first year is the portion of time line between point 0 and point 1. The cash flow occurring at point 1 is the cash flow that occurs at the end of period 1. Finally, the discount rate, which is 12 percent in our example, is specified for each period on the time line and it may differ from period to period. If the cash flow occurs at the beginning, rather than the end, of each year, the time line would be as shown in Part B of [Exhibit 6.1](#).

**Exhibit 6.1** Time Line



Note that a cash flow occurring at the end of year 1 is equivalent to a cash flow occurring at the beginning of year 2.

Cash flows can be positive or negative. A positive cash flow is called a *cash inflow*; a negative cash flow, a *cash outflow*.

The following notation will be used in our discussion:

PV : Present value

FV<sub>n</sub> : Future value  $n$  years hence

: Cash flow occurring at the end of year  $t$

$C_t$

$A$  : A stream of constant periodic cash flows over a given time

$r$  : Interest rate or discount rate

$g$  : Expected growth rate in cash flows

$n$  : Number of periods over which the cash flows occur.

## 6.2 ■ FUTURE VALUE OF A SINGLE AMOUNT

Suppose you invest ₹ 1,000 for three years in a savings account that pays 10 percent interest per year. If you let your interest income be reinvested, your investment will grow as follows:

First year :	Principal at the beginning	1,000
	Interest for the year (₹ 1,000 × 0.10)	100
	Principal at the end	1,100
Second year :	Principal at the beginning	1,100
	Interest for the year (₹ 1,100 × 0.10)	110
	Principal at the end	1,210
Third year :	Principal at the beginning	1,210
	Interest for the year (₹ 1,210 × 0.10)	121
	Principal at the end	1,331

## Formula

The process of investing money as well as reinvesting the interest earned thereon is called compounding. The future value or compounded value of an investment after  $n$  years when the interest rate is  $r$  percent is:

$$FV_n = PV(1 + r)^n \quad (6.1)$$

In this equation  $(1 + r)^n$  is called the future value interest factor or simply the future value factor.

To solve future value problems you have to find the future value factors. You can do it in different ways. In the example given above, you can multiply 1.10 by itself three times or more generally  $(1 + r)$  by itself  $n$  times. This becomes tedious when the period of investment is long.

Fortunately, you have an easy way to get the future value factor. Most calculators have a key labelled ' $y^x$ '. So all that you have to do is to enter 1.10, press the key labelled  $y^x$ , enter 3, and press the '=' key to obtain the answer.

Alternatively, you can consult a future value interest factor (FVIF) table. [Exhibit 6.2](#) presents one such table showing the future value factors for certain combinations of periods and interest rates. A more comprehensive table is given in [Appendix A](#) at the end of the book.

Suppose you deposit ₹ 1,000 today in a bank which pays 10 percent interest compounded annually. How much will the deposit grow to after 8 years and 12 years?

The future value 8 years hence will be:

$$\begin{aligned} \text{₹ } 1,000 (1.10)^8 &= \text{₹ } 1,000 (2.144) \\ &= \text{₹ } 2,144 \end{aligned}$$

The future value 12 years hence will be:

$$\begin{aligned} \text{₹ } 1,000 (1.10)^{12} &= \text{₹ } 1,000 (3.138) \\ &= \text{₹ } 3,138 \end{aligned}$$

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## **Exhibit 6.2 | Value of $FVIF_{r,n}$ for Various Combinations of $r$ and $n$**

$n/r$	6%	8%	10%	12%	14%
2	1.124	1.166	1.210	1.254	1.300
4	1.262	1.360	1.464	1.574	1.689
6	1.419	1.587	1.772	1.974	2.195
8	1.594	1.851	2.144	2.476	2.853
10	1.791	2.159	2.594	3.106	3.707
12	2.012	2.518	3.138	3.896	4.817

While tables are easy to use they have a limitation as they contain values only for a small number of interest rates. So often you may have to use a calculator or a spreadsheet – the use of spreadsheet is illustrated later.

## Compound and Simple Interest

So far we assumed that money is invested at compound interest which means that each interest payment is reinvested to earn further interest in future periods. By contrast, if no interest is earned on interest the investment earns only simple interest. In such a case the investment grows as follows:

$$\text{Future value} = \text{Present value} [1 + \text{Number of years} \times \text{Interest rate}]$$

For example, an investment of ₹ 1,000, if invested at 12 percent simple interest rate, will in 5 years time become:

$$1,000 [1 + 5 \times 0.12] = ₹ 1,600$$

[Exhibit 6.3](#) shows how an investment of ₹ 1,000 grows over time under simple interest as well as compound interest when the interest rate is 12 percent. From this exhibit you can feel the power of compound interest. As Albert Einstein once remarked: 'I don't know what the seven wonders of the world are, but I know the eighth -compound interest'. You may be wondering why your ancestors did not display foresight. Hopefully, you will show concern for the posterity.

### Exhibit 6.3 Value of ₹ 1000 Invested at 10 percent Simple and Compound Interest

Year	Simple Interest				Compound Interest			
	Starting Balance	+ Interest	=	Ending Balance	Starting Balance	+ Interest	=	Ending Balance
1	1000	+ 100	=	1100	1000	+ 100	=	1100
5	1400	+ 100	=	1500	1464	+ 146	=	1610
10	1900	+ 100	=	2000	2358	+ 236	=	2594
20	2900	+ 100	=	3000	6116	+ 612	=	6728
50	5900	+ 100	=	6000	106,718	+ 10672	=	117,390
100	10,900	+ 100	=	11,000	12,527,829	+ 1,252,783	=	13,780,612

[Exhibit 6.4](#) shows graphically how money grows under simple interest and compound interest. Note that under simple interest the growth is linear and under compound interest the growth is exponential.

### Power of Compounding

The power of compounding is often illustrated with the sale of Manhattan Island in 1626. It was sold by Red Indians to Peter Minuit for \$24. Looking at the New York real estate prices today, it appears that Peter Minuit got a real bargain. But consider

the future value of \$24 in 2010 if Red Indians had invested for 384 years (2010 minus 1626) at an interest rate of 8 percent per year:

$$\$ 24 \times (1.08)^{384} = \$ 164,033,800,000,000$$

$$= \$ 164 \text{ trillion}$$

The total value of land on Manhattan in 2010 may perhaps have not been more than \$ 500 billion. So the deal was not really a bargain.

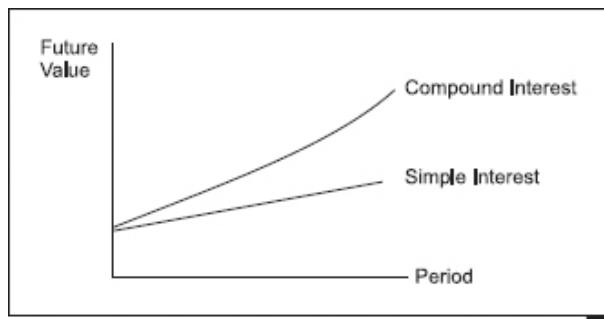
Although interesting, this comparison is misleading. First, judged by historical standards, the 8 percent rate is much higher. If we use a 3.5 percent rate, which is more consistent with historical experience, the future value of \$ 24 would be just  $\$ 24 \times (1.035)^{384} = \$ 13,101,034$ . Second, we ignored the rental income to Peter Minuit and his successors' over the last 384 years.

Considering everything, Peter Minuit got a real good deal.

## Doubling Period

Investors commonly ask the question: How long would it take to double the amount at a given rate of interest? To answer this question we may look at the future value interest factor table. Looking at [Exhibit 6.2](#) we find that when the interest rate is 12 percent it takes about 6 years to double the amount, when the interest is 6 percent it takes about 12 years to double the amount, so on and so forth. Is there a rule of thumb which dispenses with the use of the future value interest factor table? Yes, there is one and it is called the rule of 72. According to this rule of thumb, the doubling period is obtained by dividing 72 by the interest rate. For example, if the interest rate is 8 percent, the doubling period is about 9 years ( $72/8$ ). Likewise, if the interest rate is 4 percent the doubling period is about 18 years ( $72/4$ ). Though somewhat crude, it is a handy and useful rule of thumb.

### Exhibit 6.4 Graphic View of Simple and Compound Interest



If you are inclined to do a slightly more involved calculation, a more accurate rule of thumb is the rule of 69. According to this rule of thumb, the doubling period is equal to:

$$0.35 + \frac{69}{\text{Interest Rate}}$$

As an illustration of this rule of thumb, the doubling period is calculated for two interest rates, 10 percent and 15 percent.

Interest Rate	Doubling Period
10 percent	$0.35 + \frac{69}{10} = 7.25 \text{ years}$
15 percent	$0.35 + \frac{69}{15} = 4.95 \text{ years}$

## Finding the Growth Rate

The formula we used to calculate future value is quite general and it can be applied to answer other types of questions related to growth. Suppose your company currently has 5,000 employees and this number is expected to grow by 5 percent per year. How many employees will your company have in 10 years? The number of employees 10 years hence will be:

$$5,000 \times (1.05)^{10} = 5000 \times 1.629 = 8,145$$

Consider another example. Phoenix Limited had revenues of ₹ 100 million in 2000 which increased to ₹ 1000 million in 2010. What was the compound growth rate in revenues? The compound growth rate may be calculated as follows:

$$\begin{aligned}100 (1 + g)^{10} &= 1,000 \\(1 + g)^{10} &= \frac{1000}{100} = 10 \\(1 + g) &= 10^{1/10} \\g &= 10^{1/10} - 1 \\&= 1.26 - 1 = 0.26 \text{ or } 26 \text{ percent}\end{aligned}$$

## 6.3 ■ PRESENT VALUE OF A SINGLE AMOUNT

Suppose someone promises to give you ₹ 1,000 three years hence. What is the present value of this amount if the interest rate is 10 percent? The present value can be calculated by discounting ₹ 1,000, to the present point of time, as follows :

$$\begin{aligned}\text{Value three years hence} &= ₹ 1,000 \\ \text{Value two years hence} &= ₹ 1,000 \left[ \frac{1}{1.10} \right] \\ \text{Value one year hence} &= ₹ 1,000 \left[ \frac{1}{1.10} \right] \left[ \frac{1}{1.10} \right] \\ \text{Value now} &= ₹ 1,000 \left[ \frac{1}{1.10} \right] \left[ \frac{1}{1.10} \right] \left[ \frac{1}{1.10} \right]\end{aligned}$$

## Formula

The process of discounting, used for calculating the present value, is simply the inverse of compounding. The present value formula can be readily obtained by manipulating the compounding formula:

$$FV_n = PV (1 + r)^n \quad (6.2)$$

Dividing both the sides of Eq. (6.2) by  $(1 + r)^n$ , we get:

$$PV = FV_n [1 / (1 + r)^n] \quad (6.3)$$

The factor  $1/(1 + r)^n$  in Eq. (6.3) is called the discounting factor or the present value interest factor ( $PVIF_{r,n}$ ). Exhibit 6.5 gives the value of  $PVIF_{r,n}$  for several combinations of  $r$  and  $n$ . A more detailed table of  $PVIF_{r,n}$  is given in Appendix A at the end of the book.

What is the present value of ₹ 1,000 receivable 6 years hence if the rate of discount is 10 percent?

The present value is:

$$\text{₹ } 1,000 \times PVIF_{10\%, 6} = \text{₹ } 1,000(0.565) = \text{₹ } 565$$

What is the present value of ₹ 1,000 receivable 20 years hence if the discount rate is 8 percent? Since Exhibit 6.5 does not have the value of  $PVIF_{8\%, 20}$  we obtain the answer as follows:

$$\begin{aligned} \text{₹ } 1,000 \left[ \frac{1}{1.08} \right]^{20} &= \text{₹ } 1,000 \left[ \frac{1}{1.08} \right]^{10} \left[ \frac{1}{1.08} \right]^{10} \\ &= \text{₹ } 1,000 (PVIF_{8\%, 10})(PVIF_{8\%, 10}) \\ &= \text{₹ } 1,000 (0.463)(0.463) = \text{₹ } 214 \end{aligned}$$

### Exhibit 6.5 Value of $PVIF_{r,n}$ for Various Combinations of $r$ and $n$

$n/r$	6%	8%	10%	12%	14%
2	0.890	0.857	0.826	0.797	0.770
4	0.792	0.735	0.683	0.636	0.592
6	0.705	0.630	0.565	0.507	0.456
8	0.626	0.540	0.467	0.404	0.351
10	0.558	0.463	0.386	0.322	0.270
12	0.497	0.397	0.319	0.257	0.208

## Present Value of an Uneven Series

In financial analysis we often come across uneven cash flow streams. For example, the cash flow stream associated with a capital investment project is typically uneven. Likewise, the dividend stream associated with an equity share is usually uneven and perhaps growing.

The present value of a cash flow stream - uneven or even - may be calculated with the help of the following formula:

$$PV_n = \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} + \dots + \frac{A_n}{(1+r)^n} = \sum_{t=1}^n \frac{A_t}{(1+r)^t} \quad (6.4)$$

where,  $PV_n$  is the present value of a cash flow stream,  $A_t$  is the cash flow occurring at the end of year  $t$ ,  $r$  is the discount rate, and  $n$  is duration of the cash flow stream.

[Exhibit 6.6](#) shows the calculation of the present value of an uneven cash flow stream, using a discount rate of 12 percent.

### Exhibit 6.6 Present Value of an Uneven Cash Flow Stream

Year	Cash Flow ₹	$PVIF_{12\%,n}$	Present Value of Individual Cash Flow
1	1,000	0.893	893
2	2,000	0.797	1,594
3	2,000	0.712	1,424
4	3,000	0.636	1,908
5	3,000	0.567	1,701
6	4,000	0.507	2,028
7	4,000	0.452	1,808
8	5,000	0.404	2,020
Present Value of the Cash Flow Stream			13,376

**Spreadsheet Analysis** To calculate the present value of the cash flow stream given in [Exhibit 6.6](#), you can use the Excel spreadsheet as shown below:

	A	B	C	D	E	F	G	H	I
1	Year	1	2	3	4	5	6	7	8
2	Cash flow	1,000	2,000	2,000	3,000	3,000	4,000	4,000	5,000
3	Discount rate	12%	NPV		=NPV(B3, B2:I2)		→		13,375

Type the cash flows for years 1 through 8 in the cells B2 to I2 and the discount rate in the cell B3. If you want the present value in say cell I3, select I3 and type = NPV(B3,B2:I2) and press enter and the value will

appear therein. Here it should be noted that in Excel the term NPV is used to denote the net result of adding the present values of a stream of future cash flows unlike our usual practice of using the term NPV, net present value, to denote the excess of the total present value of the future receipts (payments) over the initial investment (cash inflow).

## 6.4 ■ FUTURE VALUE OF AN ANNUITY

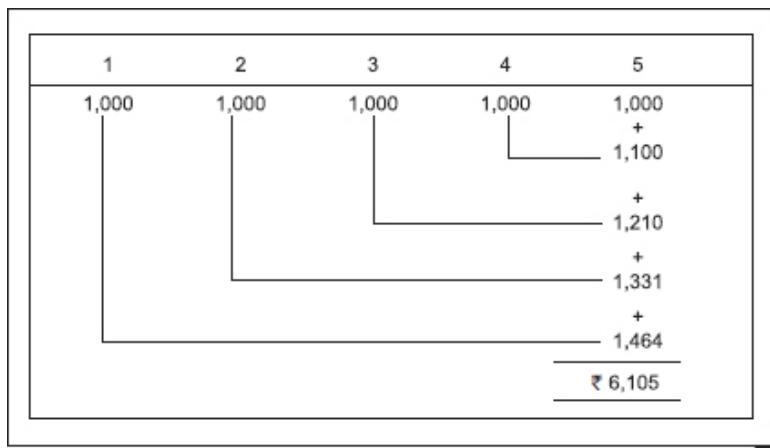
An annuity is a stream of constant cash flows (payments or receipts) occurring at regular intervals of time. The premium payments of a life insurance policy, for example, are an annuity. When the cash flows occur at the end of each period, the annuity is called an **ordinary annuity** or a **deferred annuity**. When the cash flows occur at the beginning of each period, the annuity is called an **annuity due**. Our discussion here will focus on a deferred annuity. The formula for an annuity due is simply  $(1 + r)$  times the formula for the corresponding ordinary annuity.

Suppose you deposit ₹ 1,000 annually in a bank for 5 years and your deposits earn a compound interest rate of 10 percent. What will be the value of this series of deposits (an annuity) at the end of 5 years? Assuming that each deposit occurs at the end of the year, the future value of this annuity will be:

$$\begin{aligned} & \text{₹ } 1,000(1.10)^4 + \text{₹ } 1,000(1.10)^3 + \text{₹ } 1,000(1.10)^2 + \text{₹ } 1,000(1.10) + \text{₹ } 1,000 \\ & = \text{₹ } 1,000(1.464) + \text{₹ } 1,000(1.331) + \text{₹ } 1,000(1.21) + \text{₹ } 1,000(1.10) + \text{₹ } 1,000 \\ & = \text{₹ } 6,105 \end{aligned}$$

The time line for this annuity is shown in [Exhibit 6.7](#).

**Exhibit 6.7** Time Line for an Annuity



## Formula

In general terms the future value of an annuity is given by the following formula:

$$\begin{aligned} FVA_n &= A (1 + r)^{n-1} + A (1 + r)^{n-2} + \dots + A \\ &= A [(1 + r)^n - 1] / r \end{aligned} \tag{6.5)<sup>1</sup>}$$

where  $FVA_n$  is the future value of an annuity which has a duration of  $n$  periods,  $A$  is the constant periodic flow,  $r$  is the interest rate per period, and  $n$  is the duration of the annuity.

The term  $[(1 + r)^n - 1] / r$  is referred to as the future value interest factor for an annuity ( $FVIFA_{r,n}$ ). The value of this factor for several combinations of  $r$  and  $n$  is given in [Exhibit 6.8](#). A more detailed table is given in [Appendix A](#) at the end of this book.

**Exhibit 6.8** Value of  $FVIFA_{r,n}$  for Various Combinations of  $r$  and  $n$

$n/r$	6%	8%	10%	12%	14%
2	2.060	2.080	2.100	2.120	2.140
4	4.375	4.507	4.641	4.779	4.921
6	6.975	7.336	7.716	8.115	8.536
8	9.897	10.636	11.436	12.299	13.232
10	13.181	14.487	15.937	17.548	19.337
12	16.869	18.977	21.384	24.133	27.270

## Applications

The future value annuity formula can be applied in a variety of contexts. Its important applications are illustrated below.

**Knowing What Lies in Store for You** Suppose you have decided to deposit ₹ 30,000 per year in your Public Provident Fund Account for 30 years. What will be the accumulated amount in your Public Provident Fund Account at the end of 30 years if the interest rate is 8 percent?

The accumulated sum will be:

$$\begin{aligned} & \text{₹ 30,000 } (\text{FVIFA}_{8\%,30\text{yrs}}) \\ &= \text{₹ 30,000} \left[ \frac{(1.08)^{30} - 1}{.08} \right] \\ &= \text{₹ 30,000} [ 113.283 ] \\ &= \text{₹ 3,398,490} \end{aligned}$$

**Use of Excel Spreadsheet** Time value calculations can be easily done using a spreadsheet. In Excel, there are customised notations and functions for the various time value parameters as shown below:

Parameter	Notation/Symbol	Built in Formula in Excel
Present value	PV	=PV(rate,nper,pmt,[fv],[type])
Future value	FV	=FV(rate,nper,pmt,[pv],[type])
No. of continuous successive periods	NPER	=NPER(rate,pmt,pv,[fv],[type])
Payment per period	PMT	=PMT(rate,nper,pv,[fv],[type])
Interest rate	RATE	=RATE(nper,pmt,pv,[fv],[type])

The following printout of an Excel worksheet, may be used to understand how Excel is used, to calculate the accumulated sum in the above illustration.

	A	B
1	Amount of deposit per period(PMT)	₹ 30,000
2	No. of periods(NPER)	Years 30
3	Interest rate (RATE)	p.a 8%
4	Accumulated amount(FV)	₹ 3,398,496
5	Formula used	=FV(B3, B2, -B1)

Open the worksheet and input the respective given values for the various parameters inside the cells A1 to A3, respectively inside cells B1 to

B3 as shown above. To get the future value in cell B4, select B4 and type =FV (and even as you type this, the formula template, viz. FV(rate,nper,pmt,[pv].[type]) will become visible nearby (by way of a tip) to guide you further. What you have to do thereafter is just give the cell reference numbers of the respective parameter values inside the parenthesis in the order cited, duly separated by commas. Thus in the place for rate type B3(just left click the mouse in the cursor on cell B3 and that cell no. will get typed automatically), in the place for nper type B2, and in the place for pmt type -B1. Note that if there is a payment/outflow, a - sign should precede the cell reference.

Where a notation is inside a square bracket, it indicates that if you skip that place, Excel will take that the value is 0. In our case as there is no PV figure in the given data just skip that place. The notation 'type' can take only one of the two values viz, 0 if the outflow/inflow takes place at the end of each period or 1 if that takes place in the beginning of each period. Again, if nothing is typed in the space marked [type], the value would be 0.

To sum up, type =FV(B3,B2,-B1) inside B4 and press enter and the future value will automatically appear in that cell.

**How Much Should You Save Annually** You want to buy a house after 5 years when it is expected to cost ₹ 2 million. How much should you save annually if your savings earn a compound return of 12 percent?

The future value interest factor for a 5 year annuity, given an interest rate of 12 percent, is:

$$FVIFA_{n=5, r=12\%} = \frac{(1+0.12)^5 - 1}{0.12} = 6.353$$

The annual savings should be:

$$\frac{₹ 2000,000}{6.353} = ₹ 314,812$$

**Annual Deposit in a Sinking Fund** Futura Limited has an obligation to redeem ₹ 500 million bonds 6 years hence. How much should the company deposit annually in a sinking fund account wherein it earns 14 percent interest, to cumulate ₹ 500 million in 6 years time?

The future value interest factor for a 6 year annuity, given an interest rate of 14 percent is:

$$FVIFA_{n=6, r=14\%} = \frac{(1+0.14)^6 - 1}{0.14} = 8.536$$

The annual sinking fund deposit should be:

$$\frac{₹ 500 \text{ million}}{8.536} = ₹ 58.575 \text{ million}$$

**Finding the Interest Rate** A finance company advertises that it will pay a lump sum of ₹ 8,000 at the end of 6 years to investors who deposit annually ₹ 1,000 for 6 years. What interest rate is implicit in this offer?

The interest rate (also called the internal rate of return or IRR) may be calculated in two steps:

1. Find the  $FVIFA_{r,6}$  for this contract as follows:

$$\begin{aligned} \text{₹ } 8,000 &= \text{₹ } 1,000 \times FVIFA_{r,6} \\ FVIFA_{r,6} &= \frac{\text{₹ } 8,000}{\text{₹ } 1,000} = 8.00 \end{aligned}$$

2. Look at the  $FVIFA_{r,n}$  table and read the row corresponding to 6 years until you find a value close to 8.000. Doing so, we find that

$FVIFA_{12\%,6}$  is 8.115

So, we conclude that the interest rate is slightly below 12 percent.

An Excel worksheet of the above is as under:

	A	B	C	D	E
1	Future value (Fv)	8,000			
2	Periods in years (Nper)	6	Rate	→	11.43%
3	Periodic payment (Pmt)	1000	= (B2, -B3, B1)		

In the rate formula, viz.  $=RATE(nper,pmt,pv,[fv],[type])$ , the value for  $pv$  here is nil. In typing out the rate formula you may either type a 0 in the place for  $pv$  or just put two commas between B3 and B1.

**How Long Should You Wait** You want to take up a trip to the moon which costs ₹ 1,000,000 – the cost is expected to remain unchanged in nominal terms. You can save annually ₹ 50,000 to fulfill your desire. How long will you have to wait if your savings earn an interest of 12 percent?

The future value of an annuity of ₹ 50,000 that earns 12 percent is equated to ₹ 1,000,000.

$$50,000 \times FVIFA_{n=?,12\%} = 1,000,000$$

$$50,000 \times \left[ \frac{1.12^n - 1}{0.12} \right] = 1,000,000$$

$$1.12^n - 1 = \frac{1,000,000}{50,000} \times 0.12 = 2.4$$

$$1.12^n = 2.4 + 1 = 3.4$$

$$n \log 1.12 = \log 3.4$$

$$n \times 0.0492 = 0.5315$$

$$n = \frac{0.5315}{0.0492} = 10.8 \text{ years}$$

You will have to wait for about 11 years.

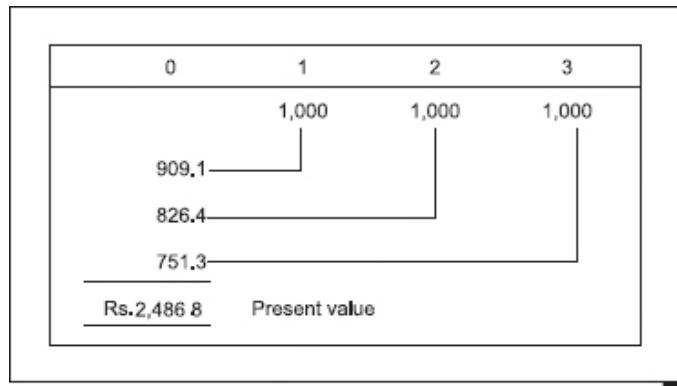
## 6.5 ■ PRESENT VALUE OF AN ANNUITY

Suppose you expect to receive ₹ 1,000 annually for 3 years, each receipt occurring at the end of the year. What is the present value of this stream of benefits if the discount rate is 10 percent? The present value of this annuity is simply the sum of the present values of all the inflows of this annuity:

$$\begin{aligned} & \text{₹ } 1,000 \left[ \frac{1}{1.10} \right] + \text{₹ } 1,000 \left[ \frac{1}{1.10} \right]^2 + \text{₹ } 1,000 \left[ \frac{1}{1.10} \right]^3 \\ &= \text{₹ } 1,000 \times 0.9091 + \text{₹ } 1,000 \times 0.8264 + \text{₹ } 1,000 \times 0.7513 \\ &= \text{₹ } 2,486.8 \end{aligned}$$

The time line for this problem is shown in [Exhibit 6.9](#).

### Exhibit 6.9 Time Line



## Formula

In general terms the present value of an annuity may be expressed as follows:

$$\begin{aligned} PVA_n &= \frac{A}{(1+r)} + \frac{A}{(1+r)^2} + \dots + \frac{A}{(1+r)^{n-1}} + \frac{A}{(1+r)^n} \\ &= A \left[ \frac{1}{(1+r)} + \frac{1}{(1+r)^2} + \dots + \frac{1}{(1+r)^{n-1}} + \frac{1}{(1+r)^n} \right] \\ &= A [\{1 - (1/(1+r))^n\} / r] \end{aligned} \quad (6.6)^2$$

where  $PVA_n$  is the present value of an annuity which has a duration of  $n$  periods,  $A$  is the constant periodic flow, and  $r$  is the discount rate.

$\{1 - (1/(1+r))^n\}/r$  is referred to as the present value interest factor for an annuity ( $PVIFA_{r,n}$ ). It is, as can be seen clearly, simply equal to the product of the future value interest factor for an annuity ( $FVIFA_{r,n}$ ) and the present value interest factor ( $PVIF_{r,n}$ ). [Exhibit 6.10](#) shows the value of  $PVIFA_{r,n}$  for several combinations of  $r$  and  $n$ . A more detailed table of  $PVIFA_{r,n}$  values is found in [Appendix A](#) at the end of this book.

**Exhibit 6.10** Value of  $PVIFA_{r,n}$  for Different Combinations of  $r$  and  $n$

$n/r$	6%	8%	10%	12%	14%
2	1.833	1.783	1.737	1.690	1.647
4	3.465	3.312	3.170	3.037	2.914
6	4.917	4.623	4.355	4.111	3.889
8	6.210	5.747	5.335	4.968	4.639
10	7.360	6.710	6.145	5.650	5.216
12	8.384	7.536	6.814	6.194	5.660

## Applications

The present value annuity formula can be applied in a variety of contexts. Its important applications are discussed below.

**How Much Can You Borrow for a Car** After reviewing your budget, you have determined that you can afford to pay ₹ 12,000 per month for 3 years toward a new car. You call a finance company and learn that the going rate of interest on car finance is 1.5 percent per month for 36 months. How much can you borrow?

To determine how much you can borrow, we have to calculate the present value of ₹ 12,000 per month for 36 months at 1.5 percent per month.

Since the loan payments are an ordinary annuity, the present value interest factor of annuity is:

$$PVIFA_{r,n} = \frac{1 - \frac{1}{(1+r)^n}}{r} = \frac{1 - \frac{1}{(1.015)^{36}}}{0.015} = 27.66$$

Hence the present value of 36 payments of ₹ 12,000 each is:

$$\text{Present value} = ₹ 12,000 \times 27.66 = ₹ 331,920$$

You can, therefore, borrow ₹ 331,920 to buy the car.

The above can be worked out in a spreadsheet as shown below:

	A	B	C	D	E
1	Monthly payment (Pmt) ₹	12,000			
2	Period in months (Nper)	36	Present value	→	331,928
3	Rate of interest per month (Rate)	1.50%	= PV (B3, B2, -B1)		

**Period of Loan Amortisation** You want to borrow ₹ 1,080,000 to buy a flat. You approach a housing finance company which charges 12.5 percent interest. You can pay ₹ 180,000 per year toward loan amortisation. What should be the maturity period of the loan?

The present value of annuity of ₹ 180,000 is set equal to ₹ 1,080,000.

$$180,000 \times PVIFA_{n,r} = 1,080,000$$
$$180,000 \times PVIFA_{n=?, r=12.5\%} = 1,080,000$$

$$180,000 \left[ \frac{1 - \frac{1}{(1.125)^n}}{0.125} \right] = 1,080,000$$

Given this equality the value of  $n$  is calculated as follows:

$$\frac{1 - \frac{1}{(1.125)^n}}{0.125} = \frac{1,080,000}{180,000} = 6$$

$$\frac{1}{(1.125)^n} = 0.25$$

$$1.125^n = 4$$

$$n \log 1.125 = \log 4$$

$$n \times 0.0512 = 0.6021$$

$$n = \frac{0.6021}{0.0512} = 11.76 \text{ years}$$

You can perhaps request for a maturity of 12 years.

**Determining the Loan Amortisation Schedule** Most loans are repaid in equal periodic instalments (monthly, quarterly, or annually), which cover interest as well as principal repayment. Such loans are referred to as **amortised loans**.

For an amortised loan we would like to know (a) the periodic instalment payment and (b) the loan amortisation schedule showing the break up of the periodic instalment payments between the interest component and the principal repayment component. To illustrate how these are calculated, let us look at an example.

Suppose a firm borrows ₹ 1,000,000 at an interest rate of 15 percent and the loan is to be repaid in 5 equal instalments payable at the end of each of the next 5 years. The annual instalment payment A is obtained by solving the following equation.

$$\text{Loan amount} = A \times PVIFA_{n=5, r=15\%}$$

$$1,000,000 = A \times 3.3522$$

$$\text{Hence } A = 298,312$$

The amortisation schedule is shown in [Exhibit 6.11](#). The interest component is the largest for year 1 and progressively declines as the outstanding loan amount decreases.

---

## Exhibit 6.11 | Loan Amortisation Schedule

Year	Beginning Amount (1)	Annual Instalment (2)	Interest (3)	Principal Repayment (2)-(3) = (4)	Remaining Balance (1)-(4) = (5)
1	1,000,000	298,312	150,000 <sup>a</sup>	148,312 <sup>b</sup>	851,688
2	851,688	298,312	127,753	170,559	681,129
3	681,129	298,312	102,169	196,143	484,986
4	484,986	298,312	72,748	225,564	259,422
5	259,422	298,312	38,913	259,399	23*

a. Interest is calculated by multiplying the beginning loan balance by the interest rate.  
 b. Principal repayment is equal to annual instalment minus interest.  
 \* Due to rounding off error a small balance is shown.

The above schedule can be set up using a spreadsheet as below:

	A	B	C	D	E	F
1		Present value	Interest rate	No. of instalments (in years)	Annual instalment amount	
2		1,000,000	15%	5	298,316	
3	Year	Beginning amount	Annual instalment	Interest	Principal repayment	Remaining balance
4	1	1,000,000	298,316	150000	148,316	851,684
5	2	851,684	298,316	127,753	170,563	681,121
6	3	681,121	298,316	102,168	196,148	484,973
7	4	484,973	298,316	72,746	225,570	259,403
8	5	259,403	298,316	38,910	259,406	-3

To create the above spreadsheet, proceed as follows: In B4, type =B2 to get the beginning amount. To get the instalment amount in C4, type =E2 and press F4. A \$ sign will appear before E and 2 (\$E\$2). This will make the value in this cell absolute, that is, constant throughout. Use the formula =B4\*\$C\$2 to get interest amount in D4 (note that C2 here is made absolute by pressing F4). Fill in the principal repayment amount in E4 using the formula =C4-D4 and the remaining balance in F4 using the formula =B4-E4. Copy this value to B5 by typing =F4. Next, click on C4. Observe that there is a tiny black box at the lower right corner of the cell. This is called a fill handle. Point the cursor to the fill handle (it will turn into a black cross) and drag it down upto C8. This will autofill the value in C4 (whether an absolute value or a formula) upto C8. Use the fill handle to autofill all the remaining cells by dragging down the values in the respective cells above them.

**Determining the Periodic Withdrawal** Your father deposits ₹ 300,000 on retirement in a bank which pays 10 percent annual interest. How much can be withdrawn annually for a period of 10 years?

$$\begin{aligned}
 A &= ₹ 300,000 \times \frac{1}{PVIFA_{10\%, 10}} \\
 &= ₹ 300,000 \times \frac{1}{6.145} \\
 &= ₹ 48,820
 \end{aligned}$$

A spreadsheet calculation of the above is as under.

	A	B	C	D	E
1	Initial deposit ₹	300,000			
2	Interest rate	10%	Annual withdrawal	→	48,824
3	Period years	10	= PMT (B2, B3, -B1)		

**Finding the Interest Rate** Suppose someone offers you the following financial contract: If you deposit ₹ 10,000 with him he promises to pay ₹ 2,500 annually for 6 years. What interest rate do you earn on this deposit? The interest rate may be calculated in two steps:

*Step 1* Find the PVIFA<sub>r,6</sub> for this contract by dividing ₹ 10,000 by ₹ 2,500

$$PVIFA_{r,6} = \frac{₹ 10,000}{₹ 2,500} = 4.000$$

*Step 2* Look at the PVIFA table and read the row corresponding to 6 years until you find a value close to 4.000. Doing so, you find that

PVIFA<sub>12%,6</sub> is 4.111 and PVIFA<sub>14%,6</sub> is 3.889

Since 4.000 lies in the middle of these values the interest rate lies (approximately) in the middle. So, the interest rate is 13 percent.

**Valuing an Infrequent Annuity** Raghavan will receive an annuity of ₹ 50,000, payable once every two years. The payments will stretch out over 30 years. The first payment will be received at the end of two years. If the annual interest rate is 8 percent, what is the present value of the annuity?

The interest rate over a two-year period is:

$$(1.08) \times (1.08) - 1 = 16.64 \text{ percent}$$

This means that ₹ 100 invested over two years will yield ₹ 116.64.

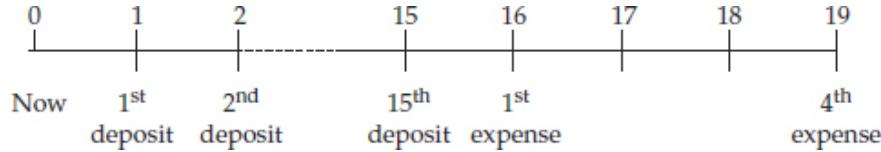
We have to calculate the present value of a ₹ 50,000 annuity over 15 periods, with an interest rate of 16.64 percent per period. This works out to:

$$₹ 50,000 [1 - (1/1.1664)^{15}] / 0.1664 = ₹ 270,620$$

**Equating Present Value of Two Annuities** Ravi wants to save for the college education of his son, Deepak. Ravi estimates that the college education expenses will be rupees one million per year for four years when his son reaches college in 16 years – the expenses will be payable at the beginning of the years. He expects the annual interest rate of 8 percent

over the next two decades. How much money should he deposit in the bank each year for the next 15 years (assume that the deposit is made at the end of the year) to take care of his son's college education expenses?

The time line for this problem is as follows:



The present value of college education expenses when his son becomes 15 years old is:

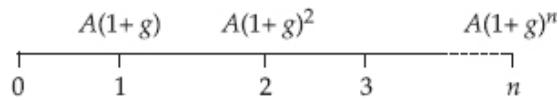
$$\begin{aligned} & \text{₹ } 1,000,000 \times \text{PVIFA (4 years, 8\%)} \\ & = \text{₹ } 1,000,000 \times 3.312 = \text{₹ } 3,312,000 \end{aligned}$$

The annual deposit to be made so that the future value of the deposits at the end of 15 years is ₹ 3,312,000 is:

$$\begin{aligned} A &= \frac{\text{₹ } 3,312,000}{\text{FVIFA(15 years, 8\%)}} = \frac{\text{₹ } 3,312,000}{27.152} \\ &= \text{₹ } 121,980 \end{aligned}$$

## Present Value of a Growing Annuity

A cash flow that grows at a constant rate for a specified period of time is a growing annuity. If  $A$  is the current cash flow, the time line of a growing annuity is shown below:



The present value of a growing annuity can be determined using the following formula:

$$\text{PV of a Growing Annuity} = A (1+g) \left[ \frac{1 - \frac{(1+g)^n}{(1+r)^n}}{r-g} \right] \quad (6.7)$$

3

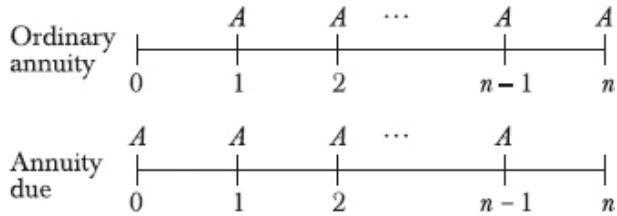
The above formula can be used when the growth rate is less than the discount rate ( $g < r$ ) as well as when the growth rate is more than the discount rate ( $g > r$ ). However, it does not work when the growth rate is equal to the discount rate ( $g = r$ ) - in this case, the present value is simply equal to  $n A$ .

For example, suppose you have the right to harvest a teak plantation for the next 20 years over which you expect to get 100,000 cubic feet of teak per year. The current price per cubic foot of teak is ₹ 500, but it is expected to increase at a rate of 8 percent per year. The discount rate is 15 percent. The present value of the teak that you can harvest from the teak plantation can be determined as follows:

$$\begin{aligned} \text{PV of teak} &= ₹ 500 \times 100,000 (1.08) \left[ \frac{1 - \frac{1.08^{20}}{1.15^{20}}}{0.15 - 0.08} \right] \\ &= ₹ 551,736,683 \end{aligned}$$

## A Note on Annuities Due

So far we discussed ordinary annuities in which cash flows occur at the end of each period. There is a variation, which is fairly common, in which cash flows occur at the beginning of each period. Such an annuity is called an **annuity due**. For example, when you enter into a lease for an apartment, the lease payments are due at the beginning of the month. The first lease payment is made at the beginning; the second lease payment is due at the beginning of the second month, so on and so forth. The time lines for ordinary annuity and annuity due are shown below:



Since the cash flows of an annuity due occur one period earlier in comparison to the cash flows on an ordinary annuity, the following relationship holds:

$$\text{Annuity due value} = \text{Ordinary annuity value} \times (1 + r)$$

This applies for both present and future values. So, two steps are involved in calculating the value of an annuity due. First, calculate the present or future value as though it were an ordinary annuity. Second, multiply your answer by  $(1 + r)$ .

## **6.6 ■ PRESENT VALUE OF A PERPETUITY**

A perpetuity is an annuity of infinite duration. For example, the British government has issued bonds called consols which pay yearly interest forever.

## Present Value of a Perpetuity

The present value of a perpetuity may be expressed as follows:

$$P_{\infty} = A \times PVIFA_{r,\infty} \quad (6.8)$$

where  $P_{\infty}$  is the present value of a perpetuity and  $A$  is the constant annual payment.

What is the value of  $PVIFA_{r,\infty}$ ? It is equal to:

$$\sum_{t=1}^{\infty} \frac{1}{(1+r)^t} = \frac{1}{r} \quad (6.9)_4$$

Put in words, it means that the present value interest factor of a perpetuity is simply 1 divided by the interest rate expressed in decimal form. Hence, the present value of a perpetuity is simply equal to the constant annual payment divided by the interest rate. For example, the present value of a perpetuity of ₹ 10,000 if the interest rate is 10 percent is equal to: ₹ 10,000/0.10 = ₹ 100,000. Intuitively, this is quite convincing because an initial sum of ₹ 100,000 would, if invested at a rate of interest of 10 percent, provide a constant annual income of ₹ 10,000 for ever, without any impairment of the capital value.

## Growing Perpetuity

An office complex is expected to generate a net rental of ₹ 3 million next year, which is expected to increase by 5 percent every year. If we assume that the increase will continue indefinitely, the rental stream is a growing perpetuity. If the discount rate is 10 percent, the present value of the rental stream is:

$$PV = \frac{3,000,000}{(1.10)} + \frac{3,000,000(1.05)^1}{(1.10)^2} + \dots + \frac{3,000,000(1.05)^{n-1}}{(1.10)^n} + \dots \quad (6.10)$$

Algebraically, it may be expressed as follows:

$$PV = \frac{C}{(1+r)} + \frac{C(1+g)}{(1+r)^2} + \frac{C(1+g)^2}{(1+r)^3} + \dots + \frac{C(1+g)^{n-1}}{(1+r)^n} + \dots$$

where  $C$  is the rental to be received a year hence,  $g$  is the rate of growth per year, and  $r$  is the discount rate.

While Eq. (6.10) looks daunting, it reduces itself to the following simplification.

$$PV = \frac{C}{r-g} \quad (6.11)_5$$

## 6.7 ■ INTRA-YEAR COMPOUNDING AND DISCOUNTING

So far we assumed that compounding is done annually. Now we consider the case where compounding is done more frequently. Suppose you deposit ₹ 1,000 with a finance company which advertises that it pays 12 percent interest semi-annually—this means that the interest is paid every six months. Your deposit (if interest is not withdrawn) grows as follows:

First six months	: Principal at the beginning	= ₹ 1,000.0
	Interest for 6 months	= ₹ 60.0
	$\text{₹ } 1,000 \times \frac{.12}{2}$	
	Principal at the end	= ₹ 1,060.0
Second six months	: Principal at the beginning	= ₹ 1,060.0
	Interest for 6 months	= ₹ 63.6
	$\text{₹ } 1,060 \times \frac{.12}{2}$	
	Principal at the end	= ₹ 1,123.6

Note that if compounding is done annually, the principal at the end of one year would be ₹ 1,000  $(1.12) = ₹ 1,120$ . The difference of ₹ 3.6 (between ₹ 1,123.6 under semiannual compounding and ₹ 1,120 under annual compounding) represents interest on interest for the second half year.

The general formula for the future value of a single cash flow after  $n$  years when compounding is done  $m$  times a year is:

$$FV_n = PV \left[ 1 + \frac{r}{m} \right]^{m \times n} \quad (6.12)$$

Suppose you deposit ₹ 5,000 in a bank for 6 years. If the interest rate is 12 percent and the frequency of compounding is 4 times a year your deposit after 6 years will be:

$$\begin{aligned} \text{₹ } 5,000 \left[ 1 + \frac{0.12}{4} \right]^{4 \times 6} &= \text{₹ } 5,000 (1.03)^{24} \\ &= \text{₹ } 5,000 \times 2.0328 = \text{₹ } 10,164 \end{aligned}$$

## Effective Annual Rate and Annual Percentage Rate

We have seen above that ₹ 1,000 grows to ₹ 1,123.6 at the end of a year if the stated rate of interest is 12 percent and compounding is done semi-annually. This means that ₹ 1,000 grows at the rate of 12.36 percent per annum. The figure of 12.36 percent is called the effective annual rate - the rate of interest under annual compounding which produces the same result as that produced by an interest rate of 12 percent under semi-annual compounding.

The *effective annual rate* (EAR) reflects the total amount of interest that will be earned at the end of one year. The EAR is also referred to as the *effective annual yield* (EAY) or the *annual percentage yield* (APY).

Banks also quote interest rate in terms of *annual percentage rate* (APR), which reflects the amount of simple interest earned in one year. This means that APR is the interest earned without considering the effect of compounding.

EAR is linked to APR as follows:

$$\text{EAR} = \left[ 1 + \frac{\text{APR}}{m} \right]^m$$

where  $m$  is the frequency of compounding per year.

Suppose a bank offers 12 percent stated annual interest rate. What will be the EAR when compounding is done annually, semiannually, and quarterly?

$$\text{EAR with annual compounding} = \left[ 1 + \frac{0.12}{1} \right]^1 - 1 = 0.12$$

$$\text{EAR with semi-annual compounding} = \left[ 1 + \frac{0.12}{2} \right]^2 - 1 = 0.1236$$

$$\text{EAR with quarterly compounding} = \left[ 1 + \frac{0.12}{4} \right]^4 - 1 = 0.1255$$

## Continuous Compounding

As discussed above we can compound semi-annually, quarterly, monthly, or even more often. In the limiting case, compounding is done instantaneously, which is commonly referred to as *continuous compounding*. Banks and financial institutions sometimes quote continuously compounded rates.

While the notion of continuous compounding may appear daunting, its effect is captured in a simple formula.

$$A_o \times e^{rT} \quad (6.13)$$

where  $A_o$  is the initial investment,  $e$  is the base of natural logarithm (it is approximately 2.718),  $r$  is the annual percentage return, and  $T$  is the number of years over which the investment runs.

Suppose you invest ₹ 1000 today with a financial institution that offers an annual percentage rate of 10 percent compounded continuously. What will be the value of your investment after 5 years?

The value 5 years hence will be ₹  $1,000 \times e^{10 \times 5} = ₹ 1,648.70$

When compounding becomes continuous, the EAR rate is expressed as follows:

$$\text{EAR} = e^r - 1 \quad (6.14)$$

where  $e$  is the base of natural logarithm and  $r$  is the APR.

In the jargon of finance,  $e^r$  is called the continuously compounded future value. It is calculated using the  $\ln$  function. It is often a “better” method of computing return because there is a theory behind the numbers and this theory gives the same results whether one is computing the annual statistics from daily, weekly, or monthly data.

[Exhibit 6.12](#) shows how compounding frequency impacts the EAR. It is clear from the exhibit that the effect of increasing the frequency of compounding is not as dramatic as some would believe it to be - the additional gains dwindle as the frequency of compounding increases.

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**Exhibit 6.12 | Compounding Frequency and Effective Interest Rate**

<i>Frequency</i>	<i>Stated Interest Rate (%)</i>	<i>m</i>	<i>Formula</i>	<i>Effective Interest Rate (%)</i>
Annual	12	1	0.12	12.00
Semi-annual	12	2	$\left[1 + \frac{0.12}{2}\right]^2 - 1$	12.36
Quarterly	12	4	$\left[1 + \frac{0.12}{4}\right]^4 - 1$	12.55
Monthly	12	12	$\left[1 + \frac{0.12}{12}\right]^{12} - 1$	12.68
Weekly	12	52	$\left[1 + \frac{0.12}{52}\right]^{52} - 1$	12.73
Daily	12	365	$\left[1 + \frac{0.12}{365}\right]^{365} - 1$	12.75
Continuous	12		$e^{0.12} - 1$	12.75

## Shorter Discounting Periods

Sometimes cash flows have to be discounted more frequently than once a year - semi-annually, quarterly, monthly, or daily. As in the case of intra-year compounding, the shorter discounting period implies that (i) the number of periods in the analysis increases and (ii) the discount rate applicable per period decreases. The general formula for calculating the present value in the case of shorter discounting period is:

$$PV = FV_n \left[ \frac{1}{1+r/m} \right]^{mn} \quad (6.15)$$

where  $PV$  is the present value,  $FV_n$  is the cash flow after  $n$  years,  $m$  is the number of times per year discounting is done, and  $r$  is the annual discount rate.

To illustrate, consider a cash flow of ₹ 10,000 to be received at the end of four years. The present value of this cash flow when the discount rate is 12 percent ( $r = 12$  percent) and discounting is done quarterly ( $m = 4$ ) is determined as follows:

$$\begin{aligned} PV &= ₹ 10,000 \times PVIF_{r/m, m \times n} \\ &= ₹ 10,000 \times PVIF_{3\%, 16} \\ &= ₹ 10,000 \times 0.623 = ₹ 6,230 \end{aligned}$$

## SUMMARY

- Money has time value. A rupee today is more valuable than a rupee a year hence.
- When cash flows occur at different points in time, it is easier to deal with them using a **time line**. A time line shows the timing and the amount of each cash flow in a cash flow stream.
- The process of investing money as well as reinvesting the interest earned thereon is called **compounding**. The future or compounded value of an investment after  $n$  years when the interest rate is  $r$  percent is:

$$\text{Future value}_n = \text{Present value} (1 + r)^n$$

- If no interest is earned on interest the investment earns only simple interest. In such a case the investment grows as follows:

$$\text{Future value} = \text{Present value} [1 + nr]$$

- According to the **rule of 72**, the doubling period under compounding is obtained by dividing 72 by the interest rate.
- The process of **discounting**, used for calculating the present value, is simply the inverse of compounding. The present value formula is:

$$PV = FV_n [1/(1+r)^n]$$

- The present value of a cash flow is equal to:

$$PV_n = \sum_{t=1}^n \frac{A_t}{(1+r)^t}$$

- An **annuity** is a stream of constant cash flow (payment or receipt) occurring at regular intervals of time. When the cash flows occur at the end of each period the annuity is called an **ordinary annuity** or a deferred annuity. When the cash flows occur at the beginning of each period, the annuity is called an **annuity due**.

- The future value of an annuity is given by the formula:

$$FVA_n = A [(1+r)^n - 1] / r$$

- The present value of an annuity is given by the formula:

$$PVA_n = A [1 - (1+r)^n] / r$$

- A cash flow that grows at a constant rate for a specified period of time is a growing annuity. The present value of a **growing annuity** is given by the following formula:

$$PV \text{ of a Growing Annuity} = A(1+g) \left[ \frac{1 - (1+g)^n}{(1+r)^n} \right] / (r-g)$$

- Since the cash flows of an annuity due occur one period earlier in comparison to the cash flows of an ordinary annuity, the following relationship holds:

$$\text{Annuity due value} = \text{Ordinary annuity value} \times (1+r)$$

- A **perpetuity** is an annuity of infinite duration. The present value of a perpetuity is:

$$\text{Present value of a perpetuity} = A/r$$

- The general formula for the future value of a single cash flow after  $n$  years when compounding is done  $m$  times a year is:

$$FV_n = PV [1 + r/m]^{mn}$$

- The relationship between **effective interest rate** and the **stated annual interest rate** is as follows:

$$\text{Effective interest rate} = \left[ 1 + \frac{\text{Stated annual interest rate}}{m} \right]^m - 1$$

- When compounding becomes continuous the effective interest rate is expressed as:

$$\text{Effective interest rate} = e^r - 1$$

- The formula for calculating the present value in the case of shorter discounting period is:

$$PV = FV_n [1 / (1 + r/m)]^{mn}$$

## QUESTIONS

1. Why does money have time value?
2. State the general formula for the future value of a single amount.
3. What is the difference between compound and simple interest?
4. Explain the rule of 72.
5. Explain the rule of 69. How does it compare with the rule of 72?
6. State the general formula for calculating the present value of a single amount.
7. What is an annuity? What is the difference between an ordinary annuity and an annuity due?
8. State the formula for the future value of an annuity.
9. State the formula for the present value of an annuity.
10. What is a growing annuity? What is the formula for finding the present value of a growing annuity?
11. What is the formula for the present value of a perpetuity?
12. State the formula for the future value of a single cash flow after  $n$  years when compounding is done  $m$  times a year.
13. What is the relationship between the effective interest rate and the stated interest rate?
14. State the formula for calculating the present value of a single cash flow when discounting is done  $m$  times a year.
15. A firm's earnings grew from ₹ 1 per share to ₹ 3 per share over a period of 10 years. The total growth was 200 percent, but the annual compound growth rate was less than 20 percent. Why?

## SOLVED PROBLEMS

- 6.1 If you invest ₹ 5,000 today at a compound interest of 9 percent, what will be its future value after 75 years?

*Solution* The future value of ₹ 5,000 after 75 years, when it earns a compound interest of 9 percent, is

$$\text{₹ } 5,000 (1.09)^{75}$$

Since the FVIF table given in [Appendix A](#) has a maximum period of 30, the future value expression may be stated as

$$\text{₹ } 5,000 (1.09)^{30} (1.09)^{30} (1.09)^{15}$$

The above product is equal to

$$\text{₹ } 5,000 (13.268) (13.268) (3.642) = \text{₹ } 32,05,685.1$$

- 6.2 If the interest rate is 12 percent, what are the doubling periods as per the rule of 72 and the rule of 69 respectively?

*Solution* As per the rule of 72 the doubling period will be

$$72 / 12 = 6 \text{ years}$$

As per the rule of 69, the doubling period will be

$$0.35 + \frac{69}{12} = 6.1 \text{ years}$$

- 6.3 A borrower offers 16 percent nominal rate of interest with quarterly compounding. What is the effective rate of interest?

*Solution* The effective rate of interest is

$$\begin{aligned} \left[1 + \frac{0.16}{4}\right]^4 - 1 &= (1.04)^4 - 1 \\ &= 1.17 - 1 \\ &= 0.17 = 17 \text{ percent} \end{aligned}$$

- 6.4 Fifteen annual payments of ₹ 5,000 are made into a deposit account that pays 14 percent interest per year. What is the future value of this annuity at the end of 15 years?

*Solution* The future value of this annuity will be:

$$\begin{aligned} \text{₹ } 5,000 (\text{FVIFA}_{14\%, 15}) &= \text{₹ } 5,000 (43.842) \\ &= \text{₹ } 2,19,210 \end{aligned}$$

- 6.5 A finance company advertises that it will pay a lumpsum of ₹ 44,650 at the end of five years to investors who deposit annually ₹ 6,000 for 5 years. What is the interest rate implicit in this offer?

*Solution* The interest rate may be calculated in two steps

- (a) Find the FVIFA for this contract as follows:

$$\begin{aligned} \text{₹ } 6,000 (\text{FVIFA}) &= \text{₹ } 44,650 \\ \text{So} \\ \text{FVIFA} &= \frac{\text{₹ } 44,650}{\text{₹ } 6,000} = 7.442 \end{aligned}$$

- (b) Look at the FVIFA table and read the row corresponding to 5 years until 7.442 or a value close to it is reached. Doing so we find that

$$\text{FVIFA}_{20\%, 5 \text{ yrs}} \text{ is } 7.442$$

So, we conclude that the interest rate is 20 percent.

- 6.6 What is the present value of ₹ 1,000,000 receivable 60 years from now, if the discount rate is 10 percent?

*Solution* The present value is

$$\text{₹ } 1,000,000 \left[ \frac{1}{1.10} \right]^{60}$$

This may be expressed as

$$\begin{aligned} & \text{₹ } 1,000,000 \left[ \frac{1}{1.10} \right]^{30} \left[ \frac{1}{1.10} \right]^{30} \\ & = \text{₹ } 1,000,000 (0.057) (0.057) = \text{₹ } 3249 \end{aligned}$$

- 6.7 A 12 – payment annuity of ₹ 10,000 will begin 8 years hence. (The first payment occurs at the end of 8 years). What is the present value of this annuity if the discount rate is 14 percent?

*Solution* This problem may be solved in two steps.

*Step 1* Determine the value of this annuity a year before the first payment begins, i.e., 7 years from now. This is equal to:

$$\begin{aligned} \text{₹ } 10,000 (\text{PVIFA}_{14\%, 12 \text{ years}}) &= \text{₹ } 10,000 (5.660) \\ &= \text{₹ } 56,600 \end{aligned}$$

*Step 2* Compute the present value of the amount obtained in Step1:

$$\begin{aligned} \text{₹ } 56,600 (\text{PVIF}_{14\%, 7 \text{ years}}) &= \text{₹ } 56,600 (0.400) \\ &= \text{₹ } 22,640 \end{aligned}$$

- 6.8 What is the present value of the following cash stream if the discount rate is 14 percent?

Year	0	1	2	3	4
Cash flow	5,000	6,000	8,000	9,000	8,000

*Solution* The present value of the above cash flow stream is:

$$5,000(1.000) + 6,000(0.877) + 8,000(0.769) + 9,000(0.675) + 8,000(0.592) = 27,225$$

- 6.9 Mahesh deposits ₹ 200,000 in a bank account which pays 10 percent interest. How much can he withdraw annually for a period of 15 years?

*Solution* The annual withdrawal is equal to:

$$\frac{\text{₹ } 200,000}{\text{PVIFA}_{10\%, 15 \text{ yrs}}} = \frac{\text{₹ } 200,000}{7,606} = \text{₹ } 26,295$$

- 6.10 You want to take a world tour which costs ₹ 1,000,000 – the cost is expected to remain unchanged in nominal terms. You are willing to save annually ₹ 80,000 to fulfill your desire. How long will you have to wait if your savings earn a return of 14 percent per annum?

*Solution* The future value of an annuity of ₹ 80,000 that earns 14 percent is equated to ₹ 1,000,000.

$$\begin{aligned} 80,000 \times \text{FVIFA}_{n = ?, 14\%} &= 1,000,000 \\ 80,000 \left[ \frac{1.14^n - 1}{0.14} \right] &= 1,000,000 \\ 1.14^n - 1 &= \frac{1,000,000}{80,000} \times 0.14 = 1.75 \\ 1.14^n &= 1.75 + 1 = 2.75 \\ n \log 1.14 &= \log 2.75 \\ n \times 0.0569 &= 0.4393 \\ n &= 0.4393 / 0.0569 = 7.72 \text{ years} \end{aligned}$$

You will have to wait for 7.72 years.

- 6.11 Shyam borrows ₹ 80,000 for a musical system at a monthly interest of 1.25 percent. The loan is to be repaid in 12 equal monthly instalments, payable at the end of each month. Prepare the loan amortisation schedule.

*Solution*

The monthly instalment  $A$  is obtained by solving the equation:

$$80,000 = A \times PVIFA_{n=12, r=1.25\%}$$

$$80,000 = A \times \frac{1 - \frac{1}{(1+r)^n}}{r}$$

$$80,000 = A \times \frac{1 - \frac{1}{(1.0125)^{12}}}{.0125}$$

$$= A \times 11.0786$$

Hence  $A = 80,000 / 11.0786 = ₹ 7221$

The loan amortisation schedule is shown below:

### Loan Amortisation Schedule

Month	Beginning Amount (1)	Monthly Instalment (2)	Interest (3)	Principal Repayment (2)-(3) = (4)	Remaining Balance (1)-(4) = (5)
1	80,000	7221	1000	6221	73779
2	73,779	7221	922.2	6298.8	67480.2
3	67,480.2	7221	843.5	6377.5	61102.7
4	61102.7	7221	763.8	6457.2	54645.5
5	54645.5	7221	683.1	6537.9	48107.6
6	48107.6	7221	601.3	6619.7	41487.9
7	41487.9	7221	518.6	6702.4	34785.5
8	34785.5	7221	434.8	6786.2	27999.3
9	27999.3	7221	350.0	6871.0	21128.3
10	21128.3	7221	264.1	6956.9	14171.4
11	14171.4	7221	177.1	7043.9	7127.1
12	7127.1	7221	89.1	7131.9	- 4.8@
@ Rounding off error					

## PROBLEMS

- 6.1 **Future Value** Calculate the value 5 years hence of a deposit of ₹ 1,000 made today if the interest rate is (a) 8 percent, (b) 10 percent, (c) 12 percent, and (d) 15 percent.
- 6.2 **Rule of 72** If you deposit ₹ 5,000 today at 12 percent rate of interest in how many years (roughly) will this amount grow to ₹ 1,60,000? Work out this

problem using the *rule of 72*—do not use tables.

- 6.3 Rule of 69** A finance company offers to give ₹ 8,000 after 12 years in return for ₹ 1,000 deposited today. Using the *rule of 69*, figure out the approximate interest offered.
- 6.4 Future Value** You can save ₹ 2,000 a year for 5 years, and ₹ 3,000 a year for 10 years thereafter. What will these savings cumulate to at the end of 15 years, if the rate of interest is 10 percent?
- 6.5 Annual Savings** Mr. Vinay plans to send his son for higher studies abroad after 10 years. He expects the cost of these studies to be ₹ 1,000,000. How much should he save annually to have a sum of ₹ 1,000,000 at the end of 10 years, if the interest rate is 12 percent?
- 6.6 Interest Rate** A finance company advertises that it will pay a lump sum of ₹ 10,000 at the end of 6 years to investors who deposit annually ₹ 1,000. What interest rate is implicit in this offer?
- 6.7 Interest Rate** Someone promises to give you ₹ 5,000 after 10 years in exchange for ₹ 1,000 today. What interest rate is implicit in this offer?
- 6.8 Present Value** Find the present value of ₹ 10,000 receivable after 8 years if the rate of discount is (i) 10 percent, (ii) 12 percent, and (iii) 15 percent.
- 6.9 Present Value** What is the present value of a 5-year annuity of ₹ 2,000 at 10 percent?
- 6.10 Retirement Plan** On retirement, Mr. Jingo is given a choice between two alternatives: (a) an annual pension of ₹ 10,000 as long as he lives, and (b) a lump sum amount of ₹ 50,000. If Mr. Jingo expects to live for 15 years and the interest rate is 15 percent, which option is more attractive?
- 6.11 Annual Withdrawal** Mr. X deposits ₹ 1,00,000 in a bank which pays 10 percent interest. How much can he withdraw annually for a period of 30 years. Assume that at the end of 30 years the amount deposited will whittle down to zero.
- 6.12 Present Value** What is the present value of an income stream which provides ₹ 1,000 at the end of year one, ₹ 2,500 at the end of year two, and ₹ 5,000 during each of the years 3 through 10, if the discount rate is 12 percent?
- 6.13 Present Value** What is the present value of an income stream which provides ₹ 2,000 a year for the first five years and ₹ 3,000 a year forever thereafter, if the discount rate is 10 percent?  
Hint: The present value for a perpetual annuity is derived by dividing the constant annual flow by the discount factor.
- 6.14 Deposit** What amount must be deposited today in order to earn an annual income of ₹ 5,000 beginning from the end of 15 years from now? The deposit earns 10 percent per year.
- 6.15 Interest Rate** Suppose someone offers you the following financial contract. If you deposit ₹ 20,000 with him he promises to pay ₹ 4,000 annually for 10 years. What is the interest rate?
- 6.16 Present Value** What is the present value of the following cash flow streams?

Year	1	2	3	4	5	6	7	8	9	10
A	100	200	300	400	500	600	700	800	900	1000
B	1000	900	800	700	600	500	400	300	200	100
C	500	500	500	500	500	500	500	500	500	500

The discount rate is 12 percent.

- 6.17 Future Value** Suppose you deposit ₹ 10,000 with an investment company which pays 16 percent interest with quarterly compounding. How much will this deposit grow to in 5 years?
- 6.18 Future Value** How much would a deposit of ₹ 5,000 at the end of 5 years be, if the interest rate is 12 percent and if the compounding is done quarterly?
- 6.19 EAR and APR** What is the difference between the effective rate of interest and annual percentage rate in the following cases:
- Case A: APR 12 percent and the frequency of compounding is six times a year.
- Case B: APR is 24 percent and the frequency of compounding is four times a year.
- Case C: APR is 24 percent and the frequency of compounding is twelve times a year.
- 6.20 Investment** If the interest rate is 12 percent how much investment is required now to yield an income of ₹ 12,000 per year from the beginning of the 10<sup>th</sup> year and continuing thereafter forever?
- 6.21 Preference** You have a choice between ₹ 5,000 now and ₹ 20,000 after 10 years. Which would you choose? What does your preference indicate?
- 6.22 Value** Mr. Raghu deposits ₹ 10,000 in a bank now. The interest rate is 10 percent and compounding is done semi-annually. What will the deposit grow to after 10 years? If the inflation rate is 8 percent per year, what will be the value of the deposit after 10 years in terms of the current rupee?
- 6.23 Deposit** How much should be deposited at the beginning of each year for 10 years in order to provide a sum of ₹ 50,000 at the end of 10 years?
- 6.24 Deposit** A person requires ₹ 20,000 at the beginning of each year from 2035 to 2039. How much should he deposit at the end of each year from 2025 to 2030? The interest rate is 12 percent.
- 6.25 Present Value** What is the present value of ₹ 2,000 receivable annually for 30 years? The first receipt occurs after 10 years and the discount rate is 10 percent.
- 6.26 Borrowing** After five years Mr. Ramesh will receive a pension of ₹ 6000 per month for 15 years. How much can Mr. Ramesh borrow now at 12 percent interest so that the borrowed amount can be paid with 30 percent of the pension amount? The interest will be accumulated till the first pension amount becomes receivable.
- 6.27 Interest Rate** Mr. Prakash buys a motorcycle with a bank loan of ₹ 60,000. An instalment of ₹ 3000 is payable to the bank for each of 24 months towards the repayment of loan with interest. What interest rate does the bank charge?

- 6.28 Sinking Fund Deposit** A Ltd. has to retire ₹ 1000 million of debentures each at the end of 8, 9, and 10 years from now. How much should the firm deposit in a sinking fund account annually for 5 years, in order to retire the debenture? The net interest rate earned is 8 percent.
- 6.29 Period of Withdrawal** B receives a provident fund amount of ₹ 1,000,000. He deposits it in a bank which pays 10 percent interest. If he withdraws annually ₹ 200,000, how long can he do so?
- 6.30 Loan Amortisation** Phoenix Company borrows ₹ 500,000 at an interest rate of 14 percent. The loan is to be repaid in 4 equal annual instalments payable at the end of each of the next 4 years. Prepare the loan amortisation schedule.
- 6.31 Maturity Period** You want to borrow ₹ 1,500,000 to buy a flat. You approach a housing company which charges 13 percent interest. You can pay ₹ 200,000 per year toward loan amortisation. What should be the maturity period of the loan?
- 6.32 Present Value of Growing Annuity** You are negotiating with the government the right to mine 100,000 tons of iron ore per year for 15 years. The price per ton of iron ore is expected to be ₹ 3,000 at the end of year 1 and increase thereafter at the rate of 6 percent per year. What is the present value of the iron ore that you can mine if the discount rate is 16 percent?
- 6.33 Present Value** As a winner of a competition, you can choose one of the following prizes:
- ₹ 500,000 now
  - ₹ 1,000,000 at the end of 6 years
  - ₹ 60,000 a year forever
  - ₹ 100,000 per year for 10 years
  - ₹ 35,000 next year and rising thereafter by 5 percent per year forever.
- If the interest rate is 10 percent, which prize has the highest present value.
- 6.34 Present Value of a Decreasing Annuity** Pipe India owns an oil pipeline which will generate ₹ 12 crore of cash income in the coming year. It has a very long life with virtually negligible operating costs. The volume of oil shipped, however, will decline over time and, hence, cash flows will decrease by 3 percent per year. The discount rate is 12 percent.
- If the pipeline is used forever, what is the present value of its cash flows?
  - If the pipeline is scrapped after 25 years, what is the present value of its cash flows?
- 6.35 Present Value of a Decreasing Annuity** An oil well presently produces 50,000 barrels per year. It will last for 15 years more, but the production will fall by 5 percent per year. Oil prices are expected to increase by 3 percent per year. Presently the price of oil is \$50 per barrel. What is the present value of the well's production if the discount rate is 10 percent?
- 6.36 Present Value of a Decreasing Annuity** An oil well presently produces 80,000 barrels per year. It will last for 20 years more, but the production will fall by 6

percent per year. Oil prices are expected to increase by 4 percent per year. Currently the price of oil is \$60 per barrel. What is the present value of the well's production if the discount rate is 12 percent?

- 6.37 Future Value** You are considering whether your savings will be enough to meet your retirement needs. You saved ₹ 100,000 last year and you expect your annual savings to increase by 8 percent per year for the next 20 years. If your savings can be invested at 9 percent, how much would you have at the end of the twentieth year? Hint: Future Value Growing Annuity = PVGA  $(1 + r)^n$
- 6.38 EAR** A bank offers an interest rate of 8 percent on deposits made with it. If the compounding is done on a weekly basis, what is the effective interest rate?
- 6.39 Interest Rate** Apna Bank's Kuber deposit plan offers to double your deposit in 7 years under its special daily compounding of interest scheme. What is the interest rate involved?
- 6.40 Amortisation Schedule** Monisha has bought an iPhone costing ₹ 100,000 at 9.5 percent p.a, repayable in 5 equated annual instalments. Draw the amortisation schedule for the loan.
- 6.41 Waiting Period** James has now joined as a finance manager in an MNC. He can save every year 60 percent of his annual salary of ₹ 10 lakhs (that will be received at the end of the year) and which is expected to increase at the rate of 10 percent every year. He has decided to marry only once his savings crosses ₹ 1 crore mark. If he keeps his savings in a bank that offers 8 percent interest, how many years should he wait to get married?
- 6.42 Growing Annuities** Prakash plans to retire after 20 years with a corpus of ₹ 50 million. He receives salary annually and he expects to receive ₹ 3 million at the end of the current year. His salary will increase at the rate of 10 percent per year and he can earn 9 percent on his investment. He plans to save a constant percentage of his salary; what should that percentage be?
- 6.43 Discount Interest Loans** You borrow ₹ 100,000 for one year at an interest rate of 15 percent from a lender who deducts the interest in advance from the loan upfront and gives you ₹ 85000. What is the EAR?
- 6.44 Break-even Investment Returns** Your investment company offers two different investment plans. Plan A offers a ten-year annuity of ₹ 500,000 whereas plan B offers an annual perpetuity of ₹ 30,000. Both plans make their first payment a year from today. What discount rate will make you indifferent between the two options?
- 6.45 Present Value of Infrequent Annuity** An investment pays ₹ 1,000,000 every four years for 40 years. The first payment will occur after four years. What is the value of this investment if the discount rate is 12 percent and the discounting is continuous?

## MINICASE - I

As an investment advisor, you have been approached by a client called Ramesh, who wants some help in investment related matters.

Ramesh is currently 45 years old and has ₹ 600,000 in the bank. He plans to work for 15 more years and retire at the age of 60. Ramesh's present salary is ₹ 400,000 per year. He expects his salary to increase at the rate of 12 percent per year until his retirement.

Ramesh has decided to invest his bank balance and future savings in a portfolio in which stocks and bonds would be equally weighted. For the sake of simplicity, assume that these proportions will be maintained by him throughout. He also believes that bonds would provide a return of 7 percent and stocks a return of 13 percent. You concur with his assessment.

Once Ramesh retires at the age of 60 he would like to withdraw ₹ 500,000 per year from his investments for the following 15 years as he expects to live upto the age of 75 years. He also wants to bequeath ₹ 1,000,000 to his children at the end of his life. How much money would he need 15 years from now?

How much should Ramesh save each year for the next 15 years to be able to meet his investment objectives spelt out above? Assume that the savings will occur at the end of each year.

Suppose Ramesh wants to donate ₹ 200,000 each year in the last three years of his life to a charitable cause. Each donation would be made at the beginning of the year. How much money would he need when he reaches the age of 60 to meet this specific need?

Ramesh recently attended a seminar on human capital where the speaker talked about a person's human capital as the present value of his life time earnings. Ramesh is curious to find out the present value of his lifetime salary. For the sake of simplicity assume that his present salary of ₹ 400,000 will be paid exactly one year from now, and his salary will be paid in annual installments. What is the present value of his life time salary, if the discount rate is 8 percent? Remember that Ramesh expects his salary to increase at the rate of 12 percent per year until his retirement.

In answering the above questions, ignore the tax factor.

## **MINICASE - II**

Sardar Kartar Singh is a resident of Thailand for the past two decades and is the owner of a flourishing business there. He has a son, Satnam, 10 years old and a baby girl Jasleen who will be one year old this day. The family has come to India to celebrate her birthday in Punjab. Also, Kartar's wife has made some grand plans for the future financial security of the family and they intend to use their present visit for placing suitable deposits with their bank in New Delhi as per those plans.

According to the plan, Satnam would be doing his MBA after 10 years. It would be a two year course in a premier private business school in India. For that the all inclusive expenditure at present rates would be ₹ 20 lakhs and ₹ 25 lakhs in the beginning of the first and second year respectively. Jasleen would marry at the end of

her 21st year and for that an amount of ₹ 3 crores would then be needed. Kartar's wife is insistent that her presence would be essential in India in the best interests of both the children-to keep a watchful eye on Satnam during his stint at the business school and most importantly, to have ample time to renew the old network with family and friends for ensuring a very good match for the girl. Funds would have to be tied up for her and children's relocation to India at the end of ten years from now.

Kartar Singh always had great respect for his wife's commonsense and logic (though he was always shy of acknowledging it!). To arrange the funds, he has very recently sold one of his investments, a flat in a prime locality in Bangkok, for a hefty sum. For Satnam's MBA he has decided to open two recurring deposit accounts, maturing on the 10<sup>th</sup> and 11<sup>th</sup> years respectively. For Jasleen's marriage he wants to open a cumulative term deposit for 20 years. For family maintenance in India after 10 years, he wants to open another cumulative term deposit for 10 years with the maturity value of which he could immediately purchase an annuity due for the following 10 years. It is expected that after 10 years the family in India would need ₹ 12 lakhs per year without taking inflation into consideration.

To make the calculations on the specific amounts needed he has called you, an upcoming financial consultant. He asks you to make the calculations in such a way that he could easily understand the logic thereof. You understand from him that as all the deposits would be made out of his NRE account with the bank, it would not deduct any tax amount from the interest to be earned.

Specifically you are required to calculate the amounts that need to be deposited now in:

- (i) the two recurring deposit accounts, in the beginning of each month.
- (ii) a cumulative fixed deposit for meeting the cost of Jasleen's marriage.
- (iii) a cumulative fixed deposit with the bank for purchasing the annuity due needed by the family in India after 10 years from an insurance company which is expected to give a return of 10 percent per year.

You set to work with the following data:

For both cumulative fixed deposit and Recurring deposit, nominal interest rate for periods of more than 5 years is 8 percent and compounding is done once in a quarter. Inflation in India after 10 years is expected to be 5 percent for the next ten years. The MBA course expenses are likely to grow at 5 percent per annum.

Show your detailed working.

## Appendix 6A

### XNPV AND XIRR

So far we assumed that cash flows occur periodically (every year, or every half-year, or every quarter, and so on).

In finance, many cash flows, however, do not occur periodically. In such cases the standard functions of NPV and IRR have to be modified to reflect the actual dates when the cash flows occur. These functions are called extended NPV (or XNPV) and extended IRR (or XIRR).

XNPV is defined as:

$$XNPV = \sum_{t=1}^N \frac{C_t}{(1+r)^{(d_t - d_1)/365}}$$

where  $C_i$  is the  $i$  th cash flow,  $d_i$  is the  $i$  th cash flow date,  $d_1$  is the 0 th date,  $r$  is the discount rate per year.

XIRR is the interest rate corresponding to XNPV = 0

$$0 = \sum_{i=1}^N \frac{C_i}{(1+r)^{(d_i - d_1)/365}}$$

To calculate XNPV and XIRR, use the Microsoft Excel functions XNPV and XIRR. Microsoft Excel stores dates as sequential series numbers so that they can be used in calculations. By default, January 1, 1900 is serial number 1. All subsequent dates are numbered accordingly. For example, January 1, 2008 is serial number 39448 because it is 39,448 days after January 1, 1900.

## XNPV and XIRR Illustration

Vishal needed some funds to start a small business. He borrowed an amount of ₹ 5 lakhs from his close friend Suresh: ₹ 2 lakhs on 19<sup>th</sup> March 2014 and ₹ 3 lakhs on 22<sup>nd</sup> May 2015. He repaid the loan in parts on various dates: ₹ 2 lakhs on 1<sup>st</sup> January 2016, ₹ 422,000 on 28<sup>th</sup> November 2017, and ₹ 480,000 on 31<sup>st</sup> December 2018. If the cost of capital (discount rate) to Suresh is 15 percent, what is the NPV of the cash flows to him? What is the return earned by him (IRR) on this loan?

The XNPV can be obtained as shown below using the XNPV function in Excel:

	A	B	C	D	E	F
1	Date	19-Mar-14	22-May-15	1-Jan-16	28-Nov-17	31-Dec-18
2	Cash flow	-200,000	-300,000	200,000	422,000	480,000
3	Discount rate	0.15	XNPV	=XNPV(B3,B2:F2,B1:F1) →	198,645	

The XNPV is ₹ 198, 645.

The XIRR can be obtained using the XIRR function:

	A	B	C	D	E	F
1	Date	19-Mar-14	22-May-15	1-Jan-16	28-Nov-17	31-Dec-18
2	Cash flow	-200,000	-300,000	200,000	422,000	480,000
3	XIRR	=XIRR(B2:F2,B1:F1)	→		30.13%	

The XIRR is 30.13 percent.

- 1 The formula for the future value of an annuity is derived as follows:

The future value of an annuity is:

$$FVA_n = A (1 + r)^{n-1} + A (1 + r)^{n-2} + \dots + A (1 + r) + A \quad (1)$$

Multiplying both the sides of (1) by  $(1 + r)$  gives:

$$FVA_n (1 + r) = A (1 + r)^n + A (1 + r)^{n-1} + \dots + A (1 + r)^2 + A (1 + r) \quad (2)$$

Subtracting (1) from (2) yields:

$$FVA_n r = A [(1 + r)^n - 1] \quad (3)$$

Dividing both the sides of (3) by  $r$  gives:

$$FVA_n = A \left[ \frac{(1+r)^n - 1}{r} \right] \quad (4)$$

- 2 The formula for the present value of an annuity is derived as follows:

$$PVA_n = A (1 + r)^{-1} + A (1 + r)^{-2} + \dots + A (1 + r)^{-n} \quad (1)$$

Multiplying both the sides of (1) by  $(1 + r)$  gives:

$$PVA_n (1 + r) = A + A (1 + r)^{-1} + \dots + A (1 + r)^{1-n} \quad (2)$$

Subtracting (1) from (2) yields:

$$PVA_n \cdot r = A [1 - (1 + r)^{-n}] = A \{ [(1 + r)^n - 1] / (1 + r)^n \} \quad (3)$$

Dividing both the sides of (3) by  $r$  results in:

$$PVA_n = A \{ [(1 + r)^n - 1] / r (1 + r)^n \} = A \{ [1 - (1/r + 1)^n] / r \} \quad (4)$$

- 3 The formula for the present value of a growing annuity (PVGA) is derived as follows:

$$PVGA = \frac{A(1+g)}{(1+r)} + \frac{A(1+g)^2}{(1+r)^2} + \cdots + \frac{A(1+g)^n}{(1+r)^n} \quad (1)$$

Multiplying both the sides of (1) by  $(1 + g)/(1 + r)$  gives:

$$PVGA \times \frac{(1+g)}{(1+r)} = \frac{A(1+g)^2}{(1+r)^2} + \frac{A(1+g)^3}{(1+r)^3} + \cdots + \frac{A(1+g)^{n+1}}{(1+r)^{n+1}} \quad (2)$$

Subtracting (2) from (1) yields:

$$PVGA \left[ 1 - \frac{(1+g)}{(1+r)} \right] = \frac{A(1+g)}{(1+r)} - \frac{A(1+g)^{n+1}}{(1+r)^{n+1}} \quad (3)$$

This simplifies to:

$$PVGA = A (1 + g) \left[ \frac{1 - \frac{(1+g)^n}{(1+r)^n}}{r - g} \right] \quad (4)$$

- 4 The formula for  $PVIFA_{r,\infty}$  is derived as follows:

$$PVIFA_{r,\infty} = 1(1 + r)^{-1} + 1(1 + r)^{-2} + \cdots + 1(1 + r)^{-\infty} \quad (1)$$

Multiplying both the sides of (1) by  $(1 + r)$  gives:

$$PVIFA_{r,\infty} (1 + r) = 1 + 1(1 + r)^{-1} + \cdots + 1(1 + r)^{-(\infty-1)} \quad (2)$$

Subtracting (1) from (2) yields:

$$PVIFA_{r,\infty} \times r = 1 - 1(1 + r)^{-\infty} \quad (3)$$

Since the second term on the right hand side of (3) vanishes, we get:

$$PVIFA_{r,\infty} \times r = 1 \quad (4)$$

This results in:

$$PVIFA_{r,\infty} = \frac{1}{r} \quad (5)$$

- 5 Proof for this formula is given in [Chapter 7](#).

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter6/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter6/index.html)

- Additional Self-Test Problems
- Additional Solved Problems
- Chapters Excel
- Excel on Solved Problems
- Answer Key



## 7 CHAPTER

# Valuation of Bonds and Stocks

## Learning Objectives

After studying this chapter you should be able to:

- ✓ Distinguish between various valuation concepts.
- ✓ Estimate the value of a bond.
- ✓ Calculate various measures of bond yield.
- ✓ Read bond and stock quotations.
- ✓ Value a preference stock.
- ✓ Calculate the value of a stock using the dividend discount model and the P/E ratio approach.
- ✓ Show the relationship between E/P ratio, expected return, and growth.

In [Chapter 6](#) we discussed the basic methods used to value future cash flows. In this chapter we will apply those methods for valuing bonds and stocks. In addition, we will introduce some of the terminology used in these areas and describe how the financial press reports the prices of these assets.

We assume that the appropriate discount rate is known. The question of how risk determines the appropriate discount rate is very important and we will discuss this issue in the following chapter. For now, our focus will be on what the relevant cash flows of financial assets are and how to value them, given an appropriate discount rate.

The objective of financial management is to maximise the value of the firm. Hence managers must know how stocks and bonds are valued. Knowing how to value securities (bonds and stocks, in the main) is as important for investors as it is for managers. Current and prospective investors must understand how to value bonds and stocks. Such knowledge is helpful to them in deciding whether they should buy or hold or sell securities at the prices prevailing in the market.

This chapter discusses the basic discounted cash flow valuation model and its application to bonds and stocks.

## 7.1 ■ VALUATION CONCEPTS

The term value is used in different senses. Hence, let us briefly review the differences that exist among the major concepts of value.

**Liquidation Value versus Going Concern Value** The **liquidation value** is the amount that can be realised when an asset, or a group of assets representing a part or even the whole of a firm, is sold separately from the operating organisation to which it belongs. In contrast, the **going concern value** represents the amount that can be realised if the firm is sold as a continuing operating entity.

In general, security valuation models assume a going concern, an operating business entity that generates cash flows to its security holders. When the going concern assumption is not appropriate as in the case of an impending bankruptcy, liquidation value of assets is more relevant in determining the worth of the firm's financial securities.

**Book Value versus Market Value** The **book value** of an asset is the accounting value of the asset, which is simply the historical cost of the asset less accumulated depreciation or amortisation as the case may be. The book value of a firm's equity is equal to the book value of its assets minus the book value of its liabilities. Because book value reflects a historical accounting value it may diverge significantly from market value. However, under IFRS accounting, which is expected to be adopted in India, more assets are likely to be reported at "fair values." So, the traditional divergence between book value and market value may diminish.

The **market value** of an asset is simply the market price at which the asset trades in the market place. Often the market value is greater than the book value.

**Market Value versus Intrinsic Value** As the nomenclature suggests, the market value of a security is the price at which the security trades in the financial market.

The **intrinsic value** of a security is the present value of the cash flow stream expected from the security, discounted at a rate of return appropriate for the risk associated with the security. Put differently, intrinsic value is economic value. If the market is reasonably efficient, the market price of the security should hover around its intrinsic value. The focus of this chapter is on establishing a security's intrinsic value.

## 7.2 ■ BOND VALUATION

A bond represents a contract under which a borrower promises to pay interest and principal on specific dates to the holders of the bond.

Bonds are issued by a variety of organisations. The principal issuers of bonds in India are the central government, state governments, public sector undertakings, private sector companies, and municipal bodies.

Bonds issued by the central government are called *Treasury bonds*. These are bonds which have maturities ranging upto 30 years. These bonds generally pay interest semi-annually. Presently, Treasury bonds dominate the Indian bond market in terms of market capitalisation, liquidity, and turnover.

*State government bonds* are issued by the state governments. These bonds have maturities that generally range from 3 to 20 years and pay interest semi-annually.

Bonds issued by companies are classified into two types: PSU (public sector undertakings) bonds and private sector bonds. *PSU bonds* are bonds issued by companies in which the central or state governments have an equity stake in excess of 50 percent. Some of these bonds enjoy a tax-free status whereas others are taxable.

*Private sector bonds* are bonds issued by private sector companies. Bonds issued by companies, PSU bonds as well as private sector bonds, generally have maturity ranging from 1 year to 15 years and pay interest semi-annually.

**Terminology** In order to understand the valuation of bonds, we need familiarity with certain bond related terms.

**Par Value** This is the value stated on the face of the bond. It represents the amount the firm borrows and promises to repay at the time of maturity. Usually the par or face value of bonds issued by business firms is ₹ 100. Sometimes it is ₹ 1,000.

**Coupon Rate and Interest** A bond carries a specific interest rate which is called ‘the coupon rate’. The interest payable to the bond holder is simply: par value of the bond × coupon rate. Most bonds pay interest semi-annually. For example, a government security which has a par value of ₹ 1,000 and a coupon rate of 8 percent pays an interest of ₹ 40 every six months.

**Maturity Period** Typically bonds have a maturity period of 1-15 years; sometimes they have longer maturity. At the time of maturity the par (face) value plus perhaps a nominal premium is payable to the bondholder.

**Valuation Model** The value of a bond - or any asset, real or financial - is equal to the present value of the cash flows expected from it. Hence determining the value of a bond requires:

- An estimate of expected cash flows
- An estimate of the required return

To simplify our analysis of bond valuation we will make the following assumptions:

- The coupon interest rate is fixed for the term of the bond.
- The coupon payments are made annually and the next coupon payment is receivable exactly a year from now.
- The bond will be redeemed at par on maturity.

Given these assumptions, the cash flow for a non-callable bond (a bond that cannot be prematurely retired) comprises of an annuity of a fixed coupon interest and the principal amount payable at maturity. Hence the value of the bond is:

$$P = \sum_{t=1}^n \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n} \quad (7.1)$$

where  $P$  is the value (in rupees),  $n$  is the number of years to maturity,  $C$  is the annual coupon payment (in rupees),  $r$  is the periodic required return,  $M$  is the maturity value, and  $t$  is the time when the payment is received.

Since the stream of coupon payments is an ordinary annuity, we can apply the formula for the present value of an ordinary annuity. Hence the bond value is given by the formula:

$$P = C \times PVIFA_{r,n} + M \times PVIF_{r,n} \quad (7.1a)$$

To illustrate how to compute the price of a bond, consider a 10-year, 12% coupon bond with a par value of ₹ 1,000. Let us assume that the required yield on this bond is 13%. The cash flows for this bond are as follows:

- 10 annual coupon payments of ₹ 120
- ₹ 1000 principal repayment 10 years from now

The value of the bond is:

$$\begin{aligned} P &= 120 \times PVIFA_{13\%, 10 \text{ yrs}} + 1,000 \times PVIF_{13\%, 10 \text{ yrs}} \\ &= 120 \times 5.426 + 1,000 \times 0.295 \\ &= 651.1 + 295 = ₹ 946.1 \end{aligned}$$

**Bond Values with Semi-annual Interest** Most of the bonds pay interest semi-annually. To value such bonds, we have to work with a unit period of six months, and not one year. This means that the bond valuation equation has to be modified along the following lines:

- The annual interest payment,  $C$ , must be divided by two to obtain the semi-annual interest payment.
- The number of years to maturity must be multiplied by two to get the number of half-yearly periods.
- The discount rate has to be divided by two to get the discount rate applicable to half-yearly periods.

With the above modifications, the basic bond valuation becomes:

$$\begin{aligned} P &= \sum_{t=1}^{2n} \frac{C/2}{(1+r/2)^t} + \frac{M}{(1+r/2)^{2n}} \\ &= C/2 (\text{PVIFA}_{r/2,2n}) + M(\text{PVIF}_{r/2,2n}) \end{aligned} \quad (7.2)$$

where  $P$  is the value of the bond,  $C/2$  is the semi-annual interest payment,  $r/2$  is the discount rate applicable to a half-year period,  $M$  is the maturity value, and  $2n$  is the maturity period expressed in terms of half-yearly periods.

As an illustration, consider an 8 year, 12 percent coupon bond with a par value of ₹ 100 on which interest is payable semi-annually. The required return on this bond is 14 percent.

Applying Eq.(7.2), the value of the bond is:

$$\begin{aligned} P &= \sum_{t=1}^{16} \frac{6}{(1.07)^t} + \frac{100}{(1.07)^{16}} \\ &= 6(\text{PVIFA}_{7\%,16}) + 100(\text{PVIF}_{7\%,16}) \\ &= ₹ 6(9.447) + ₹ 100(0.339) = ₹ 90.6 \end{aligned}$$

Let us recalculate the above using the Excel financial function PRICE (settlement, maturity, rate, yield, redemption, frequency, basis), as follows:

	A	B	C	D	E	F	G	H	I	J
1	Settlement	1/1/2015	This is the date of purchase. If not specified fill in any date							
2	Maturity	30/12/2022	The formula in this case is =B1+365*8, as the maturity period is 8 years							
3	Rate	12%	The annual coupon rate							
4	Yield	14%	The required return per annum							
5	Redemption	100	Fill in the redemption value as a percentage of the par value							
6	Frequency	2	This represents the number of times interest is paid in a year							
7	Basis	3	3 represents the day count convention, actual no. of days/365, in interest calculation							
8	Price	90.55	To get the result in B8, use the function = PRICE(B1, B2, B3, B4, B5, B6, B7)							
9	Bond price is obtained per ₹ 100 of the face value of the bond. Here, the redemption value being ₹ 100, the price would be ₹ 90.55 × 100/100 = ₹ 90.55									

**Relationship between Coupon Rate, Required Yield, and Price** A basic property of a bond is that its price varies inversely with yield. The reason is simple. As the required yield decreases, the present value of the cash flow increases; hence the price increases. Conversely, when the required yield increases, the present value of the cash flow decreases.

The price-yield relationship may be illustrated with an example. Consider a bond carrying a coupon rate of 14 percent issued 3 years ago for ₹ 1000 (its par value) by Signal Corporation. The original maturity of the bond was 10 years, so its residual maturity now is 7 years. The interest rate has fallen in the last 3 years and investors now expect a return of 10 percent from this bond. The price of this bond now would be

$$P_0 = \sum_{t=1}^7 \frac{140}{(1.10)^t} + \frac{1000}{(1.10)^7} = ₹ 1194.7$$

The arithmetic of the bond price increase is clear. What is the logic behind it? The fact that the required return on such a bond has fallen to 10 percent means that if you had ₹ 1,000 to invest, you can buy new bonds like Signal's except that these new bonds would pay ₹ 100, rather than ₹ 140, by way of interest. Naturally, as an investor you would prefer ₹ 140 to ₹ 100, so you would be willing to pay more than ₹ 1,000 for a Signal bond to enjoy its higher coupons. All investors would behave similarly and consequently the bond of Signal would be bid up in price to ₹ 1194.7. At that price it would provide a return of 10 percent, the rate the new bonds offer.

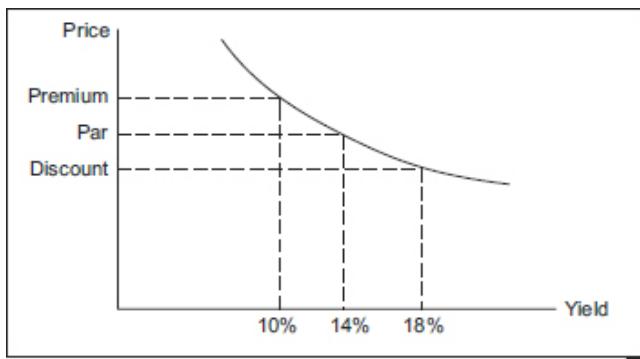
Now let us look at what happens when the interest rate rises after the bond has been issued. Assume that because of a rise in interest rates,

investors now expect a return of 18 percent from the Signal bond. The price of the bond would be:

$$P_0 = \sum_{t=1}^7 \frac{140}{(1.18)^t} + \frac{1000}{(1.18)^7} = ₹ 847.5$$

The graph of the price-yield relationship for the bond has a convex shape as shown in [Exhibit 7.1](#).

### **Exhibit 7.1 Price–Yield Relationship**



To sum up, the relationship between the coupon rate, the required yield, and the price is as follows:

- Coupon rate > Required yield  $\longleftrightarrow$  Price > Par (Premium bond)
- Coupon rate = Required yield  $\longleftrightarrow$  Price = Par
- Coupon rate < Required yield  $\longleftrightarrow$  Price < Par (Discount bond)

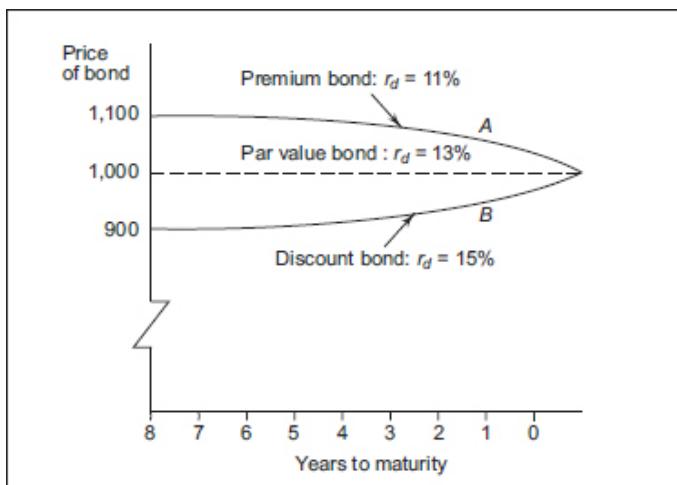
**Relationship between Bond Price and Time** Since the price of a bond must typically be equal to its par value at maturity (assuming that there is no risk of default), the bond price changes with time. For example, a bond that is redeemable for ₹ 1,000 (which is its par value) after 5 years when it matures, will have a price of ₹ 1,000 at maturity, no matter what the current price is. If its current price is, say, ₹ 1,100, it is said to be a premium bond. If the required yield does not change between now and the maturity date, the premium will decline over time as shown by curve A in [Exhibit 7.2](#). On the other hand, if the bond has a current price of say ₹ 900, it is said to be a discount bond. The discount too will disappear over time as shown by curve B in [Exhibit 7.2](#). Only when the current price is equal to par value - in such a case the bond is said to be a par bond - there is no change in price as time passes, assuming that the required yield does not change between now and the maturity date. This is shown by the dashed line in [Exhibit 7.2](#).

## 7.3 ■ BOND YIELDS

In the previous section we learned how to determine the price of a bond and discussed how price and yield were related. We now discuss various yield measures.

The commonly employed yield measures are: current yield, yield to maturity, and yield to call. Let us examine how these yield measures are calculated.

### Exhibit 7.2 Price Changes with Time



**Current Yield** The current yield relates the annual coupon interest to the market price. It is expressed as:

$$\text{Current yield} = \frac{\text{Annual interest}}{\text{Price}}$$

For example, the current yield of a 10 year, 12 percent coupon bond with a par value of ₹ 1000 and selling for ₹ 950 is 12.63 percent.

$$\text{Current yield} = \frac{120}{950} = 0.1263 \text{ or } 12.63 \text{ percent}$$

The current yield calculation reflects only the coupon interest rate. It does not consider the capital gain (or loss) that an investor will realise if the bond is purchased at a discount (or premium) and held till maturity. It also ignores the time value of money. Hence it is an incomplete and simplistic measure of yield.

**Yield to Maturity** The yield to maturity (YTM) of a bond is the interest rate that makes the present value of the cash flows receivable from owning the bond equal to the price of the bond. Mathematically, it is the interest rate ( $r$ ) which satisfies the equation:

$$P = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^n} + \frac{M}{(1+r)^n} \quad (7.3)$$

where  $P$  is the price of the bond,  $C$  is the annual interest (in rupees),  $M$  is the maturity value (in rupees), and  $n$  is the number of years left to maturity.

The computation of YTM requires a trial and error procedure. To illustrate this, consider a ₹ 1,000 par value bond, carrying a coupon rate of 9 percent, maturing after 8 years. The bond is currently selling for ₹ 800. What is the YTM on this bond? The YTM is the value of  $r$  in the following equation:

$$\begin{aligned} 800 &= \sum_{t=1}^n \frac{90}{(1+r)^t} + \frac{1000}{(1+r)^8} \\ &= 90 (\text{PVIFA}_{r,8\text{yrs}}) + 1,000 (\text{PVIF}_{r,8\text{yrs}}) \end{aligned}$$

Let us begin with a discount rate of 12 percent. Putting a value of 12 percent for  $r$  we find that the right-hand side of the above expression is:

$$\begin{aligned} &\text{₹ } 90 (\text{PVFA}_{12\%,8\text{yrs}}) + \text{₹ } 1,000 (\text{PVIF}_{12\%,8\text{yrs}}) \\ &= \text{₹ } 90(4.968) + \text{₹ } 1,000(0.404) = \text{₹ } 851.0 \end{aligned}$$

Since this value is greater than ₹ 800, we may have to try a higher value for  $r$ . Let us try  $r = 14$  percent. This makes the right-hand side equal to:

$$\begin{aligned} &\text{₹ } 90 (\text{PVIFA}_{14\%,8\text{yrs}}) + \text{₹ } 1,000 (\text{PVIF}_{14\%,8\text{yrs}}) \\ &= \text{₹ } 90 (4.639) + \text{₹ } 1,000 (0.351) = \text{₹ } 768.1 \end{aligned}$$

Since this value is less than ₹ 800, we try a lower value for  $r$ . Let us try  $r = 13$  percent. This makes the right-hand side equal to:

$$\begin{aligned} &\text{₹ } 90 (\text{PVIFA}_{13\%,8\text{yrs}}) + \text{₹ } 1,000 (\text{PVIF}_{13\%,8\text{yrs}}) \\ &= \text{₹ } 90 (4.800) + \text{₹ } 1,000 (0.376) = \text{₹ } 808 \end{aligned}$$

Thus  $r$  lies between 13 percent and 14 percent. Using a linear interpolation in the range 13 percent to 14 percent, we find that  $r$  is equal to 13.2 percent.

$$13\% + (14\% - 13\%) \frac{808 - 800}{808 - 768.1} = 13.2\%$$

The yield to maturity for the above example may also be obtained using an Excel spreadsheet, either using the RATE function or the YIELD function, as shown on the next page.

**An Approximation** If you are not inclined to follow the trial-and-error approach described above, you can employ the following formula to find the approximate YTM on a bond:

$$YTM \approx \frac{C + (M - P)/n}{0.4M + 0.6P} \quad (7.4)$$

where YTM is the yield to maturity, C is the annual interest payment, M is the maturity value of the bond, P is the present price of the bond, and n is the years to maturity.

To illustrate the use of this formula, let us consider the bond discussed above. The approximate YTM of the bond works out to:

$$YTM = \frac{90 + (1000 - 800)/8}{0.4 \times 1000 + 0.6 \times 800} = 13.1\%$$

Thus, we find that this formula gives a value which is very close to the true value (13.2 percent). Hence it is very useful.

The YTM calculation considers the current coupon income as well as the capital gain or loss the investor will realise by holding the bond to maturity. In addition, it takes into account the timing of the cash flows.

**Yield to Call** Some bonds carry a call feature that entitles the issuer to call (buy back) the bond prior to the stated maturity date in accordance with a call schedule (which specifies a call price for each call date). For such bonds, it is a practice to calculate the yield to call (YTC) as well as the YTM.

	A	B	C
1		Formula used	
2	Price of the bond at present(PV) ₹		800
3	Par value/Maturity value of the bond ₹		1,000
4	Coupon rate		9%
5	Coupon amount payable per period(PMT) ₹	=C3*C4	90
6	No. of periods(NPER)		8
7	Yield to Maturity(RATE)	= RATE(C6,C5,-C2,C3,0)	13.20%
8			
9	Yield to maturity of a bond can also be obtained using the Yield formula in Excel, as shown below		
10		Formula used	
11	Settlement	As the date is not given, use any date	1/1/2015
12	Maturity	=C11+365*8	30/12/2022
13	Rate		9%
14	Redemption		100
15	Frequency		1
16	Basis		3
17	Price	= 800/10	80
18	Yield to maturity	= YIELD(C11, C12, C13, C17, C14, C15, C16)	13.20%
Note: The parameters are the same as those used in the spreadsheet illustration for 'PRICE'.			

The procedure for calculating the YTC is the same as that for the YTM. Mathematically, the YTC is the value of  $r$  in the following equation:

$$P = \sum_{t=1}^{n^*} \frac{C}{(1+r)^t} + \frac{M^*}{(1+r)^{n^*}} \quad (7.5)$$

where  $M^*$  is the call price (in rupees) and  $n^*$  is the number of years until the assumed call date.

## 7.4 ■ BOND MARKET

Bonds are bought and sold in large quantities. The Indian bond market has grown rapidly since the mid 1990s. With a daily turnover of about ₹ 5,000 crore in mid-2003, it is one of the largest in Asia. The growth in the bond market has been stimulated by a host of reforms such as the increased functional autonomy of the RBI, improved institutional infrastructure, technology-related initiatives, and consolidation and creation of benchmark securities.

Most trading in bonds takes place over the counter. This means that the transactions are privately negotiated and they don't take place through the process of matching of orders on an organised exchange. This is a characteristic of bond markets all over the world, not just in India. Because the bond market is largely over the counter, it lacks transparency. A financial market is transparent if you can easily observe its prices and volumes.

The National Stock Exchange has a Wholesale Debt Market (WDM) segment. The WDM segment is a market for high value transactions in government securities, PSU bonds, commercial papers, and other debt instruments. The quotations of this segment mostly reflect over the counter transactions that are privately negotiated over the phone or computer and registered with the exchange for reporting purposes.

An illustrative quotations from the WDM segment of NSE pertaining to no-repo (NR) trades on 21/8/2018 in 7.17% government securities (GS) issued by central government (CG) and 8.55% perpetual bond (BP) issued by ICICI Bank are given below.

Date	Security Type	Security Name	Issue Name	Trade Type	No. of Trades	Traded Value	Low Price/Rate	High Price/Rate	LTP	YTM
21-Aug-2018	GS	CG2028	7.17%	NR	2	75	95.7225	95.7375	95.7225	7.8188
08-Aug-2018	BB	ICICI	8.55%	NR	1	10.00	96.5006	96.5006	96.5006	9.6000

The retail trade in corporate debt securities is done mostly on the capital market segment of the National Stock Exchange and the debt segment of the Bombay Stock Exchange.

## 7.5 ■ VALUATION OF PREFERENCE STOCK

Preference stock generally pays regular, fixed dividends. Preference dividends are not increased when the profits of the firm rise, nor are they lowered or suspended unless the firm faces financial difficulties. If preference dividends are cut or suspended for some time, the firm is normally required to pay the arrears before paying equity dividends.

Preference stock may be perpetual or redeemable. While the former has no maturity period, the latter is expected to be redeemed after its limited life. Preference stock in India is typically redeemable.

If we assume that the preference stock pays fixed annual dividend during its life and the principal amount on maturity, its value is given as follows.

$$P_o = \sum_{t=1}^n \frac{D}{(1+r_p)^t} + \frac{M}{(1+r_p)^n} \quad (7.6)$$

where  $P_o$  is the current price of the preference stock,  $D$  is the annual dividend,  $n$  is the residual life of the preference stock,  $r_p$  is the required rate of return on the preference stock, and  $M$  is the maturity value.

Since the stream of dividends is an ordinary annuity, we can apply the formula for the present value of an ordinary annuity. Hence the value of the preference stock is:

$$P_0 = D \times PVIFAr_{p,n} + M \times PVIFr_{p,n}$$

To illustrate how to compute the value of a preference stock, consider an 8 year, 10 percent preference stock with a par value of ₹ 1000. The required return on this preference stock is 9 percent.

The value of the preference stock is

$$\begin{aligned} P &= 100 \times PVIFA_{9\%, 8yrs} + 1000 \times PVIF_{9\%, 8yrs} \\ &= 100 \times 5.535 + 1000 \times 0.502 = ₹ 1055.5 \end{aligned}$$

## 7.6 ■ EQUITY VALUATION: DIVIDEND DISCOUNT MODEL

According to the dividend discount model, the value of an equity share is equal to the present value of dividends expected from its ownership plus the present value of the sale price expected when the equity share is sold. For applying the dividend discount model, we will make the following assumptions: (i) dividends are paid annually; and (ii) the first dividend is received one year after the equity share is bought.

**Single-period Valuation Model** Let us begin with the case where the investor expects to hold the equity share for one year. The price of the equity share will be:

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_1}{(1+r)} \quad (7.7)$$

where  $P_0$  is the current price of the equity share,  $D_1$  is the dividend expected a year hence,  $P_1$  is the price of the share expected a year hence, and  $r$  is the rate of return required on the equity share.

*Example* Prestige's equity share is expected to provide a dividend of ₹ 2.00 and fetch a price of ₹ 18.00 a year hence. What price would it sell for now if investors' required rate of return is 12 percent? The current price will be:

$$P_0 = \frac{2.0}{(1.12)} + \frac{18.00}{(1.12)} = ₹ 17.86$$

What happens if the price of the equity share is expected to grow at a rate of  $g$  percent annually? If the current price,  $P_0$ , becomes  $P_0(1+g)$  a year hence, we get:

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_0(1+g)}{(1+r)} \quad (7.8)$$

Simplifying Eq.(7.8) we get:

$$P_0 = \frac{D_1}{r-g} \quad (7.9)_1$$

*Example* The expected dividend per share on the equity share of Roadking Limited is ₹ 2.00. The dividend per share of Roadking Limited has grown over the past five years at the rate of 5 percent per year. This growth

rate will continue in future. Further, the market price of the equity share of Roadking Limited, too, is expected to grow at the same rate. What is a fair estimate of the intrinsic value of the equity share of Roadking Limited if the required rate is 15 percent?

Applying Eq.(7.9) we get the following estimate:

$$P_0 = \frac{2.00}{0.15 - .05} = ₹ 20.00$$

**Expected Rate of Return** In the preceding discussion we calculated the intrinsic value of an equity share, given information about (i) the forecast values of dividend and share price, and (ii) the required rate of return. Now we look at a different question: What rate of return can the investor expect, given the current market price and forecast values of dividend and share price? The expected rate of return is equal to:

$$r = D_1 / P_0 + g \quad (7.10)$$

*Example* The expected dividend per share of Vaibhav Limited is ₹ 5.00. The dividend is expected to grow at the rate of 6 percent per year. If the price per share now is ₹ 50.00, what is the expected rate of return?

Applying Eq. (7.10), the expected rate of return is:

$$r = 5/50 + 0.06 = 16 \text{ percent}$$

**Multi-period Valuation Model** Having learnt the basics of equity share valuation in a single-period framework, we now discuss the more realistic, and also the more complex, case of multi-period valuation.

Since equity shares have no maturity period, they may be expected to bring a dividend stream of infinite duration. Hence the value of an equity share may be put as:

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_\infty}{(1+r)^\infty} = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} \quad (7.11)$$

where  $P_0$  is the price of the equity share today,  $D_1$  is the dividend expected a year hence,  $D_2$  is the dividend expected two years hence, ...,  $D_\infty$  is the dividend expected at the end of infinity, and  $r$  is the expected return.

Equation (7.11) represents the valuation model for an infinite horizon. Is it applicable to a finite horizon? Yes. To demonstrate this, consider how an equity share would be valued by an investor who plans to hold it for  $n$  years and sell it thereafter for a price of  $P_n$ . The value of the equity share to him is:

$$\begin{aligned}
P_0 &= \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n} \\
&= \sum_{t=1}^n \frac{D_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}
\end{aligned} \tag{7.12}$$

Now, what is the value of  $P_n$  in Eq.(7.12)? Applying the dividend capitalisation principle, the value of  $P_n$  would be the present value of the dividend stream beyond the  $n$ th year, evaluated as at the end of the  $n$ th year. This means:

$$P_n = \frac{D_{n+1}}{(1+r)^1} + \frac{D_{n+2}}{(1+r)^2} + \dots + \frac{D_\infty}{(1+r)^\infty} \tag{7.13}$$

Substituting this value of  $P_n$  in Eq. (7.12) we get:

$$\begin{aligned}
P_0 &= \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_n}{(1+r)^n} \\
&\quad + \frac{1}{(1+r)^n} \left[ \frac{D_{n+1}}{(1+r)} + \frac{D_{n+2}}{(1+r)^2} + \dots + \frac{D_\infty}{(1+r)^\infty} \right] \\
&= \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_n}{(1+r)^n} + \frac{D_n}{(1+r)^{n+1}} + \dots + \frac{D_\infty}{(1+r)^\infty} \\
&= \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}
\end{aligned} \tag{7.14}$$

This is the same as Eq.(7.11) which may be regarded as a generalised multi-period valuation formula. Eq.(7.11) is general enough to permit any dividend pattern — constant, rising, declining, or randomly fluctuating. For practical applications it is helpful to make simplifying assumptions about the pattern of dividend growth. The more commonly used assumptions are as follows:

- The dividend per share remains constant forever, implying that the growth rate is nil (the zero growth model).
- The dividend per share grows at a constant rate per year forever (the constant growth model).
- The dividend per share grows at a constant rate for a finite period, followed by a constant normal rate of growth forever thereafter (the two-stage model).
- The dividend per share, currently growing at an above-normal rate, experiences a gradually declining rate of growth for a while. Thereafter, it grows at a constant normal rate (the  $H$  model).

**Zero Growth Model** If we assume that the dividend per share remains constant year after year at a value of  $D$ , Eq.(7.11) becomes:

$$P_0 = \frac{D}{(1+r)} + \frac{D}{(1+r)^2} + \dots + \frac{D}{(1+r)^n} + \dots \infty \quad (7.15)$$

Equation (7.15), on simplification, becomes:

$$P_0 = \frac{D}{r} \quad (7.16)$$

This is an application of the present value of perpetuity formula.

**Constant Growth Model** One of the most popular dividend discount models assumes that the dividend per share grows at a constant rate ( $g$ ). The value of a share, under this assumption, is:

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_1(1+g)}{(1+r)^2} + \dots + \frac{D_1(1+g)^n}{(1+r)^{n+1}} + \dots \quad (7.17)$$

Applying the formula for the sum of a geometric progression, the above expression simplifies to:

$$P_0 = \frac{D_1}{r-g} \quad (7.18)_2$$

*Example* Ramesh Engineering Limited is expected to grow at the rate of 6 percent per annum. The dividend expected on Ramesh's equity share a year hence is ₹ 2.00. What price will you put on it if your required rate of return for this share is 14 percent?

The price of Ramesh's equity share would be:

$$P_0 = \frac{2.00}{0.14 - 0.06} = ₹ 25.00$$

**What Drives Growth** Most stock valuation models are based on the assumption that dividends grow over time. What drives this growth? The two major drivers of growth are: (a) ploughback ratio and (b) return on equity (ROE). To see why this is so let us consider an example. Omega Limited has an equity (net worth) base of 100 at the beginning of year 1. It earns a return on equity of 20 percent. It pays out 40 percent of its equity earnings and ploughs back 60 percent of its equity earnings. Its financials for a 3 year period are shown in [Exhibit 7.3](#), from which we find that dividends grow at a rate of 12 percent. The growth figure is a product of: Ploughback ratio × Return on equity =  $0.6 \times 20\% = 12\%$

### Exhibit 7.3 | Financials of Omega Limited

	Year 1	Year 2	Year 3
■ Beginning equity	100	112	125.44
■ Return on equity	20%	20%	20%
■ Equity earnings	20	22.4	25.1
■ Dividend payout ratio	0.4	0.4	0.4
■ Dividends	8	8.96	10.04
■ Ploughback ratio	0.6	0.6	0.6
■ Retained earnings	12	13.44	15.06

**Two Stage Growth Model** The simplest extension of the constant growth model assumes that the extraordinary growth (good or bad) will continue for a finite number of years and thereafter the normal growth rate will prevail indefinitely.

Assuming that the dividends move in line with the growth rate, the price of the equity share will be:

$$P_0 = \left[ \frac{D_1}{(1+r)} + \frac{D_1(1+g_1)}{(1+r)^2} + \frac{D_1(1+g_1)^2}{(1+r)^3} \dots + \frac{D_1(1+g_1)^{n-1}}{(1+r)^n} \right] + \frac{P_n}{(1+r)^n} \quad (7.19)$$

where  $P_0$  is the current price of the equity share,  $D_1$  is the dividend expected a year hence,  $g_1$  is the extraordinary growth rate applicable for  $n$  years, and  $P_n$  is the price of the equity share at the end of year  $n$ .

The first term on the right hand side of Eq.(7.19) is the present value of a growing annuity. Its value is equal to:

$$D_1 \left[ \frac{1 - \left[ \frac{1+g_1}{1+r} \right]^n}{r - g_1} \right] \quad (7.20)$$

Remember that this is a straightforward application of Eq.(6.7) developed in the [previous chapter](#).

Hence

$$P_0 = D_1 \left[ \frac{1 - \left[ \frac{1+g_1}{1+r} \right]^n}{r - g_1} \right] + \frac{P_n}{(1+r)^n} \quad (7.21)$$

Since the two-stage growth model assumes that the growth rate after  $n$  years remains constant,  $P_n$  will be equal to:

$$\frac{D_{n+1}}{r - g_2} \quad (7.22)$$

where  $D_{n+1}$  is the dividend for year  $n+1$  and  $g_2$  is the growth rate in the second period.

$D_{n+1}$ , the dividend for year  $n+1$ , may be expressed in terms of the dividend at the end of the first stage and growth rate in the second stage:

$$D_{n+1} = D_1 (1+g_1)^{n-1} (1+g_2) \quad (7.23)$$

Substituting the above expression, we have:

$$P_0 = D_1 \left[ \frac{1 - \left[ \frac{1+g_1}{1+r} \right]^n}{r - g_1} \right] + \left[ \frac{D_1 (1+g_1)^{n-1} (1+g_2)}{r - g_2} \right] \left[ \frac{1}{(1+r)^n} \right] \quad (7.24)$$

**Example** The current dividend on an equity share of Vertigo Limited is ₹ 2.00. Vertigo is expected to enjoy an above-normal growth rate of 20 percent for a period of 6 years. Thereafter the growth rate will fall and stabilise at 10 percent. Equity investors require a return of 15 percent. What is the intrinsic value of the equity share of Vertigo?

The inputs required for applying the two-stage model are:

$$g_1 = 20 \text{ percent}$$

$$g_2 = 10 \text{ percent}$$

$$n = 6 \text{ years}$$

$$r = 15 \text{ years}$$

$$D_1 = D_0 (1+g_1) = ₹ 2(1.20) = 2.40$$

Plugging these inputs in the two-stage model, we get the intrinsic value estimate as follows:

$$\begin{aligned} P_0 &= 2.40 \left[ \frac{1 - \left[ \frac{1.20}{1.15} \right]^6}{.15 - .20} \right] + \left[ \frac{2.40 (1.20)^5 (1.10)}{.15 - .10} \right] \left[ \frac{1}{(1.15)^6} \right] \\ &= 2.40 \left[ \frac{1 - 1.291}{-0.05} \right] + \left[ \frac{2.40 (2.488)(1.10)}{.05} \right] [0.432] \\ &= 13.96 + 56.80 \\ &= ₹ 70.76 \end{aligned}$$

The Excel spreadsheet for the two stage growth model is as under:

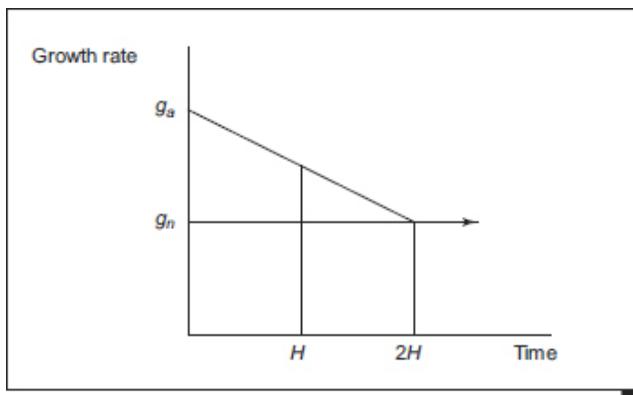
	A	B	C	D	E
1	$g_1$	$g_2$	n(years)	r	$D_0(₹)$
2	20%	10%	6	15%	2
3	$P_0(₹)$	Formula used = E2*(1 + A2)*(1 - ((1 + A2)/(1 + D2))^C2)/(D2 - A2) + E2*(1 + A2)*(1 + A2)^(C2 - 1)*(1 + B2)/(D2 - B2)/(1 + D2)^C2			70.76

**H Model** The *H* model of equity valuation is based on the following assumptions:

- While the current dividend growth rate,  $g_a$ , is greater than  $g_n$ , the normal long-run growth rate, the growth rate declines linearly for  $2H$  years.
- After  $2H$  years the growth rate becomes  $g_n$ .

The graphical representation of the dividend growth rate pattern for the *H*-model is shown in [Exhibit 7.4](#).

**Exhibit 7.4 Dividend Growth Rate Pattern for the *H* model**



While the derivation of the *H* model is rather complex, the valuation equation for the *H* model is quite simple:

$$P_0 = \frac{D_0[(1+g_n) + H(g_a - g_n)]}{r - g_n} \quad (7.25)$$

where  $P_0$  is the intrinsic value of the share,  $D_0$  is the current dividend per share,  $r$  is the rate of return expected by investors,  $g_n$  is the normal long-run growth rate,  $g_a$  is the current growth rate, and  $H$  is one-half of the period during which  $g_a$  will level off to  $g_n$ .

[Equation \(7.25\)](#) may be re-written as:

$$P_0 = \frac{D_0(1+g_n)}{r - g_n} + \frac{D_0H(g_a - g_n)}{r - g_n} \quad (7.26)$$

Expressed this way, the *H* model may be interpreted in a simple, intuitive manner. The first term on the right hand side of [Eq. \(7.26\)](#)

$$\frac{D_0(1+g_n)}{r - g_n}$$

represents the value based on the normal growth rate, whereas the second term

$$\frac{D_0 H(g_a - g_n)}{r - g_n}$$

reflects the premium due to abnormal growth rate.

**Example** The current dividend on an equity share of International Computers Limited is ₹ 3.00. The present growth rate is 50 percent. However, this will decline linearly over a period of 10 years and then stabilise at 12 percent. What is the intrinsic value per share of International Computers Limited, if investors require a return of 16 percent?

The inputs required for applying the *H*-model are:

$$\begin{aligned} D_0 &= ₹ 3.00 \\ g_a &= 50 \text{ percent} \\ H &= 5 \text{ years} \\ g_n &= 12 \text{ percent} \\ r &= 16 \text{ percent} \end{aligned}$$

Plugging these inputs in the *H*-model we get the intrinsic value estimate as follows:

$$P_0 = \frac{300[(1.12) + 5(0.50 - 0.12)]}{.16 - .12} = ₹ 226.5$$

The Excel illustration of the *H*-model is under:

	A	B	C	D	E
1	$g_a$	$g_n$	H(years)	$r$	$D_0(₹)$
2	50%	12%	5	16%	3
3	$P_0(₹)$	Formula used = E2* ((1+B2) + C2*(A2-B2)) / (D2-B2)			226.50

**Impact of Growth on Price, Returns, and P/E Ratio** The expected growth rates of companies differ widely. Some companies are expected to remain virtually stagnant or grow slowly; other companies are expected to show normal growth; still others are expected to achieve supernormal growth rate.

Assuming a constant total required return, differing expected growth rates mean differing stock prices, dividend yields, capital gains yields, and price-earnings ratios. To illustrate this, consider three cases:

	Growth rate (%)
Low growth firm	5
Normal growth firm	10
Supernormal growth firm	15

The expected earnings per share and dividend per share of each of the three firms for the following year are ₹ 3.00 and ₹ 2.00 respectively. Investors' required total return from equity investment is 20 percent.

Given the above information, we may calculate the stock price, dividend yield, capital gains yield, and price-earnings ratio for the three cases as shown in [Exhibit 7.5](#).

The results in [Exhibit 7.5](#) suggest the following points:

1. As the expected growth in dividend increases, other things being equal, the expected return<sup>3</sup> depends more on the capital gains yield and less on the dividend yield.
2. As the expected growth rate in dividend increases, other things being equal, the price-earnings ratio increases.
3. High dividend yield and low price-earnings ratio imply limited growth prospects.
4. Low dividend yield and high price-earnings ratio imply considerable growth prospects.

**Exhibit 7.5 Price, Dividend Yield, Capital Gains Yield, and Price-Earnings Ratio under Differing Growth Assumptions**

	Price $P_0 = \frac{D_1}{r-g}$	Dividend yield ( $D_1/P_0$ )	Capital gains yield ( $P_1-P_0)/P_0$ )	Price earnings ratio (P/E)
Low growth firm	$P_0 = \frac{\text{₹ } 2.00}{0.20 - 0.05} = \text{₹ } 13.33$	15.0%	5.0%	4.44
Normal growth firm	$P_0 = \frac{\text{₹ } 2.00}{0.20 - 0.10} = \text{₹ } 20.00$	10.0%	10.0%	6.67
Supernormal growth firm	$P_0 = \frac{\text{₹ } 2.00}{0.20 - 0.15} = \text{₹ } 40.00$	5.0%	15.0%	13.33

**Is the Stock Market Shortsighted?** Many managers believe that the stock market is myopic and obsessed with short-term performance. Let's test this assertion with the help of the constant growth model. Sun Pharma was quoting at ₹ 591.80 on May 26, 2014. Sun Pharma's most recent dividend was ₹ 10 per share and the dividend growth rate in the previous five years was 19 percent per year. If we assume that the dividend per share continues to grow at the same rate for the next five years and apply a

discount rate of 13 percent, the present value of the projected dividends for the following five years would be:

$$\begin{aligned} PV &= \frac{\text{₹ } 10(1.19)}{(1.13)} + \frac{\text{₹ } 10(1.19)^2}{(1.13)^2} + \frac{\text{₹ } 10(1.19)^3}{(1.13)^3} + \frac{\text{₹ } 10(1.19)^4}{(1.13)^4} + \frac{\text{₹ } 10(1.19)^5}{(1.13)^5} \\ &= 10.53 + 11.09 + 11.68 + 12.30 + 12.95 = \text{₹ } 58.55 \end{aligned}$$

Recall that Sun Pharma's stock price was ₹ 591.80. Therefore, less than 10 percent of the current stock price is attributable to the projected cash flows (by way of dividends) for the following five years. This means that Sun Pharma managers should focus on increasing long-term cash flows. This is true for most companies. Indeed, many researchers and consultants have found that for a typical company more than 80 percent of current stock price is accounted for by cash flows beyond five years.

If long-term cash flows account for the bulk of a stock's value, why are managers and analysts obsessed with quarterly earnings? The primary reason seems to be the informational content of short-term earnings. While the quarterly earnings by themselves may not be important, the information they convey about long-term prospects may be very significant. If the quarterly earnings are lower than expected because the new products launched by the company have failed, the long-term cash flows of the company would be negatively impacted. On the other hand, if the reason is that the company has significantly increased its R&D outlay on promising projects, the market may greet it positively rather than negatively. Another reason for managerial focus on short-term earnings may be that the bonus of managers is linked to reported earnings.

## 7.7 ■ EQUITY VALUATION: THE P/E RATIO APPROACH

An approach to valuation, practised widely by investment analysts, is the P/E ratio or earnings multiplier approach. The value of a stock, under this approach, is estimated as follows:

$$P_0 = E_1 \times P_0 / E_1 \quad (7.27)$$

where  $P_0$  is the estimated price,  $E_1$  is the estimated earnings per share,  $P_0/E_1$  is the justified price-earnings ratio.

**Determinants of the P/E Ratio** The determinants of the P/E ratio can be derived from the dividend discount model, which is the foundation for valuing equity stocks.

Let us start with the constant growth dividend discount model:

$$P_0 = \frac{D_1}{r - g} \quad (7.28)$$

In this model  $D_1 = E_1(1-b)$ .  $b$  stands for the ploughback ratio and  $g = \text{ROE} \times b$ . Note that ROE is return on equity. Making these substitutions we find that:

$$P_0 = \frac{E_1(1-b)}{r - \text{ROE} \times b} \quad (7.29)$$

Dividing both the sides by  $E_1$ , we get:

$$\frac{P_0}{E_1} = \frac{(1-b)}{r - \text{ROE} \times b} \quad (7.30)$$

Equation (7.30) indicates that the factors that determine the P/E ratio are:

- The dividend payout ratio,  $(1-b)$
- The required rate of return,  $r$
- The expected growth rate,  $\text{ROE} \times b$

**P/E Ratio and Ploughback Ratio** Note that  $b$ , the ploughback ratio, appears in the numerator as well as the denominator of the ratio on the right hand side of Eq. (7.30). What is the effect of a change in  $b$  on the P/E ratio? It depends on how ROE compares with  $r$ . If ROE is greater than  $r$ , an increase in  $b$  leads to an increase in P/E; if ROE is equal to  $r$  an increase in

$b$  has no effect on P/E; if ROE is less than  $r$  an increase in  $b$  leads to decrease in P/E.

**P/E Ratio and Interest Rate** The required rate of return on equity stocks reflects interest rate and risk. When interest rates increase, required rates of return on all securities, including equity stocks, increase, pushing security prices downward. When interest rates fall security prices rise. Hence there is an inverse relationship between P/E ratios and interest rates.

**P/E Ratio and Risk** Other things being equal, riskier stocks have lower P/E multiples. This can be seen easily by examining the formula for the P/E ratio of the constant growth model:

$$P/E = \frac{1-b}{r-g} \quad (7.31)$$

Riskier stocks have higher required rates of return ( $r$ ) and hence lower P/E multiples. This is true in all cases, not just the constant growth model. For any expected earnings and dividend stream, the present value will be lower when the stream is considered to be riskier. Hence the P/E multiple will be lower.

**P/E Ratio and Liquidity** Other things being equal, stocks which are highly liquid command higher P/E multiples and stocks which are highly illiquid command lower P/E multiples. The reason for this is not far to seek. Investors value liquidity just the way they value safety and hence are willing to give higher P/E multiples to liquid stocks.

## 7.8 ■ THE RELATIONSHIP BETWEEN EARNINGS-PRICE RATIO, EXPECTED RETURN, AND GROWTH

We often hear about growth stocks and income stocks. Growth stocks are supposed to provide returns primarily in the form of capital appreciation whereas income stocks are expected to provide returns mainly in the form of cash dividends. Does such a distinction make sense? Let us examine.

Consider the case of Maturity Limited, a firm that does not grow at all. It pays all its earnings as dividends and does not plough back anything. Put differently, it pays a constant stream of dividends and hence its stock is like a perpetual bond. Hence the expected return on its stock is its dividend per share divided by the share price (i.e. the dividend yield) which is also the same as its earnings per share divided by the share price (i.e. the E/P ratio). If the earnings per share as well as the dividend per share is ₹ 15 and the stock price is ₹ 100, we have:

$$\begin{aligned}\text{Expected return} &= \text{Dividend yield} = \text{Earnings-price ratio} \\ &= \frac{D_1}{P_0} = \frac{E_1}{P_0} \\ &= 15/100 \text{ or } 15 \text{ percent}\end{aligned}$$

The price is equal to:

$$P_0 = \frac{D_1}{r} = \frac{E_1}{r} \quad (7.32)$$

where  $r$  is the expected return.

Even for a growing firm, the expected return can equal the E/P ratio, if retained earnings earn a return equal to the opportunity cost of capital. Suppose Maturity Limited identifies a proposal to invest ₹ 15 a share next year which is expected to earn a return of 15 percent, just equal to the opportunity cost of capital. To undertake this investment, Maturity Limited decides to skip the dividend for year 1. The investment of ₹ 15 a share will generate an additional earnings of ₹ 2.25 (₹ 15 times 15 percent) per share in future thereby raising the dividend per share to ₹ 17.25 per share from year 2 onwards.

The net present value (NPV) per share for this proposal will be:

$$-15 + \frac{2.25}{0.15} = 0$$

Since the prospective return on this investment is equal to the opportunity cost of capital, it makes no contribution to the value of the firm and has no effect on the share price. The reduction in value caused by a zero dividend in year 1 is offset by an increase in value due to higher dividends in subsequent years. Hence, the opportunity cost of capital equals the E/P ratio:

$$r = \frac{E_1}{P_0} = \frac{15}{100} = 0.15$$

**Exhibit 7.6** presents our example for varying assumptions about the profitability of the proposed investment. Note that the earnings-price ratio ( $E_1/P_0$ ) is equal to the market capitalisation rate ( $r$ ) only when the proposed investment has a zero NPV. This is a very important point because managers often confuse E/P ratio with the opportunity cost of capital and tend to make poor financial decisions.

### Exhibit 7.6 Impact of Project Rate of Return on E/P Ratio

Rate of Return	Incremental Cash Flow	Project's NPV in Year 1	Impact on Share Price in Year 0	Share Price in Year 0, $P_0$	$\frac{E_1}{P_0}$	$r$
0.05	0.75	-10	-8.70	91.30	0.164	0.15
0.10	1.50	-5	-4.35	95.65	0.157	0.15
0.15	2.25	0	0	0	0.15	0.15
0.20	3.00	5	4.35	104.35	0.144	0.15
0.25	3.75	10	8.70	108.70	0.138	0.15

In general, we can think of the stock price as the capitalised value of the earnings under the assumption of no growth plus the present value of growth opportunities (PVGO).

$$P_0 = \frac{E_1}{r} + \text{PVGO} \quad (7.33)$$

Manipulating this a bit, we get

$$\frac{E_1}{P_0} = r \left[ 1 - \frac{\text{PVGO}}{P_0} \right] \quad (7.34)$$

From this equation, it is clear that:

- Earnings-price ratio is equal to  $r$  when PVGO is zero.
- Earnings-price ratio is less than  $r$  when PVGO is positive.
- Earnings-price ratio is more than  $r$  when PVGO is negative.

## 7.9 ■ STOCK MARKET

The stock market consists of a primary segment and a secondary segment. New securities are issued in the primary market and outstanding securities are traded in the secondary market.

The process of issuing securities in the primary market will be discussed in [Chapter 18](#). Here our focus is mainly on the secondary market.

The secondary market in India comprises of several stock exchanges recognised by the government under the Securities Contracts (Regulation) Act. Of course, the principal bourses are the National Stock Exchange and the Bombay Stock Exchange, accounting for virtually all the trading on the Indian stock market.

## **Veritable Transformation**

The secondary market in India has undergone a metamorphosis after 1994. The following changes have virtually transformed the character of the secondary market.

**Screen-based Trading** Till 1994, trading on the stock market in India was based on the open outcry system. With the establishment of the National Stock Exchange in 1994, India entered the era of screen-based trading. Within a short span of time, screen-based trading has supplanted the open outcry system on all the stock exchanges in the country, thanks to SEBI's initiative and the inherent superiority of screen-based trading.

**Electronic Delivery** Traditionally, trades in India required physical delivery. This led to high paperwork cost and created bad paper risk.

To mitigate the costs and risks associated with physical delivery, security transactions are now settled mainly through electronic delivery facilitated by depositories. A depository is an institution which dematerialises physical certificates and effects transfer of ownership by electronic book entries.

**Rolling Settlement** Previously security transactions in India were settled on the basis of a weekly account period. From 2002 onwards, SEBI has gradually introduced the rolling settlement system under which each day constitutes an account period and its trades are settled after a few days. For example, under the T + 2 rolling system which is currently in vogue in India, the trades are settled after 2 days.

Thanks to screen-based trading, electronic delivery, and rolling settlement, the transaction costs in India's stock market have decreased dramatically.

## **Principal Exchanges**

The National Stock Exchange has in a short period of time emerged as the largest exchange; the Bombay Stock Exchange, traditionally the leading exchange, is now the second largest exchange in the country. Hence it is instructive to understand the distinctive features of these principal exchanges.

**The National Stock Exchange** The distinctive features of the National Stock Exchange (NSE), as it functions currently, are as follows:

- The NSE is a ringless, national, computerised exchange.
- The NSE has two segments: the Capital Market segment and the Wholesale Debt Market segment. The Capital Market segment covers equities, convertible debentures, and retail trade in non-convertible debentures. The Wholesale Debt Market segment is a market for high value transactions in government securities, PSU bonds, commercial papers, and other debt instruments.
- The trading members in the Capital Market segment are connected to the central computer in Mumbai through a satellite link-up, using VSATs (Very Small Aperture Terminals). The trading members in the Wholesale Debt Market segment are linked through dedicated high speed lines to the central computer at Mumbai.
- The NSE has opted for an order-driven system.
- When a trade takes place, a trade confirmation slip is printed at the trading member's workstation. It gives details like quantity, price, code number of counterparty, and so on.
- The identity of a trading member is not revealed to others.
- All trades on NSE are guaranteed by the National Securities Clearing Corporation (NSCC).

**The Bombay Stock Exchange** Established in 1875, the Bombay Stock Exchange (BSE) is one of oldest organised exchanges in the world with a long, colourful, and chequered history. Its distinctive features are as follows:

- The BSE switched from the open outcry system to the screen-based system in 1995. It accelerated its computerisation programme in response to the threat from NSE.
- Jobbers traditionally played an important role on the BSE. A jobber is a broker who trades on his own account and hence offers a two-way quote or a bid-ask quote. To accommodate both brokers and jobbers,

BSE initially adopted a ‘quote-driven’ system and an ‘order-driven’ system, but subsequently, as jobbing was discontinued, shifted to the latter system.

- From 1996, BSE extended its BOLT network outside Mumbai. A number of subsidiary companies of regional exchanges became members of BSE and through them BSEs reach has expanded.

## Stock Market Quotations and Stock Market Indices

Information on stock market activity is reported in various media. It is covered by on-line services, newspapers, business periodicals, other publications, radio, and television.

Investors are interested in knowing what is happening to individual stocks and what is happening to the market as a whole. Let us see how the information about these aspects is reported.

**Individual Stock Quotations** Investors can get to know what is happening to individual stocks and what is happening to the market as a whole by referring to the websites of BSE and NSE. For instance you may go to [https://www.nseindia.com/products/content/equities/equities/archieve\\_eq.htm](https://www.nseindia.com/products/content/equities/equities/archieve_eq.htm) and select a report named Bhavcopy dated 03-09-2018 to see the following traded details of Bajaj Auto Limited stock on NSE on that day. ISIN (last column) stands for International Securities Identification Number.

Symbol	Se- ries	Open	High	Low	Close	Last	Prev close	Total Trdqty	Total Trdval	Time Stamp	Total Trade	ISIN
BAJAJ-AUTO	EQ	2765	2807.7	2750	2771.9	2766	2744.85	876984	2437919650	3-Sep-18	36274	INE917I01010

Some of the important abbreviations used in stock quotations are:

- con - convertible
- xd - ex (excluding) dividend
- cd - cum (with) dividend
- xr - ex (excluding) right
- sl - small lot

**Stock Market Indices** Investors often ask the question: How is the market doing? This interest in the broad market movement stems from the general observation that prices of most of the stocks tend to move together, a fact that has a fairly strong empirical underpinning. The general movement of the market is measured by indices representing the entire market or important segments thereof.

The two most popular stock market indices in India are Sensex and Nifty. A brief discussion of them follows:

- **S&P BSE Sensex** Perhaps the most widely followed stock market index in India, the *S&P BSE BSE Sensex*, popularly called the Sensex reflects the movement of 30 sensitive shares. The index of

any trading day reflects the aggregate market value of the floating stock of the sample of 30 shares on that day in relation to the average aggregate market value of the floating stock of these shares in the base year, 1978-79. The base value of this index is 100.

- **Nifty 50** Perhaps the most rigorously constructed stock market index in India, the *Nifty 50* reflects the price movement of 50 shares selected on the basis of market capitalisation and liquidity (impact cost). The index of any trading day reflects the aggregate market value of the floating stock of a sample of 50 shares on that day in relation to the aggregate market value of the floating stock of those shares on November 3, 1995. The base value of this index is 1000.

## SUMMARY

- The term value is used in different senses. Liquidation value, going concern value, book value, market value, and intrinsic value are the most commonly used concepts of value.
- The **intrinsic value** of any asset, real or financial, is equal to the present value of the cash flows expected from it. Hence, determining the value of an asset requires an estimate of expected cash flows and an estimate of the required return.
- The value of a bond is:

$$P = \sum_{t=1}^n \frac{C}{(1+r)^t} + \frac{M}{(1+r)^n}$$

- A basic property of a bond is that its price varies inversely with yield.
- The relationship between coupon rate, required yield, and bond price is as follows:
 

Coupon rate < Required yield  $\longleftrightarrow$  Price < Par (Discount bond)

Coupon rate = Required yield  $\longleftrightarrow$  Price = Par

Coupon rate > Required yield  $\longleftrightarrow$  Price > Par (Premium bond)
- The **current yield** on a bond is defined as: Annual interest / Price
- The **yield to maturity** (YTM) on a bond is the rate of return the investor earns when he buys the bond and holds it till maturity. It is the value of  $r$  in the bond valuation model. For estimating YTM readily, the following approximation may be used:

$$YTM = \frac{C + (M - P)/n}{0.4M + 0.6P}$$

- According to the **dividend discount model**, the value of an equity share is equal to the present value of dividends expected from its ownership.
- If the dividend per share remains constant the value of the share is:

$$P_0 = D / r$$

- If the dividend per share grows at a constant rate, the value of the share is:

$$P_0 = D_1 / (r - g)$$

- The two key drivers of dividend growth are (a) ploughback ratio and (b) return on equity.
- The value per share, according to the *H* model is:

$$P_0 = \frac{D_0(1+g_n)}{r-g_n} + \frac{D_0H(g_a-g_n)}{r-g_n}$$

- An approach to valuation, practised widely by investment analysts, is the P/E ratio approach. The value of an equity share, under this approach, is estimated as follows:

$$P_0 = E_1 \times P_0/E_1$$

- The stock price may be considered as the capitalised value of the earnings under the assumption of no growth plus the present value of growth opportunities.
- The stock market consists of a primary segment and a secondary segment. The principal bourses are the National Stock Exchange and the Bombay Stock Exchange, accounting for the bulk of the trading on the Indian stock market.

## QUESTIONS

1. Describe briefly the various concepts of value.
2. Discuss the basic bond valuation formula.
3. State the formula for a bond which pays interest semi-annually.
4. What is the relationship between coupon rate, required yield, and price?
5. Explain and illustrate the following yield measures: current yield, yield to maturity, and yield to call.
6. State and illustrate the formula to find the approximate YTM on a bond.
7. Discuss the constant growth dividend discount model.
8. Explain the two stage dividend discount model.
9. Discuss the *H* model.
10. What is the impact of growth on price, dividend yield, capital gains yield, and price-earnings ratio?
11. Discuss the P/E ratio approach to stock valuation.
12. How is the E/P linked to the required return and the present value of growth opportunities?
13. Explain how the price-earnings ratio is related to growth, dividend payout ratio, and the required return.
14. Discuss the transformation of the Indian stock market from mid 1990s.
15. Discuss the salient features of the National Stock Exchange.
16. Discuss the salient features of the Bombay Stock Exchange.

17. How is stock price reported?

## SOLVED PROBLEMS

- 7.1 A ₹ 100 par value bond bearing a coupon rate of 12 percent will mature after 5 years. What is the value of the bond, if the discount rate is 15 percent?

*Solution* Since the annual interest payment will be ₹ 12 for 5 years and the principal repayment will be ₹ 100 after 5 years, the value of the bond, at a discount rate of 15 percent, will be

$$\begin{aligned} V &= ₹ 12 (PVIFA_{15\%, 5 \text{ yrs}}) + ₹ 100 (PVIF_{15\%, 5 \text{ yrs}}) \\ &= ₹ 12 (3.352) + ₹ 100 (0.497) \\ &= 40.22 + 49.70 = ₹ 89.92 \end{aligned}$$

- 7.2 The market price of a ₹ 1,000 par value bond carrying a coupon rate of 14 percent and maturing after 5 years is ₹ 1050. What is the yield to maturity (YTM) on this bond? What is the approximate YTM?

*Solution* The YTM is the value of  $r$  in the following equation:

$$\begin{aligned} 1,050 &= \sum_{t=1}^5 \frac{140}{(1+r)^t} + \frac{1,000}{(1+r)^5} \\ &= 140 (PVIFA_{r, 5 \text{ yrs}}) + 1,000 (PVIF_{r, 5 \text{ yrs}}) \end{aligned}$$

Let us try a value of 13 percent for  $r$ . The right hand side of the above expression becomes:

$$\begin{aligned} &140 (PVIFA_{13\%, 5 \text{ yrs}}) + 1,000 (PVIF_{13\%, 5 \text{ yrs}}) \\ &= 140 (3.517) + 1,000 (0.543) \\ &= 492.4 + 543.0 = ₹ 1035.4 \end{aligned}$$

Since this is less than ₹ 1,050, we try a lower value for  $r$ . Let us try  $r = 12$  percent. This makes the right-hand side equal to:

$$\begin{aligned} &140 (PVIFA_{12\%, 5 \text{ yrs}}) + 1,000 (PVIF_{12\%, 5 \text{ yrs}}) \\ &= 140 (3.605) + 1,000 (0.567) \\ &= 504.7 + 567.0 = ₹ 1071.7 \end{aligned}$$

Thus,  $r$  lies between 12 percent and 13 percent. Using a linear interpolation in this range, we find that  $r$  is equal to:

$$12\% + (13\% - 12\%) \frac{1071.7 - 1050.0}{1071.7 - 1035.4} = 12.60 \text{ percent}$$

(b) The approximate YTM works out to:

$$YTM = \frac{140 + (1,000 - 1,050)/5}{0.40 \times 1000 + 0.6 \times 1050} = 12.62 \text{ percent}$$

- 7.3 A ₹ 100 par value bond bears a coupon rate of 14 percent and matures after 5 years. Interest is payable semi-annually. Compute the value of the bond if the required rate of return is 16 percent.

*Solution*

In this case the number of half-yearly periods is 10, the half-yearly interest payment is ₹ 7, and the discount rate applicable to a half-yearly period is 8 percent. Hence, the value of the bond is:

$$\begin{aligned}
 V &= \sum_{t=1}^{10} \frac{7}{(1.08)^t} + \frac{100}{(1.08)^{10}} \\
 &= 7 (\text{PVIFA}_{8\%, 10 \text{ yrs}}) + 100 (\text{PVIF}_{8\%, 10 \text{ yrs}}) \\
 &= 7 (6.710) + 100 (0.463) \\
 &= 46.97 + 46.30 \\
 &= ₹ 93.27
 \end{aligned}$$

- 7.4 The equity stock of Rax Limited is currently selling for ₹ 30 per share. The dividend expected next year is ₹ 2.00. The investors' required rate of return on this stock is 15 percent. If the constant growth model applies to Rax Limited, what is the expected growth rate?

*Solution*

According to the constant growth model

$$P_0 = \frac{D_1}{r - g}$$

This means

$$g = r - D_1 / P_0$$

Hence, the expected growth rate (g) for Rax Limited is:

$$g = 0.15 - \frac{2.00}{30.00} = .083 \text{ or } 8.3 \text{ percent}$$

- 7.5 Vardhman Limited's earnings and dividends have been growing at a rate of 18 percent per annum. This growth rate is expected to continue for 4 years. After that the growth rate will fall to 12 percent for the next 4 years. Thereafter, the growth rate is expected to be 6 percent forever. If the last dividend per share was ₹ 2.00 and the investors' required rate of return on Vardhman's equity is 15 percent, what is the intrinsic value per share?

*Solution* The intrinsic value per share of Vardhman may be computed using a 3-step procedure.

**Step 1:** The dividend stream during the first eight years when Vardhman would enjoy a relatively high rate of growth will be:

$$\begin{aligned}
 D_1 &= 2.00 (1.18) &= 2.36 \\
 D_2 &= 2.00 (1.18)^2 &= 2.78 \\
 D_3 &= 2.00 (1.18)^3 &= 3.29 \\
 D_4 &= 2.00 (1.18)^4 &= 3.88 \\
 D_5 &= 2.00 (1.18)^4 (1.12) &= 4.34 \\
 D_6 &= 2.00 (1.18)^4 (1.12)^2 &= 4.86 \\
 D_7 &= 2.00 (1.18)^4 (1.12)^3 &= 5.45 \\
 D_8 &= 2.00 (1.18)^4 (1.12)^4 &= 6.10
 \end{aligned}$$

The present value of this dividend stream is:

$$2.36 (0.870) + 2.78 (0.756) + 3.29 (0.658) + 3.88 (0.572) \\ + 4.34 (0.497) + 5.45 (0.432) + 6.10 (0.376) = ₹ 16.83$$

**Step 2:** The price of the share at the end of 8 years, applying the constant growth model at that point of time, will be:

$$P_8 = \frac{D_8}{r - g_n} = \frac{D_8(1+g_n)}{r - g_n} \\ = \frac{2.00(1.18)^4(1.12)^4(1.06)}{0.15 - 0.06} = ₹ 71.84$$

The present value of this price is:

$$\frac{71.84}{(1.15)^8} = 23.49$$

**Step 3:** The sum of the above components is:

$$P_0 = ₹ 16.83 + ₹ 23.49 = ₹ 40.32$$

- 7.6 The current dividend on an equity share of Pioneer Technology is ₹ 3.00. Pioneer is expected to enjoy an above-normal growth rate of 40 percent for 5 years. Thereafter, the growth rate will fall and stabilise at 12 percent. Equity investors require a return of 15 percent from Pioneer's stock. What is the intrinsic value of the equity share of Pioneer?

**Solution** The inputs required for applying the two-stage growth model are:

$$g_1 = 40\%, g_2 = 12\%, n = 5 \text{ years}, r = 15\%$$

$$D_1 = D_0(1+g_1) = ₹ 3 (1.40) = ₹ 4.20$$

Plugging these inputs in the two-stage growth model, we get the intrinsic value estimate as follows:

$$P_0 = 4.20 \left[ \frac{1 - \left[ \frac{1.40}{1.15} \right]^5}{0.15 - 0.40} \right] + \left[ \frac{4.20(1.40)^4(1.12)}{0.15 - 0.12} \right] \left[ \frac{1}{(1.15)^5} \right] \\ = 28.12 + 299.48 = ₹ 327.60$$

- 7.7 The current dividend on an equity share of National Computers Limited is ₹ 5.00. The present growth rate is 50 percent. However, this will decline linearly over a period of 8 years and then stabilise at 10 percent. What is the intrinsic value per share of National Computers, if investors require a return of 18 percent from its stock?

**Solution** The inputs required for applying the *H*-model are:

$$D_0 = ₹ 5.00, g_a = 50\%, H = 4 \text{ years}, g_n = 10 \text{ years}, r = 18\%$$

Plugging these inputs in the *H*-model we get the intrinsic value estimate as follows:

$$P_0 = \frac{5.00[(1.10) + 4(0.50 - 0.10)]}{0.18 - 0.10} = ₹ 168.75$$

## PROBLEMS

- 7.1 Bond Value** A ₹ 100 par value bond, bearing a coupon rate of 11 percent will mature after 5 years. What is the value of the bond, if the discount rate is 15 percent?
- 7.2 Bond Value** A ₹ 100 par value bond, bearing a coupon rate of 12 percent, will mature after 7 years. What is the value of the bond if the discount rate is 14 percent? 12 percent?
- 7.3 YTM** The market value of a ₹ 1,000 par value bond, carrying a coupon rate of 12 percent and maturing after 7 years, is ₹ 750. What is the yield to maturity on this bond?
- 7.4 YTM** The market value of a ₹ 100 par value bond, carrying a coupon rate of 14 percent and maturing after 10 years, is ₹ 80. What is the yield to maturity on this bond?
- 7.5 Bond Value** A ₹ 100 par value bond bears a coupon rate of 12 percent and matures after 6 years. Interest is payable semi-annually. Compute the value of the bond if the required rate of return is 16 percent, compounded semi-annually.
- 7.6 YTM** You are considering investing in one of the following bonds:

	Coupon rate	Maturity	Price/₹ 100 par value
Bond A	12%	10yrs	₹ 70
Bond B	10%	6yrs	₹ 60

- Your income tax rate is 30 percent and your capital gains tax is effectively 10 percent. Capital gains taxes are paid at the time of maturity on the difference between the purchase price and par value. What is your post-tax yield to maturity from these bonds?
- 7.7 Bond Value** A company's bonds have a par value of ₹ 100, mature in 7 years, and carry a coupon rate of 12 percent payable semi-annually. If the appropriate discount rate is 16 percent, what price should the bond command in the market place?
- 7.8 Stock Price** The share of a certain stock paid a dividend of ₹ 2.00 last year ( $D_0 = ₹ 2.00$ ). The dividend is expected to grow at a constant rate of 6 percent in the future. The required rate of return on this stock is considered to be 12 percent. How much should this stock sell for now? Assuming that the expected growth rate and required rate of return remain the same, at what price should the stock sell 2 years hence?
- 7.9 Stock Price** Sherief Corporation's previous dividend was ₹ 12.00. Earnings and dividends are expected to grow at a rate of 10 percent. The required rate of return on Sherief's stock is 15 percent. What should be the market price of Sherief's stock now?
- 7.10 Growth Rate** The equity stock of Max Limited is currently selling for ₹ 32 per share. The dividend expected next is ₹ 2.00. The investors' required rate of return on this stock is 12 percent. Assume that the constant growth model applies to Max Limited. What is the expected growth rate of Max Limited?

- 7.11 Rate of Return** Fizzle Limited is facing gloomy prospects. The earnings and dividends are expected to decline at the rate of 4 percent. The previous dividend was ₹ 1.50. If the current market price is ₹ 8.00, what rate of return do investors expect from the stock of Fizzle Limited?
- 7.12 Variable Growth Rate** The Commonwealth Corporation's earnings and dividends have been growing at the rate of 12 percent per annum. This growth rate is expected to continue for 4 years. After that the growth rate would fall to 8 percent for the next four years. Beyond that the growth rate is expected to be 5 percent forever. If the last dividend was ₹ 1.50 and the investors' required rate of return on the stock of Commonwealth is 14 percent, how much should be the market value per share of Commonwealth Corporation's equity stock?
- 7.13 Two Stage Growth Model** Determine the intrinsic value of an equity share, given the following data:
- |                                     |              |
|-------------------------------------|--------------|
| Last dividend ( $D_0$ )             | : ₹ 2.00     |
| Growth rate for the next five years | : 15 percent |
| Growth rate beyond 5 years          | : 10 percent |
| Assume a required rate of return.   |              |
- 7.14 YTM** You can buy a ₹ 1000 par value bond carrying an interest rate of 14 percent (payable annually) and maturing after 4 years for ₹ 900. If the re-investment rate applicable to the interest receipts from this bond is 16 percent, what will be your yield to maturity?
- 7.15 Two Stage Growth Model** The current dividend on an equity share of Dizzy Limited is ₹ 2.00. Dizzy is expected to enjoy an above-normal growth rate of 18 percent for 6 years. Thereafter the growth rate will fall and stabilise at 12 percent. Equity investors require a return of 16 percent from Dizzy's stock. What is the intrinsic value of the equity share of Dizzy?
- 7.16 H Model** The current dividend on an equity share of International Chemicals Limited is ₹ 4.00. The present growth rate is 20 percent. However, this will decline linearly over a period of 8 years and stabilise at 10 percent. What is the intrinsic value per share of International Chemicals Limited if investors require a return of 18 percent?
- 7.17 PVGO** Mahaveer Electronics is expected to give a dividend of ₹ 8 next year and the same would grow by 12 percent per year forever. Mahaveer pays out 40 percent of its earnings. The required rate of return on Mahaveer's stock is 15 percent. What is the PVGO?
- 7.18 YTM** Rajesh has invested ₹ 2 crores in ₹ 100 par 5 year bonds of a company which pays semi-annual interest of ₹ 5.5 which he regularly invests in bank deposits carrying interest at 9 percent. What is the yield to maturity of this arrangement?
- 7.19 YTM** Ashok has paid ₹ 880 per bond to buy ₹ 1000 par bonds maturing after 8 years that pay an annual coupon of 10 percent. He falls in the income tax bracket of 30 percent. The capital gains tax is effectively 9 and has to be paid at

the time of maturity on the difference between the purchase price and par value. What is his post-tax yield to maturity from these bonds?

- 7.20 PVGO** Bio Synthetics has a policy of maintaining a payout ratio of 40 percent. Their net profit margin is steady at 10 percent and sales growth rate is 9 percent. If the number of outstanding equity shares is 10 million and the forecasted sales for the year is ₹ 800 million, what is their present value of growth opportunities? The rate of return required by the investors in Bio Synthetics is 14 percent.
- 7.21 Stock Valuation** Investors require a rate of return of 16 percent from the stock of Evergreen Industries, which has a strict policy of paying just 10 percent of their net profits as dividend on their outstanding equity shares of 0.8 crore. Their net profit margin is steady at 12 percent. The revenues of the company is likely to grow at a high growth rate of 30 percent for the next 3 years and thereafter at a modest rate of just 10 percent. If the sales now has just reached ₹ 200 crore, what is the current intrinsic value of their equity stock?
- 7.22 Market Price** A dividend of ₹ 6 per share has been paid on the equity shares of Cosmos International and according to an analyst forecast the dividend and stock price are expected to grow at 5 percent in the future. If that forecast is reliable, and investors require a return of 20 percent from Cosmos what would be the likely market price per share after 2 years?
- 7.23 Bond Yield** A ₹ 1000 par bond has a coupon rate of 10 percent paid annually. It matures in 12 years. It is currently selling for ₹ 1050. What is its yield to maturity? Use the approximate formula.
- 7.24 Components of Bond Returns** Bond A carries an annual coupon of 10 percent and has a residual maturity of 5 years. Bond B carries an annual coupon of 8 percent and it too has a residual maturity of 5 years. Both the bond have a par value of ₹ 1000 and a YTM of 9 percent. Bond A sells at a discount. What is the current yield for Bond A and Bond B? What is the expected capital gains yield over the next one year for Bond A and Bond B?
- 7.25 Deep Discount Bonds** On January 1, 2010 ABC Limited issues a 20-year deep discount bond maturing on December 31, 2030. The par value of the bond is ₹ 100000 and it was issued at ₹ 10000. On January 1, 2019 the bond was trading at ₹ 30,040. What was the implicit yield at the time of issue? What is the return to an investor who bought at the time of issue and sold on January 1, 2019? What return can an investor who buys on January 1, 2019 and holds it till maturity expect? Assume that there will be no default.
- 7.26 Dividend Per Share** Shakti Limited stock currently sells for ₹ 90 per share. Investors, require a return of 14 percent on the firms stock. If the constant dividend growth rate applicable to the company is 8 percent, what was the dividend paid per share on the stock recently?

## MINICASE - I

You have recently graduated from a business school and joined SMART INVEST as a financial analyst. Your job is to help clients in choosing a portfolio of bonds and stocks. Dinshaw Mistry, a prospective client, seeks your help in understanding how bonds and stocks are valued and what rates of return they offer. In particular, you have to answer the following questions.

- a. How is the value of a bond calculated?
- b. What is the value of a 5-year, ₹ 1,000 par value bond with a 10 percent annual coupon, if the required rate of return is 8 percent?
- c. What is the approximate yield to maturity of an 8-year, ₹ 1,000 par value bond with a 10 percent annual coupon, if it sells for ₹ 1,060.
- d. What is the yield to call of the bond described in part (c), if the bond can be called after 2-years at a premium of ₹ 1,050.
- e. What is the general formula for valuing any stock, irrespective of its dividend pattern?
- f. How is a constant growth stock valued?
- g. Magnum chemicals is a constant growth company which paid a dividend of ₹ 6.00 per share yesterday ( $D_0 = ₹ 6.00$ ) and the dividend is expected to grow at a rate of 12 percent per year forever. If investors require a rate of return of 15 percent (i) what is the expected value of the stock a year from now? (ii) what is the expected dividend yield and capital gains yield in the first year?
- h. Zenith Electronics paid a dividend of ₹ 10.00 per share yesterday ( $D_0 = ₹ 10.00$ ). Zenith Electronics is expected to grow at a supernormal growth rate of 25 percent for the next 4 years, before returning to a constant growth rate of 10 percent thereafter. What will be the present value of the stock, if investors require a return of 16 percent?
- i. The earnings and dividends of Ravi Pharma are expected to grow at a rate of 20 percent for the next 3 years. Thereafter, the growth rate is expected to decline linearly for the following 5 years before settling down at 10 percent per year forever. Ravi Pharma paid a dividend of ₹ 8.00 per share yesterday ( $D_0 = ₹ 8.00$ ). If investors require a return of 14 percent from the equity of Ravi Pharma, what is the intrinsic value per share?

## **MINICASE - II**

Jagan Reddy, the MD of Reddy Lifestyle was much dejected when his bankers simply refused any additional funding for his company. Somehow they didn't seem to share his enthusiasm over the company's prospects. Coming out of the bank, he called his CFO and close confidante Ram Rao. After showering a couple of choice adjectives on the bank manager he sobered down: 'What is the point in blaming the bank? Anyone can see that our stock is one of the worst performers in the market. Any idea why it is jinxed? Frankly, I have had enough of this useless furniture business. It can take us only thus far. Now, here is a secret-just keep it strictly to yourself: I think the time has come to unlock value in our old land investments. We can easily diversify into realty

business by the end of this year. We will then raise the needed funds by placing equity privately at a good premium. We can flaunt a growth rate as high as forty percent for the first four years and a fair twelve percent thereafter. All that is needed is a bit of guts! I will give you a whole six months' time to work on those hardnosed directors to make them see the writing on the wall, so that when I eventually come up with the real estate idea, they would jump for it. Enough for the day. Tomorrow we will discuss these in detail. Specifically I want you to come up with some answers, even if approximate for the following:

1. For our immediate need of ₹ 10 crores, I think the only way left is to go for a new series of unsecured debentures. Could you figure out the coupon rate we will have to offer for a five year issue now at par?
2. What should be our P/E ratio if we go for the new debenture issue? Also, based on our current earnings prospects, come up with some convincing calculations to show why our stock would continue to be a laggard in the market if we just stick to the present furniture business.
3. At what possible price would we be able to place the shares privately after a year, assuming that the board approves the diversification? Also let me know what would be the present value of growth opportunities then?

If you were the CFO, how would you have worked out the solutions for the above queries with the following data?

Currently the company's 8 percent coupon debentures of face value of ₹ 100, with a remaining maturity of five years are trading at ₹ 90 per debenture. The current market price per equity share of face value ₹ 10 of the company is ₹ 24.70 and the average P/E multiple for the industry is 14. For simplicity you assume that the profitability, payout and turnover ratios remain unchanged. You decide to use a discount rate of 15 percent for the diversified company. The summarised financial statements of the company for the year ended just now are as under:

(₹ in millions)			
■ Net sales	625	Equity capital	250
		Reserve & surplus	80
■ Cost of goods	495	Loan funds	200
■ Gross profit	130	Total	530
■ PBIT	92		
■ Interest	20	Fixed assets	410
■ PBT	72	Investments	20
■ Tax	22	Net current assets	100
■ PAT	50	Total	530
■ Dividend	30		

## PRACTICAL ASSIGNMENT

Value the equity share of the company of your choice using the two-stage growth model.

Make suitable assumptions along with justification with respect to  $g_1$ ,  $n$ ,  $g_2$ , and  $r$ . Compare your value with the prevailing market price and explain the discrepancy, if any.

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**1** The steps in simplification are:

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_0(1+g)}{(1+r)} \quad (1)$$

$$P_0 = \frac{D_1 + P_0(1+g)}{(1+r)} \quad (2)$$

$$P_0(1+r) = D_1 + P_0(1+g) \quad (3)$$

$$P_0(1+r) - P_0(1+g) = D_1 \quad (4)$$

$$P_0(r-g) = D_1 \quad (5)$$

$$P_0 = \frac{D_1}{r-g} \quad (6)$$

**2** Start with

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \dots + \frac{D_\infty}{(1+r)^\infty} = \frac{D_1}{(1+r)} + \frac{D_1(1+g)}{(1+r)^2} + \dots \quad (1)$$

Multiplying both the sides of (1) by  $[(1+g)/(1+r)]$  gives:

$$P_0 \left[ \frac{1+g}{1+r} \right] = \frac{D_1(1+g)}{(1+r)^2} + \frac{D_1(1+g)^2}{(1+r)^3} + \dots + \frac{D_1(1+g)^{n+1}}{(1+r)^{n+2}} \quad (n \rightarrow \infty) \quad (2)$$

Subtracting (2) from (1) yields:

$$\frac{P_0(r-g)}{(1+r)} = D_1 \left[ \frac{1}{(1+r)} - \frac{(1+g)^{n+1}}{(1+r)^{n+2}} \right] \quad (n \rightarrow \infty) \quad (3)$$

As  $(n \rightarrow \infty)$ ,  $\frac{(1+g)^{n+1}}{(1+r)^{n+2}} \rightarrow 0$  because  $g < r$

Hence (2) becomes:

$$\frac{P_0(r-g)}{(1+r)} = \frac{D_1}{(1+r)} \quad (4)$$

This means:

$$P_0 = \frac{D_1}{r-g} \quad (5)$$

**3** Note that total return is the sum of the dividend yield and capital gain yield:

$$\frac{D_t + P_t - P_{t-1}}{P_{t-1}} = \frac{D_t}{P_{t-1}} + \frac{P_t - P_{t-1}}{P_{t-1}}$$

Total return = Dividend yield + Capital gains yield

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## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter7/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter7/index.html)

- Additional Self-Test Problems
- Additional Solved Problems
- Chapters Excel
- Excel on Solved Problems
- Answer Key



## Risk and Return

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Measure the risk and return of a single asset.
- ✓ Measure the risk and return of a portfolio.
- ✓ Distinguish between market risk and unique risk.
- ✓ Estimate the beta of a security.
- ✓ Explain the factors that determine beta.
- ✓ Discuss the relationship between risk and return as per the capital asset pricing model.

Risk is present in virtually every decision. When a production manager selects an equipment, or a marketing manager an advertising campaign, or a financial manager a portfolio of securities, all of them face uncertain cash flows. Assessing risks and incorporating the same in the final decision is an integral part of financial analysis.

The objective in decision making is not to eliminate or avoid risk—often it may be neither feasible nor desirable to do so – but to properly assess it and determine whether it is worth bearing. Once the risk characterising future cash flows is properly measured, an appropriate risk-adjusted discount rate should be applied to convert future cash flows into their present values.

To estimate the risk-adjusted discount rate, a task that we have glossed over so far, you should be able to measure and price financial risk. While the meaning of risk and return is grasped by almost every person, as a finance professional you need an explicit and quantitative understanding of these concepts and, more importantly, the nature of relationship between them. This chapter presents a framework that will help you in doing this.

The subject matter of this chapter is inherently quantitative and may appear a bit difficult. But it is very important as it serves as the foundation

for the study of risk in all financial decisions. It is helpful to remember the following points while studying this chapter.

- Financial assets are expected to generate cash flows and hence the riskiness of a financial asset is measured in terms of the riskiness of its cash flows.
- The riskiness of an asset may be measured on a stand-alone basis or in a portfolio context. An asset may be very risky if held by itself but may be much less risky when it is part of a large portfolio.
- In the context of a portfolio, the risk of an asset is divided into two parts : diversifiable risk and market risk. Diversifiable risk arises from company-specific factors and hence can be washed away through diversification. Market risk, on the other hand, stems from general market movements and hence cannot be diversified away. For a diversified investor what matters is the market risk and not the diversifiable risk.
- In general, investors are risk-averse. So they want to be compensated for bearing market risk. In a well-ordered market there is a linear relationship between market risk and expected return.
- While this chapter focuses on risk and return from financial assets for an individual investor, the concepts discussed here can be extended to physical assets and other classes of investors (such as corporates).

## **8.1 ■ HISTORICAL RETURNS AND RISK**

Whenever you make an investment decision, it helps to estimate the distribution of returns expected in future. Before we work with prospective returns, let us understand how to compute historical returns.

## Computing Historical Returns

The total return on an investment for a given period is:

$$\text{Total return} = \frac{\text{Cash payment received during the period} + \text{Price change over the period}}{\text{Price of the investment at the beginning}}$$

All items are measured in rupees. The rupee cash payment received during the period may be positive or zero. The rupee price change over the period is simply the difference between the ending price and the beginning price. This can be positive (ending price exceeds the beginning price) or zero (ending price equals the beginning price) or negative (ending price is less than the beginning price).

In formal terms

$$R = \frac{C + (P_E - P_B)}{P_B} \quad (8.1)$$

where  $R$  is the total return over the period,  $C$  is the cash payment received during the period,  $P_E$  is the ending price of the investment, and  $P_B$  is the beginning price.

To illustrate, consider the following information for an equity stock:

- Price at the beginning of the year : ₹ 60.00
- Dividend paid at the end of the year : ₹ 2.40
- Price at the end of the year : ₹ 69.00

The total return on this stock is calculated as follows:

$$\frac{2.40 + (69.00 - 60.00)}{60.00} = 0.19 \text{ or } 19 \text{ percent}$$

It is helpful to split the total return into two components, viz., current yield and capital gains/loss yield as follows:

$$\underbrace{\frac{\text{Cash payment}}{\text{Beginning price}}}_{\text{Current return}} + \underbrace{\frac{\text{Ending price} - \text{Beginning price}}{\text{Beginning price}}}_{\text{Capital return}}$$

The total return of 19 percent in our example may be broken down as follows:

$$\frac{2.40}{60.00} + \frac{69.00 - 60.00}{60.00} = \frac{4 \text{ percent}}{\text{Current return}} + \frac{15 \text{ percent}}{\text{Capital return}}$$

Thus, the total return concept is all-inclusive (as it includes the current yield as well as the price change) and measures the total return per rupee of original investment. Hence it can be used for comparing investment returns over a specified period.

## Average Annual Returns

There are two commonly used ways to calculating the average annual return of an investment during a given historical period. The first is simply the arithmetic mean of the realised returns for each year during that period. The arithmetic mean is defined as:

$$\bar{R} = \frac{\sum_{i=1}^n R_i}{n} \quad (8.2)$$

where  $\bar{R}$  is the arithmetic mean,  $R_i$  is the  $i$ th value of the total return ( $i = 1, \dots, n$ ), and  $n$  is the number of total returns.

To illustrate, suppose the total returns from stock A over a five year period are as follows:

Year	Total return (percentage)
1	19.0
2	14.0
3	22.0
4	-12.0
5	5.0

The arithmetic mean return for stock A is:

$$\bar{R} = \frac{19+14+22-12+5}{5} = 9.6 \text{ percent}$$

When you want to know the central tendency of a series of returns, the arithmetic mean is the appropriate measure. It represents the typical performance for a single period. However, when you want to know the average compound rate of growth that has actually occurred over multiple periods, the arithmetic mean is not appropriate. This point may be illustrated with a simple example. Consider a stock whose price is 100 at the end of the year 0. The price declines to 80 at the end of year 1 and recovers to 100 at the end of year 2. Assuming that there is no dividend payment during the two year period, the annual returns and their arithmetic mean are as follows:

$$\text{Return for year 1} = \frac{80 - 100}{100} = -0.20 \text{ or } -20 \text{ percent}$$

$$\text{Return for year 2} = \frac{100 - 80}{80} = 0.25 \text{ or } 25 \text{ percent}$$

$$\text{Arithmetic mean return} = \frac{-20 + 25}{2} = 2.5 \text{ percent}$$

Thus we find that though the return over the two year period is nil, the arithmetic mean works out to 2.5 percent.

To calculate the average compound rate of growth over a period of time, the **geometric mean** is used. The geometric mean is defined as follows:

$$GM = [(1+R_1)(1+R_2)\dots(1+R_n)]^{1/n} - 1 \quad (8.3)$$

where  $GM$  is the geometric mean return,  $R_i$  is the total return for period  $i$  ( $i = 1, \dots, n$ ), and  $n$  is the number of time periods.

To illustrate, consider the total return and return relative  $(1+R_i)$  for stock A over a 5-year period:

Year	Total return (%)	Return relative $(1 + R_i)$
1	19	1.19
2	14	1.14
3	22	1.22
4	-12	0.88
5	5	1.05

The geometric mean of the returns over the 5 year period is:

$$GM = [(1.19)(1.14)(1.22)(0.88)(1.05)]^{1/5} - 1$$

$$= 1.089 - 1 = 0.089 \text{ or } 8.9 \text{ percent}$$

The geometric mean reflects the compound rate of growth over time. In the above illustration, stock A has generated a compound rate of return of 8.9 percent over a period of 5 years. This means that an investment of one rupee produces a cumulative ending wealth of ₹ 1.532 [1(1.089)<sup>5</sup>]. Notice that the geometric mean is lower than the arithmetic mean [9.6 percent].

The geometric mean is always less than the arithmetic mean, except when all the return values being considered are equal. The difference between the geometric mean and the arithmetic mean depends on the variability of the distribution. The greater the variability, the greater the difference between the two means. The relationship between geometric mean and the arithmetic mean is approximated by the following formula:

$$(1 + \text{Geometric mean})^2 \approx (1 + \text{Arithmetic mean})^2 - (\text{Standard deviation})^2$$

In the above formula, you will find a new term viz., standard deviation, which is the most popular measure of variability. It is explained in a following section.

## Computation of Arithmetic and Geometric Mean of Annual Returns Provided by Nifty 50

The Nifty 50, commonly called Nifty, is a very popular stock market index in India. The data on Nifty is given in [Exhibit 8.1](#).

### Exhibit 8.1 Data on the Nifty Index

Year ending	Nifty	Annual return (%)	Year ending	Nifty	Annual return (%)
1990	331	–	2005	2837	36.34
1991	559	68.84	2006	3966	39.83
1992	761	36.28	2007	6139	54.77
1993	1043	36.95	2008	2959	–51.79
1994	1182	13.40	2009	5201	75.76
1995	909	–23.15	2010	6135	17.95
1996	899	–1.04	2011	4624	–24.62
1997	1079	20.05	2012	5905	27.70
1998	884	–18.08	2013	6304	6.76
1999	1480	67.42	2014	8284	31.41
2000	1264	–14.65	2015	7946	–4.08
2001	1059	–16.18	2016	8186	3.02
2002	1094	3.25	2017	10531	28.65
2003	1880	71.93	2018	10863	3.15
2004	2081	10.66			

The return for the year ended 1991 is  $559/331 - 1 = 68.84$  percent. The returns for other years have been calculated the same way. The means of the returns are calculated as under:

$$\text{Arithmetic Mean} = (68.84 + 36.28 + \dots + 28.65 + 3.15)/28 = 17.88 \text{ percent}$$

$$\text{Geometric Mean} = (1.6884 \times 1.3628 \dots \times 1.2865 \times 1.0315)^{1/28} - 1 = (32.83)^{1/28} - 1 = 13.28 \text{ percent}$$

## Variance of Returns

Suppose you are analysing the return of an equity stock over a period of time. Apart from knowing the arithmetic mean return, you would also like to know the variability of returns. The most commonly used measure of variability in finance is variance or its square root the standard deviation. The variance and the standard deviation of a historical return series are defined as follows:

$$\sigma^2 = \left[ \frac{\sum_{i=1}^n (R_i - \bar{R})^2}{n-1} \right] \quad (8.4)$$

1

$$\sigma = \sqrt{\sigma^2} \quad (8.4a)$$

where  $\sigma^2$  is the variance of return,  $\sigma$  is the standard deviation of return,  $R_i$  is the return from the stock in period  $i$  ( $i = 1, \dots, n$ ),  $\bar{R}$  is the arithmetic return, and  $n$  is the number of periods.

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

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

The variance and standard deviation of returns are calculated below:

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

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

Looking at the above calculations, we find that:

- The difference between the various values and the mean value are squared. This means that values which are far away from the mean value have a much more impact on standard deviation than values which are close to the mean value.
- The standard deviation is obtained as the square root of the average of squared deviations. This means that the standard deviation and

the mean are measured in the same units and hence the two can be directly compared.

**Spreadsheet Application** A spreadsheet like Excel has many handy tools for calculation of various financial functions. To calculate the standard deviation of the returns given in the above table, type out the given data viz. period and return in cells B1 to G2. To get the standard deviation in cell G4, type the formula =STDEV(B2:G2) inside that cell and press enter. The built in function in Excel automatically calculates the standard deviation and the value 10.45 appears in the cell.

Alternatively, you can first click on the cell G4 (also called selecting G4), type = and then click on the menu item Insert. From the dialogue box that opens, first select 'Function' and out of the various functions, select the 'Statistical' function STDEV. An argument box opens wherein, in the space provided, key in the data range B2 to G2 by typing B2:G2 or by just moving the cursor from B2 to G2 and click on OK. If you wish to know the mean of the returns, type =AVERAGE(B2:G2) in cell G3 and press enter. The mean value automatically appears in cell G3.

	A	B	C	D	E	F	G
1	Period	1	2	3	4	5	6
2	Return ( $R_t$ )	15	12	20	(10)	14	9
3	Mean	$= \text{AVERAGE}(B2:G2)$				→	10.00
4	Standard deviation	$= \text{STDEV}(B2:G2)$				→	10.45

Drawing on the data for NIFTY returns, we find that the standard deviation of NIFTY returns is: 36 percent

## 8.2 ■ EXPECTED RETURN AND RISK OF A SINGLE ASSET

So far we looked at past returns. Now we discuss prospective returns. When you invest in a stock you know that the return from it can take various possible values. For example, it may be –5 percent, or 15 percent, or 35 percent. Further, the likelihood of these possible returns can vary. Hence, you should think in terms of a probability distribution.

The probability of an event represents the likelihood of its occurrence. Suppose you say that there is a 4 to 1 chance that the market price of a stock A will rise during the next fortnight. This implies that there is an 80 percent chance that the price of stock A will increase and a 20 percent chance that it will not increase during the next fortnight. Your judgment can be represented in the form of a probability distribution as follows:

Outcome	Probability
Stock price will rise	0.80
Stock price will not rise	0.20

Another example may be given to illustrate the notion of probability distribution. Consider two equity stocks, Bharat Foods stock and Oriental Shipping stock. Bharat Foods stock may provide a return of 16 percent, 11 percent, or 6 percent with certain probabilities associated with them, based on the state of the economy. The second stock, Oriental Shipping stock, being more volatile, may earn a return of 40 percent, 10 percent, or –20 percent with the same probabilities, based on the state of the economy. The probability distributions of the returns on these two stocks are shown in [Exhibit 8.2](#).

When you define the probability distribution of the rate of return (or for that matter any other variable) remember that:

- The possible outcomes must be mutually exclusive and collectively exhaustive.
  - The probability assigned to an outcome may vary between 0 and 1 (An impossible event is assigned a probability of 0, a certain event is assigned a probability of 1, and an uncertain event is assigned a probability somewhere between 0 and 1).
  - The sum of the probabilities assigned to various possible outcomes is 1.
-

**Exhibit 8.2 | Probability Distributions of the Rate of Return on Bharat Foods Stock and Oriental Shipping Stock**

State of the Economy	Probability of Occurrence	Rate of Return (%)	
		Bharat Foods	Oriental Shipping
Boom	0.30	16	40
Normal	0.50	11	10
Recession	0.20	6	-20

Based on the probability distribution of the rate of return, you can compute two key parameters, the expected rate of return and the standard deviation of rate of return.

**Expected Rate of Return** The expected rate of return is the weighted average of all possible returns multiplied by their respective probabilities. In symbols,

$$E(R) = \sum_{i=1}^n p_i R_i \quad (8.5)$$

where  $E(R)$  is the expected return,  $R_i$  is the return for the  $i$ th possible outcome,  $p_i$  is the probability associated with  $R_i$ , and  $n$  is the number of possible outcomes.

From Eq. (8.5), it is clear that  $E(R)$  is the weighted average of possible outcomes – each outcome is weighted by the probability associated with it. The expected rate of return on Bharat Foods stock is:

$$E(R_b) = (0.30)(16\%) + (0.50)(11\%) + (0.20)(6\%) = 11.5\%$$

Similarly, the expected rate of return on Oriental Shipping stock is:

$$E(R_o) = (0.30)(40\%) + (0.50)(10\%) + (0.20)(-20\%) = 13.0\%$$

**Standard Deviation of Return** Risk refers to the dispersion of a variable. It is commonly measured by the variance or the standard deviation. The variance of a probability distribution is the sum of the squares of the deviations of actual returns from the expected return, weighted by the associated probabilities. In symbols,

$$\sigma^2 = \sum p_i (R_i - E(R))^2 \quad (8.6)$$

where  $\sigma^2$  is the variance,  $R_i$  is the return for the  $i$ th possible outcome,  $p_i$  is the probability associated with the  $i$ th possible outcome, and  $E(R)$  is the expected return.

Since variance is expressed as squared returns, it is somewhat difficult to grasp. So its square root, the standard deviation, is employed as an

equivalent measure.

$$\sigma = (\sigma^2)^{1/2} \quad (8.7)$$

where  $\sigma$  is the standard deviation.

As an illustration, the standard deviation of returns on Bharat Foods stock and Oriental Shipping stock are calculated in [Exhibit 8.3](#).

### Exhibit 8.3 Illustration of the Calculation of Standard Deviation

Bharat Foods Stock									
State of the Economy	$p_i$	$R_i$	$p_i R_i$	$R_i - E(R)$	$(R_i - E(R))^2$	$p_i (R_i - E(R))^2$			
1. Boom	0.30	16	4.8	4.5	20.25	6.075			
2. Normal	0.50	11	5.5	-0.5	0.25	0.125			
3. Recession	0.20	6	1.2	-5.5	30.25	6.050			
$\sum p_i R_i = 11.5$				$\sum p_i (R_i - E(R))^2 = 12.25$					
$\sigma = [\sum p_i (R_i - E(R))^2]^{1/2} = (12.25)^{1/2} = 3.5\%$									
Oriental Shipping Stock									
1. Boom	0.30	40	12.0	27.0	729.0	218.7			
2. Normal	0.50	10	5.0	-3.0	9.0	4.5			
3. Recession	0.20	-20	-4.0	-33.0	1089.00	217.8			
$\sum p_i R_i = 13.0$				$\sum p_i (R_i - E(R))^2 = 441.0$					
$\sigma = [\sum p_i (R_i - E(R))^2]^{1/2} = (441.0)^{1/2} = 21.0\%$									

**Features of Standard Deviation** Looking at the calculation of standard deviation, we find that it has the following features:

- The differences between the various possible values and the expected value are squared. This means that values which are far away from the expected value have a much more effect on standard deviation than values which are close to the expected value.
- The squared differences are multiplied by the probabilities associated with the respective values. This means that the smaller the probability that a particular value will occur, the lesser its effect on standard deviation.
- The standard deviation is obtained as the square root of the sum of squared differences (multiplied by their probabilities). This means that the standard deviation and expected value are measured in the same units and hence the two can be directly compared.

**Rationale for Standard Deviation** Why is standard deviation employed commonly in finance as a measure of risk? The principal reasons

for using standard deviation seem to be:

- If a variable is normally distributed, its mean and standard deviation contain all the information about its probability distribution.
- If the utility of money is represented by a quadratic function (a function commonly suggested to represent diminishing utility of wealth), then the expected utility is a function of mean and standard deviation.
- Standard deviation is analytically more easily tractable.

**Continuous Probability Distributions** The probability distribution of returns on Bharat Foods stock (or Oriental Shipping stock) is a discrete distribution because probabilities have been assigned to a finite number of specific values. In finance, however, probability distributions are commonly regarded as continuous, even though they may actually be discrete. In a continuous probability distribution, probabilities are not assigned to individual points as in the case of a discrete distribution. Instead, probabilities are assigned to intervals between two points on a continuous curve. Hence, when a continuous probability distribution is used, the following kinds of questions are answered: What is the probability that the rate of return will fall between, say, 10 percent and 20 percent? What is the probability that the rate of return will be less than 0 percent or more than 25 percent?

*The Normal Distribution* The normal distribution, a continuous probability distribution, is the most commonly used probability distribution in finance. As shown in [Exhibit 8.4](#), the normal distribution, resembles a bell shaped curve. It appears that stock returns, at least over short time intervals, are approximately normally distributed. The following features of the normal distribution may be noted:

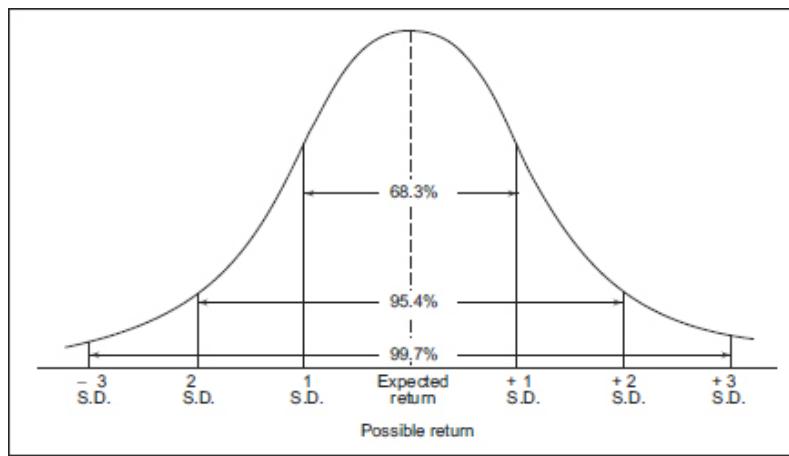
- It is completely characterised by just two parameters, viz., expected return and standard deviation of return.
- A bell-shaped distribution, it is perfectly symmetric around the expected return.
- The probabilities for values lying within certain bands are as follows:

<i>Band</i>	<i>Probability</i>
± One standard deviations from the expected return	68.3%
± Two standard deviations from the expected return	95.4%

- $\pm$  Three standard deviations from the expected return      99.7%

[Exhibit 8.4](#) displays this graphically. Detailed probability ranges are given in an appendix at the end of the book.

### Exhibit 8.4 Normal Distribution



**Risk Aversion and Required Returns** You are lucky to be invited by the host of a television game show. After the usual introduction, the host shows two boxes to you. He tells you that one box contains ₹ 10,000 and the other box is empty. He does not tell you which one is which.

The host asks you to open any one of the two boxes and keep whatever you find in it. You are not sure which box you should open. Sensing your vacillation, he says he will offer you a certain ₹ 3,000 if you forfeit the option to open a box. You don't accept his offer. He raises his offer to ₹ 3,500. Now you feel indifferent between a certain return of ₹ 3,500 and a risky (uncertain) expected return of ₹ 5,000. This means that a certain amount of ₹ 3,500 provides you with the same satisfaction as a risky expected value of ₹ 5,000. Thus your certainty equivalent (₹ 3,500) is less than the risky expected value (₹ 5,000).

Empirical evidence suggests that most individuals, if placed in a similar situation, would have a certainty equivalent which is less than the risky expected value.

The relationship of a person's certainty equivalent to the expected monetary value of a risky investment defines his attitude toward risk. If the certainty equivalent is less than the expected value, the person is *risk-averse*; if the certainty equivalent is equal to the expected value, the person

is *risk-neutral*; finally, if the certainty equivalent is more than the expected value, the person is *risk-loving*.

In general, investors are risk-averse. This means that risky investments must offer higher expected returns than less risky investments to induce people to invest in them. Remember, however, that we are talking about *expected* returns; the actual return on a risky investment may well turn out to be less than the actual return on a less risky investment.

Put differently, risk and return go hand in hand. This indeed is a well-established empirical fact, particularly over long periods of time. For example, the average annual rates and annual standard deviations for Treasury bills, bonds, and common stocks in the U.S. over a 75 year period (1926-2000) as calculated by Ibbotson Associates have been as shown in [Exhibit 8.5<sup>2</sup>](#).

### Exhibit 8.5

### Return and Risk Performance of Different Categories of Financial Assets in the U.S. Over a 75 Year Period (1926 – 2000)

	Average Annual Rate of Return (%)	Standard Deviation (%)
<i>Portfolio</i>		
Treasury bills	3.9	3.2
Government bonds	5.7	9.4
Corporate bonds	6.0	8.7
Common stocks (S&P 500)	13.0	20.2
Small-firm common stocks	17.3	33.4

From the above it is clear that: (a) Treasury bills, the least risky of financial assets, earned the lowest average annual rate of return. (b) Common stocks, the most risky of financial assets, earned the highest average annual rate of return. (c) Bonds which occupy a middling position on the risk dimension earned a middling average annual return.

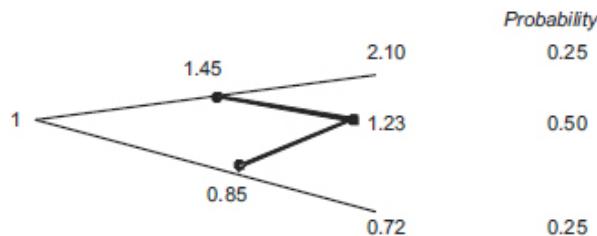
## Arithmetic Mean versus Geometric Mean

It may be noted that the returns shown in [Exhibit 8.5](#) are arithmetic means. Put differently, Ibbotson Associates just added the 75 annual returns and divided the sum by 75.

What is the rationale for the arithmetic mean? Why should the arithmetic mean be preferred to the geometric mean?

To answer these questions, let us consider an example. Suppose the equity share of Modern Pharma has an expected return of 15 percent in each year with a standard deviation of 30 percent. Assume that there are two equally possible outcomes each year, +45 percent and -15 percent (that is, the mean plus or minus one standard deviation). The arithmetic mean of these returns is 15 percent,  $(45-15)/2$ , whereas the geometric mean of these returns is 11.0 percent,  $[(1.45)(0.85)]^{1/2} - 1$ .

An investment of one rupee in the equity share of Modern Pharma would grow over a two year period as follows:



Notice that the median (middle outcome) and mode (most common outcome) are given by the geometric mean (11.0 percent), which over a two-year period compounds to 23 percent ( $1.11^2 = 1.23$ ). The expected value of all possible outcomes, however, is equal to:

$$(0.25 \times 2.10) + (0.50 \times 1.23) + (0.25 \times 0.72) = 1.32$$

Now 1.32 is equal to  $(1.15)^2$ . This means that the expected value of the terminal wealth is obtained by compounding up the arithmetic mean, not the geometric mean. Hence the arithmetic mean is the appropriate discount rate.

Put differently, the arithmetic mean is the appropriate mean because an investment that has uncertain returns will have a higher expected terminal value than an investment that earns its compound or geometric mean with certainty every year. In the above example, compounding at the rate of 11 percent for two years produces a terminal value of ₹ 1.23, for an investment of ₹ 1.00. But holding the uncertain investment which yields high returns (45 percent per year for two years in a row) or low returns (-15 percent per year

for two years in a row), yields a higher expected terminal value, ₹ 1.32. This happens because the gains from higher-than-expected returns are greater than the losses from lower-than-expected returns. As Roger G. Ibbotson and Rex A. Sinquefield put it: “Therefore, in the investment markets, where returns are described by a probability distribution, the arithmetic mean is the measure that accounts for uncertainty, and is the appropriate one for estimating discount rates and the cost of capital.”

## 8.3 ■ RISK AND RETURN OF A PORTFOLIO

Most investors invest in a portfolio of assets, as they do not want to put all their eggs in one basket. Hence, what really matters to them is not the risk and return of stocks in isolation, but the risk and return of the portfolio as a whole.

**Expected Return on a Portfolio** The expected return on a portfolio is simply the weighted average of the expected returns on the assets comprising the portfolio. For example, when a portfolio consists of two securities, its expected return is:

$$E(R_p) = w_1 E(R_1) + (1 - w_1) E(R_2) \quad (8.8)$$

where  $E(R_p)$  is the expected return on a portfolio,  $w_1$  is the proportion of a portfolio invested in security 1,  $E(R_1)$  is the expected return on security 1,  $(1-w_1)$  is the proportion of portfolio invested in security 2<sup>3</sup>,  $E(R_2)$  is the expected return on security 2.

To illustrate, consider a portfolio consisting of two securities, A and B. The expected return on these two securities are 10 percent and 18 percent respectively. The expected return on the portfolio, when the proportions invested in A and B are 0.4 and 0.6, is simply:  $0.4 \times 10 + 0.6 \times 18 = 14.8\%$ .

In general, when a portfolio consists of  $n$  securities, the expected return on the portfolio is:

$$E(R_p) = \sum w_i E(R_i) \quad (8.9)$$

where  $E(R_p)$  is the expected return on portfolio,  $w_i$  is the proportion of portfolio invested in security  $i$ , and  $E(R_i)$  is the expected return on security  $i$ .

To illustrate, consider a portfolio consisting of five securities with the following expected returns:  $E(R_1) = 10$  percent,  $E(R_2) = 12$  percent,  $E(R_3) = 15$  percent,  $E(R_4) = 18$  percent,  $E(R_5) = 20$  percent. The portfolio proportions invested in these securities are:  $w_1 = 0.1$ ,  $w_2 = 0.2$ ,  $w_3 = 0.3$ ,  $w_4 = 0.2$ ,  $w_5 = 0.2$ . The expected portfolio return is:

$$\begin{aligned} E(R_p) &= w_1 E(R_1) + w_2 E(R_2) + w_3 E(R_3) + w_4 E(R_4) + w_5 E(R_5) \\ &= 0.1 \times 10 + 0.2 \times 12 + 0.3 \times 15 + 0.2 \times 18 + 0.2 \times 20 \\ &= 15.5 \text{ percent} \end{aligned}$$

**Diversification and Portfolio Risk** Suppose you have ₹ 100,000 to invest and you want to invest it equally in two stocks, A and B. The returns on these stocks depend on the state of the economy. Your assessment suggests that the probability distributions of the returns on stocks A and B are as shown in [Exhibit 8.6](#). For the sake of simplicity, all the five states of the economy are assumed to be equiprobable. The last column of [Exhibit 8.6](#) shows the return on a portfolio consisting of stocks A and B in equal proportions. The expected return and standard deviation of return on stocks A and B and the portfolio consisting of A and B in equal proportions are calculated in [Exhibit 8.7](#).

### Exhibit 8.6 Probability Distribution of Returns

<i>State of the Economy</i>	<i>Probability</i>	<i>Return on Stock A(%)</i>	<i>Return on Stock B(%)</i>	<i>Return on Portfolio(%)</i>
1	0.20	15	-5	5
2	0.20	-5	15	5
3	0.20	5	25	15
4	0.20	35	5	20
5	0.20	25	35	30

[Exhibit 8.7](#) shows that if you invest only in stock A, the expected return is 15 percent and the standard deviation is 14.14 percent. Likewise, if you invest only in stock B, the expected return is 15 percent and the standard deviation is 14.14 percent. What happens if you invest in a portfolio consisting of stocks A and B in equal proportions? While the expected return remains at 15 percent, the same as that of either stock individually, the standard deviation of the portfolio return, 9.49 percent, is lower than that of either stock individually. Thus, in this case diversification reduces risk.

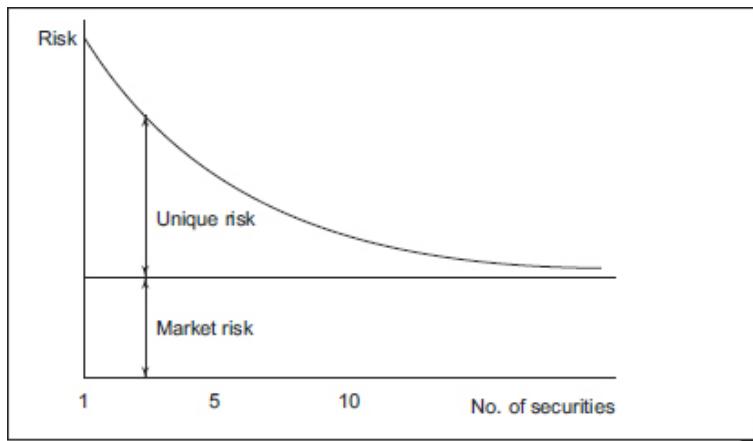
## Exhibit 8.7 | Expected Return and Standard Deviation

<i>Expected Return</i>		
Stock A	:	$0.2(15\%) + 0.2(-5\%) + 0.2(5\%) + 0.2(35\%) + 0.2(25\%) = 15\%$
Stock B	:	$0.2(-5\%) + 0.2(15\%) + 0.2(25\%) + 0.2(5\%) + 0.2(35\%) = 15\%$
Portfolio of		
A and B	:	$0.2(5\%) + 0.2(5\%) + 0.2(15\%) + 0.2(20\%) + 0.2(30\%) = 15\%$
<i>Standard Deviation</i>		
Stock A	:	$\sigma_A^2 = 0.2(15-15)^2 + 0.2(-5-15)^2 + 0.2(5-15)^2 + 0.2(35-15)^2 + 0.2(25-15)^2$ $= 200$ $\sigma_A = (200)^{1/2} = 14.14\%$
Stock B	:	$\sigma_B^2 = 0.2(-5-15)^2 + 0.2(15-15)^2 + 0.2(25-15)^2 + 0.2(5-15)^2 + 0.2(35-15)^2$ $= 200$ $\sigma_B = (200)^{1/2} = 14.14\%$
Portfolio	:	$\sigma_{(A+B)}^2 = 0.2(5-15)^2 + 0.2(5-15)^2 + 0.2(15-15)^2 + 0.2(20-15)^2 + 0.2(30-15)^2$ $= 90$ $\sigma_{(A+B)} = (90)^{1/2} = 9.49\%$

In general, if returns on securities do not move in perfect lockstep, diversification reduces risk. In technical terms, diversification reduces risk if returns are not perfectly positively correlated.

The relationship between diversification and risk is shown graphically in [Exhibit 8.8](#). When the portfolio has just one security, say stock 1, the risk of the portfolio  $\sigma_p$ , is equal to the risk of the single stock included in it,  $\sigma_1$ . As a second security – say stock 2 is added, the portfolio risk decreases. As more and more securities are added, the portfolio risk decreases, but at a decreasing rate, and reaches a limit. Empirical studies suggest that the bulk of the benefit of diversification, in the form of risk reduction, is achieved by forming a portfolio of about 15 to 20 securities. Thereafter, the gain from diversification tends to be negligible.

## Exhibit 8.8 | Relationship between Diversification and Risk



**Market Risk versus Unique Risk** Notice that the portfolio risk does not fall below a certain level, irrespective of how wide the diversification is. Why? The answer lies in the following relationship which represents a basic insight of modern portfolio theory.

$$\text{Total risk} = \text{Unique risk} + \text{Market risk}$$

The *unique* risk of a security represents that portion of its total risk which stems from firm-specific factors like the development of a new product, a labour strike, or the emergence of a new competitor. Events of this nature primarily affect the specific firm and not all firms in general. Hence, the unique risk of a stock can be washed away by combining it with other stocks. In a diversified portfolio, unique risks of different stocks tend to cancel each other – a favourable development in one firm may offset an adverse happening in another and vice versa. Hence, unique risk is also referred to as diversifiable risk or unsystematic risk.

The *market* risk of a stock represents that portion of its risk which is attributable to economy-wide factors like the growth rate of GNP, the level of government spending, money supply, interest rate structure, and inflation rate. Since these factors affect all firms to a greater or lesser degree, investors cannot avoid the risk arising from them, however diversified their portfolios may be. Hence, it is also referred to as systematic risk (as it affects all securities) or non-diversifiable risk.

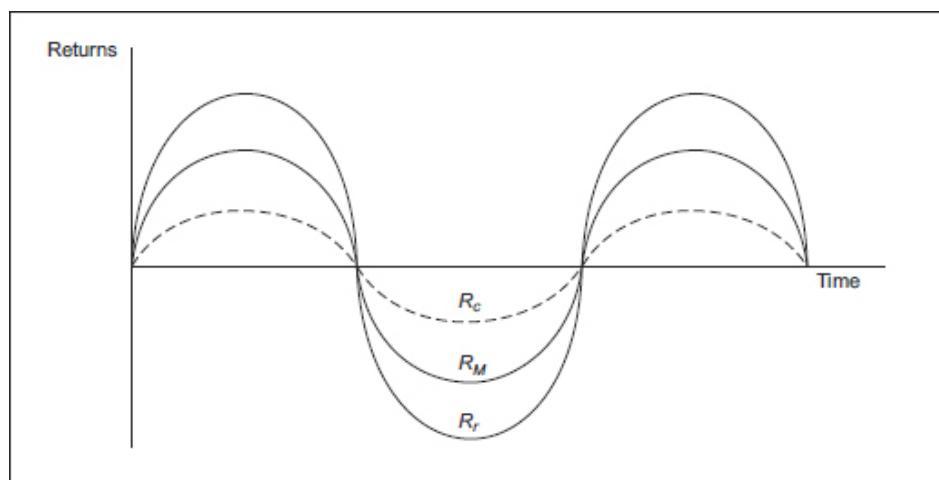
## 8.4 ■ MEASUREMENT OF MARKET RISK

If you want to figure out the contribution of an individual stock to the risk of a well-diversified portfolio, you have to look at its market risk, and not its risk if it is held in isolation.

The market risk of a security reflects its sensitivity to market movements. Different securities seem to display differing sensitivities to market movements. This is illustrated graphically in [Exhibit 8.9](#) which shows the returns on the market portfolio ( $R_M$ ) over time, along with returns on two other securities - a risky security, whose return is denoted by ( $R_r$ ) and a conservative security, whose return is denoted by ( $R_c$ ). It is evident that  $R_r$  is more volatile than  $R_M$  whereas  $R_c$  is less volatile than  $R_M$ .

The sensitivity of a security to market movements is called beta ( $\beta$ ). By definition, the beta for the market portfolio is 1. A security which has a beta of, say, 1.5 experiences greater fluctuation than the market portfolio. More precisely, if the return on market portfolio is expected to increase by 10 percent, the return on the security with a beta of 1.5 is expected to increase by 15 percent ( $1.5 \times 10$  percent). On the other hand, a security which has a beta of, say, 0.8 fluctuates lesser than the market portfolio. Individual security betas generally fall in the range 0.30 to 2.00 and rarely, if ever, assume a negative value.

**Exhibit 8.9** Behaviour of Returns Over Time



## Calculation of Beta

For calculating the beta of a security, the following market model is employed:

$$R_{jt} = \alpha_j + \beta_j R_{Mt} + e_j \quad (8.10)$$

where  $R_{jt}$  is the return on security  $j$  in period  $t$ ,  $\alpha_j$  is the intercept term, alpha,  $\beta_j$  is the regression coefficient, beta,  $R_{Mt}$  is the return on market portfolio in period  $t$ , and  $e_j$  is the random error term. Remember that you must regress the returns on the security on the returns on the market index as shown by the characteristic line in [Exhibit 8.11](#). As the dividend yield is often a very small component of returns, you will get a reasonable estimate if you regress the percentage changes in the security price on the percentage change in the market index. However, you will get absurd results, if you regress the price level of the security on the level of the index.

Beta reflects the slope of the above regression relationship. It is equal to:

$$\beta_j = \frac{\text{Cov}(R_j, R_M)}{\sigma_M^2} = \frac{\rho_{jM}\sigma_j\sigma_M}{\sigma_M^2} = \frac{\rho_{jM}\sigma_j}{\sigma_M} \quad (8.11)$$

where Cov is the covariance between the return on security  $j$  and the return on market portfolio  $M$ . It is equal to:

$$\sum_{i=1}^n (R_{jt} - \bar{R}_j)(R_{Mt} - \bar{R}_M)/(n - 1)$$

where  $\sigma_M^2$  is the variance of return on the market portfolio,  $\rho_{jM}$  is the correlation coefficient between the return on  $j$ th security and the return on the market portfolio,  $\sigma_j$  is the standard deviation of return on the  $j$ th security, and  $\sigma_M$  is the standard deviation of return on the market portfolio.

An example will help in understanding what  $\beta_j$  is and how it is calculated. The returns on security  $j$  and the market portfolio for a 10-year period are given below:

Year	Return on Security $j$ (%)	Return on Market Portfolio (%)
1	10	12
2	6	5

3	13	18
4	-4	-8
5	13	10
6	14	16
7	4	7
8	18	15
9	24	30
10	22	25

The beta for security  $j$ ,  $\beta_j$  is calculated in [Exhibit 8.10](#). For the sake of completeness, the intercept term,  $\alpha_j$ , has also been computed in [Exhibit 8.10](#).

Given the values of  $\beta_j$  (0.76) and  $\alpha_j$  (2.12 percent), the regression relationship between the return on security  $j(R_j)$  and the return on market portfolio ( $R_M$ ) is shown graphically in [Exhibit 8.11](#). The graphic representation is commonly referred to as the characteristic line. Since security  $j$  has a beta of 0.76, we infer that its return is less volatile than the return on the market portfolio. If the return on market portfolio rises/falls by 10 percent, the return on security  $j$  would be expected to increase/decrease by 7.6 percent ( $0.76 \times 10\%$ ). The intercept term for security  $j$  ( $\alpha_j$ ) is equal to 2.12 percent. It represents the expected return on security  $j$  when the return on the market portfolio is zero.

## Exhibit

### Calculation of Beta

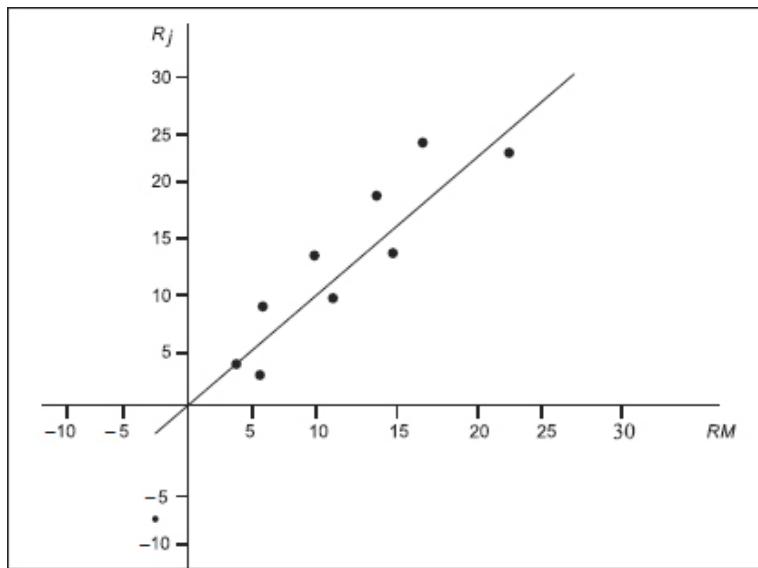
8  
-  
1  
0

Year	$R_{jt}$	$R_{Mt}$	$R_{jt} - \bar{R}_j$	$R_{Mt} - \bar{R}_M$	$(R_{jt} - \bar{R}_j)(R_{Mt} - \bar{R}_M)$	$(R_{Mt} - \bar{R}_M)^2$		
1	10	12	-2	-1	2	1		
2	6	5	-6	-8	48	64		
3	13	18	1	5	5	25		
4	-4	-8	-16	-21	336	441		
5	13	10	1	-3	-3	9		
6	14	16	2	3	6	9		
7	4	7	-8	-6	48	36		
8	18	15	6	2	12	4		
9	24	30	12	17	204	289		
10	22	25	10	12	120	144		
$\Sigma R_{jt} = 120$		$\Sigma R_{Mt} = 130$	$\sum (R_{jt} - \bar{R}_j)(R_{Mt} - \bar{R}_M) = 778$		$\sum (R_{Mt} - \bar{R}_M)^2 = 1022$			
$\bar{R}_j = 12$		$\bar{R}_M = 13$	$\text{Cov}(R_{jt}, R_{Mt}) = 778/9 = 86.4$		$\sigma_M^2 = 1022/9 = 113.6$			
Beta : $\beta_j = \frac{\text{Cov}(R_j, R_M)}{\sigma_M^2} = \frac{86.4}{113.6} = 0.76$								
Alpha : $\alpha_j = \bar{R}_j - \beta_j \bar{R}_M = 12 - (0.76)(13) = 2.12\%$								

**Spreadsheet Calculation** You can calculate the beta and alpha using the Excel. Enter the returns on security  $j$  for the years 1 to 10 in the cells B2 to K2 and enter the returns on the market portfolio in the cells B3 to K3. Select F4 and type =slope ( ). Excel will prompt you to fill inside the bracket known y's and known x's which mean the y and x coordinate values, which in this case are between columns B and K. So, what you type inside F4 will be =slope(B2:K2,B3:K3). Press Enter and you will get the result. Similarly to get the alpha in K4, inside that cell type =intercept(B2:K2,B3:K3) and press Enter. Alternatively you may get the same results by going to the menu item Insert and then selecting the statistical functions slope and intercept. The spreadsheet is shown below.

	A	B	C	D	E	F	G	H	I	J	K
1	Year	1	2	3	4	5	6	7	8	9	10
2	Return on security $j$ (%)	10	6	13	-4	13	14	4	18	24	22
3	Return on market portfolio (%)	12	5	18	-8	10	16	7	15	30	25
4	SLOPE	$= \text{SLOPE}(B2:K2, B3:K3)$			→	0.76	INTERCEPT	$= \text{INTERCEPT}(B2:K2, B3:K3)$			→ 2.10

### **Exhibit 8.11 | Characteristic Line for Security $j$**



**Unsystematic Risk Revisited** The dispersion of the data points around the characteristic line reflects the unsystematic risk of the stock. The wider the dispersion of the data points around the characteristic line, the greater the unsystematic risk. This also implies that the correlation between the stock's return and the market return is lower. On the other hand, the narrower the dispersion of the data points around the characteristic line, the smaller the unsystematic risk and the higher the correlation between the stock's return and the market return.

As we have learnt earlier, unsystematic risk can be reduced or even eliminated through diversification. If a portfolio has about 20 stocks, the portfolio data points would hover closely around the portfolio characteristic line.

**Beta of Sensex Stocks** Betas of Sensex stocks as of December 2018 are given below.

<i>Company</i>	<i>Beta</i>	<i>Company</i>	<i>Beta</i>	<i>Company</i>	<i>Beta</i>
Asian Paints	0.94	Housing Development Finance Corporation	1.25	Oil and Natural Gas Corporation	1.01
Axis Bank	1.26	ICICI Bank	1.33	Power Grid Corporation of India	0.54
Bajaj Auto	1.03	IndusInd Bank	0.96	Reliance Industries	1.37
Bajaj Finance	1046	Infosys	0.58	State Bank of India	1.41
Bharti Airtel	1.11	ITC	0.85	Sun Pharmaceutical	0.87
Coal India	0.5	Kotak Mahindra Bank	1.04	Tata Consultancy Service	0.44
HDFC Bank	0.69	Larsen & Toubro	1.09	Tata Motors	1.27
HCL Technologies	0.53	Mahindra & Mahindra	1.17	Tata Steel	1.37
Hero MotoCorp	0.89	Maruti Suzuki	1.12	Vedanta	1.36
Hindustan Unilever	0.75	NTPC	0.61	Yes Bank	1.33

## **8.5 ■ DETERMINANTS OF BETA**

What factors determine beta? Beta is mainly determined by the following characteristics of the firm: cyclicalities of revenues, operating leverage, and financial leverage.

## **Cyclicalities of Revenues**

Some firms have highly cyclical revenues, meaning that they do very well in the expansion phase of the business cycle and very poorly in the contraction phase. For example, the performance of firms in the automobile industry and retailing business fluctuates a great deal with the business cycle. On the other hand, firms in industries such as utilities, food, and pharmaceuticals are less dependent on the business cycle. Stocks of highly cyclical firms tend to have high betas, because beta is nothing but the standardised covariability of a stock's return with the market's return.

Do not confuse variability with cyclicalities. A firm that has highly variable revenues need not necessarily have highly cyclical revenues. For example, a movie-making firm may have highly variable revenues because it is difficult to predict its hits and flops. However, its revenues are dependent on the market response to its releases, not on the phase of the business cycle. Remember that stocks with high standard deviation need not necessarily have high betas.

## Operating Leverage

Suppose a firm can choose either technology A or technology B for making a certain product. The financial characteristics of the two technologies are as follows:

Technology A		Technology B	
Fixed costs	: ₹ 5 million per year	Fixed costs	: ₹ 10 million per year
Variable costs	: ₹ 60 per unit	Variable costs	: ₹ 40 per unit
Price per unit	: ₹ 80	Price per unit	: ₹ 80
Contribution margin	: ₹ 20	Contribution margin	: ₹ 40

Compared to technology A, technology B has lower variable costs and higher fixed costs. So it has higher operating leverage – operating leverage stems from fixed operating (production) costs.

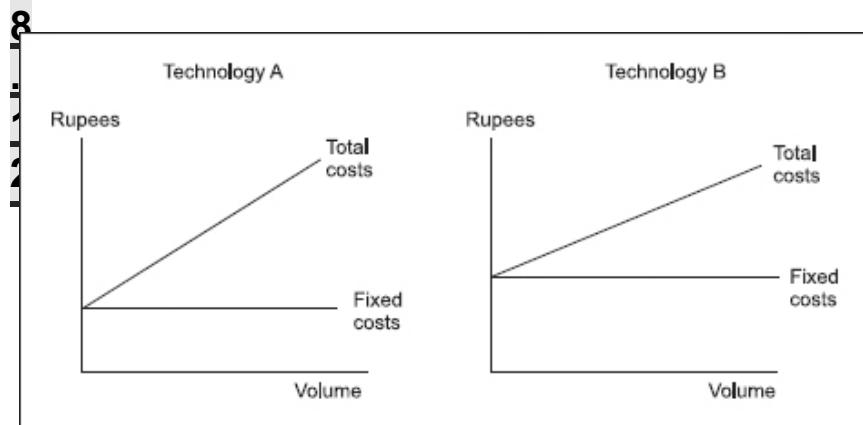
[Exhibit 8.12](#) graphs the costs associated with the two technologies. As variable costs are more under technology A, the slope of A's total costs line is steeper.

Because both the technologies produce the same product, the selling price of ₹ 80 applies for both cases. However, the contribution margin is more in the case of technology B, compared to technology A. This makes technology B riskier. An unexpected increase (decrease) of 1 unit of sales increases (decreases) PBIT by ₹ 40 in case of technology B, but only ₹ 20 in case of technology A. This is illustrated in [Exhibit 8.13](#).

As discussed earlier, the cyclical nature of a firm's revenues is a determinant of its beta. Operating leverage amplifies the effect of cyclical nature. Because business risk is the risk of the firm without financial leverage, it depends on cyclical nature of revenues and operating leverage.

### Exhibit

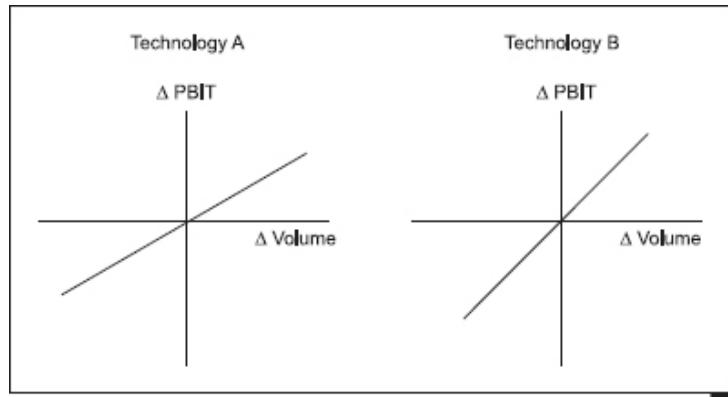
### Costs for Two Technologies



## Exhibit

### Change in PBIT in Response to Change in Volume

8  
1  
**3**



## Financial Leverage

While operating leverage refers to the firm's fixed *production* costs, financial leverage refers to the firm's fixed *financing* costs. Financial leverage stems from the use of debt finance.

In a previous section we estimated a firm's beta by regressing the returns on its stock on the returns on the market portfolio. Put differently, we estimated the firm's stock or equity beta.

To understand the effect of financial leverage on equity beta, we will first look at asset beta and its relationship with equity beta. The asset beta, as the name suggests, is the beta of the assets of the firm. It is equal to equity beta, if the firm is all-equity financed.

Suppose an individual owns all the firm's debt as well as equity. Put differently, he owns the entire firm. What is the beta of his portfolio? The beta of his portfolio is simply the weighted average of the betas of debt and equity in the portfolio. Hence,

$$\beta_{\text{assets}} = \frac{\text{Debt}}{\text{Debt} + \text{Equity}} \beta_{\text{debt}} + \frac{\text{Equity}}{\text{Debt} + \text{Equity}} \beta_{\text{equity}} \quad (8.12)$$

The beta of debt is often very low. If we equate it with zero, we get:

$$\beta_{\text{assets}} = \frac{\text{Equity}}{\text{Debt} + \text{Equity}} \times \beta_{\text{equity}} \quad (8.13)$$

Rearranging this equation, we get:

$$\beta_{\text{equity}} = \beta_{\text{assets}} \left[ 1 + \frac{\text{Debt}}{\text{Equity}} \right] \quad (8.14)$$

Thus, for a levered firm equity beta is always greater than the asset beta.

So far we ignored corporate taxes. As Robert Hamada has shown, the relationship between a firm's asset beta and its equity beta, when corporate taxes ( $t_c$ ) exist, is:

$$\beta_{\text{equity}} = \beta_{\text{assets}} \left[ 1 + (1 - t_c) \frac{\text{Debt}}{\text{Equity}} \right] \quad (8.15)$$

## **Book Values or Market Values: Which are the Best**

In general, financial economists prefer to use market values, rather than book values, when measuring debt ratios. They believe that compared to historical book values, current market values are better reflections of intrinsic values.

However, finance practitioners seem to prefer book values, rather than market values. They offer the following reasons for this preference: (a) Because of the volatility of the stock market, market-based debt measures fluctuate a great deal. (b) Restrictions on debt in bond covenants are typically expressed in terms of book values rather than market values. (c) Debt rating firms such as Standard & Poor's and Moody's use debt ratios expressed in book values to judge credit worthiness.

## 8.6 ■ RELATIONSHIP BETWEEN RISK AND RETURN

Before proceeding further, let us pause for a while and recapitulate the key elements of our story so far:

- Securities are risky because their returns are variable.
- The most commonly used measure of risk or variability in finance is standard deviation.
- The risk of a security can be split into two parts: unique risk and market risk.
- Unique risk stems from firm-specific factors, whereas market risk emanates from economy-wide factors.
- Portfolio diversification washes away unique risk, but not market risk. Hence, the risk of a fully diversified portfolio is its market risk.
- The contribution of a security to the risk of a fully diversified portfolio is measured by its beta, which reflects its sensitivity to the general market movements.

Since beta is the relevant measure of a security's risk, the next logical question is: What is the relationship between the risk of a security, as measured by its beta, and its expected return? The capital asset pricing model (CAPM), a seminal theory in modern finance developed more or less simultaneously by William Sharpe, John Lintner, and Jack Treynor, answers this question.

## Security Market Line

According to the CAPM, risk and return are related in a linear fashion:

$$E(R_j) = R_f + \beta_j [E(R_M) - R_f] \quad (8.16)$$

where  $E(R_j)$  is the expected return on security  $j$ ,  $R_f$  is the risk-free return,  $\beta_j$  is the beta of security  $j$ , and  $E(R_M)$  is the expected return on the market portfolio.

As per the above relationship, referred to as the security market line, the required return on a security consists of two components:

Risk-free return	: $R_f$
Risk-premium	: $\beta_j [E(R_M) - R_f]$

Note that the risk premium is a product of the level of risk,  $\beta_j$ , and the compensation per unit of risk,  $[E(R_M) - R_f]$ .

To illustrate, let us consider an example. Stock  $j$  has a beta of 1.4. If the risk-free rate is 10 percent and the expected return on the market portfolio is 15 percent, the expected return on stock  $j$  is:

$$10 + 1.4 (15 - 10) = 17 \text{ percent}$$

It is obvious that, ceteris paribus, the higher the beta, the higher the expected return, and vice versa.

[Exhibit 8.14](#) shows the security market line for the basic data given above. In this figure, the expected return on three securities A, B and C is shown. Security A is a defensive security with a beta of 0.5. Its expected rate of return is 12.5 percent. Security B is a neutral security with a beta of 1. Its expected rate of return is equal to the expected rate of return on the market portfolio namely 15.0 percent. Security C is an aggressive security with a beta of 1.5. Its expected rate of return is 17.5 percent. (In general, if the beta of a security is less than 1 it is characterised as defensive; if it is equal to 1 it is characterised as neutral; and if it is more than 1 it is characterised as aggressive.)

## Changes in Security Market Line

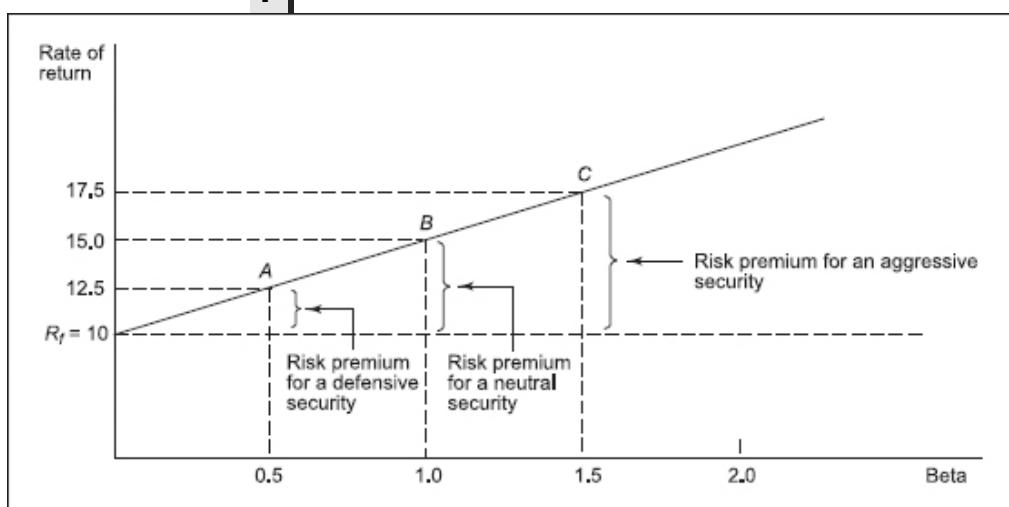
The two parameters defining the security market line are the intercept ( $R_f$ ) and the slope  $[E(R_M)] - R_f$ . The intercept represents the nominal rate of return on the risk-free security. It is expected to be equal to the risk-free real rate of return plus the inflation rate. For example, if the risk-free real rate of return is 4 percent and the inflation rate is 8 percent, the nominal rate of return on the risk-free security is expected to be 12 percent. The slope represents the price per unit of risk and is a function of the risk-aversion of investors.

If the real risk-free rate of return and/or the inflation rate changes, the intercept of the security market line changes. If the risk aversion of investors changes, the slope of the security market line changes. [Exhibit 8.15](#) shows the change in the security market line when the inflation rate increases and [Exhibit 8.16](#) shows the change in the security market line when the risk-aversion of investors decreases.

### Exhibit

### Security Market Line

8  
—  
1  
4



## Security Market Equilibrium

Suppose the required return on stock A is 15 percent, calculated as follows:

$$\begin{aligned} R_A &= R_f + \beta_A(R_M - R_f) \\ &= 10\% + 1.25(14\% - 10\%) = 15\% \end{aligned}$$

After assessing the prospects of stock A, investors conclude that its earnings, dividends, and price will continue to grow at the rate of 6 percent annum. The previous dividend per share,  $D_0$  was ₹ 1.70. The dividend per share expected a year hence is:

$$D_1 = ₹ 1.70(1.06) = 1.80$$

The market price per share happens to be ₹ 22. What would investors, in general, do? Investors would calculate the expected return from stock A as follows:

$$\begin{aligned} \text{Expected return} &= \text{Dividend yield} + \text{Growth rate} \\ &= 1.80/22 + 6\% \\ &= 8.2\% + 6\% = 14.2\% \end{aligned}$$

Finding that the expected return is less than the required rate, investors, in general, would like to sell the stock. However, as there would be no demand for the stock at ₹ 22 per share, existing owners will have to lower the price to such a level that it fetches a return of 15 percent, its required return. That price, its equilibrium price, is the value of  $P_A$  in the following equation:

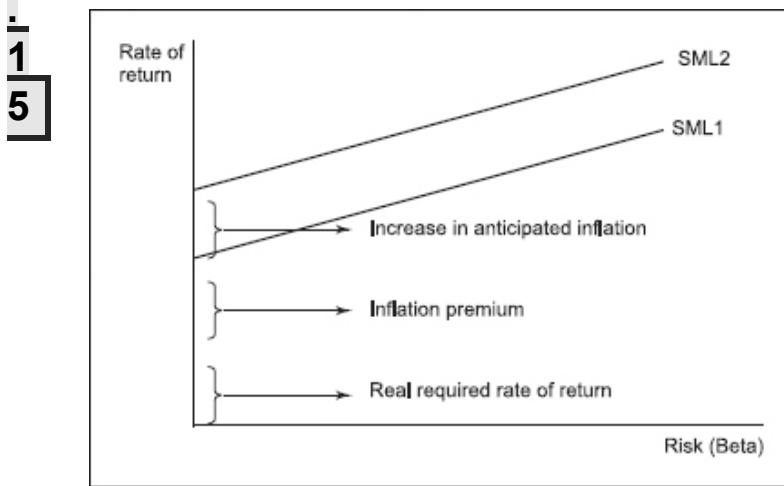
$$15\% = \frac{1.80}{P_A} + 6\%$$

Solving the above equation for  $P_A$ , we find that the equilibrium price is ₹ 20.00. If the market price initially had been lower than ₹ 20.00, investors, finding its return to be greater than required return, would seek to buy it. In this process the price will be pushed up to ₹ 20.00, its equilibrium price.

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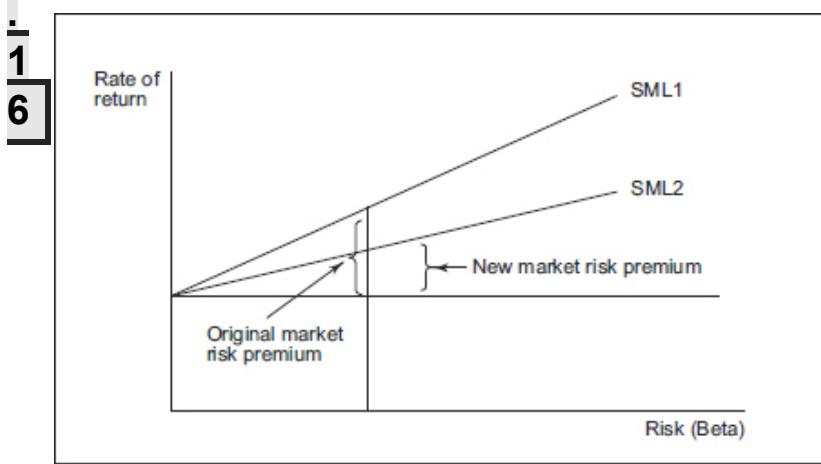
## **Exhibit**

### **Change in the Security Market Line Caused by an Increase in Inflation**



## **Exhibit**

### **Changes in the Security Market Line Caused by a Decrease in Risk Aversion**



## Changes in Equilibrium Stock Prices

Stock market prices tend to change in response to changes in the underlying factors. To illustrate, let us assume that stock A, described above, is in equilibrium and sells at a price of ₹ 20.00 per share. If the expectation with respect to this stock is fulfilled, its equilibrium price a year hence will be ₹ 21.20, six percent higher than the current price. However, several factors could change in the course of a year and alter its equilibrium price. Suppose the values of underlying factors change as follows:

	<i>Value of the Underlying Factor</i>	
	<i>Original</i>	<i>Revised</i>
$R_f$ (Riskless rate)	10%	9%
$R_M - R_f$ (Market risk premium)	4%	3%
$\beta_A$ (Stock A's beta coefficient)	1.25	1.33
$g$ (Stock A's expected growth rate)	6%	8%

The changes in the first three factors cause  $R_A$  to change from 15 percent to 13 percent.

$$\text{Original : } R_A = 10\% + 1.25(4\%) = 15\%$$

$$\text{Revised : } R_A = 9\% + 1.33(3\%) = 13\%$$

The change in the expected growth rate along with the change in the expected return alters the equilibrium price.

$$\text{Original : } P_o = \frac{1.70(1.06)}{0.15 - 0.06} = \frac{1.80}{0.09} = ₹ 20.00$$

$$\text{Revised : } P_o = \frac{1.70(1.08)}{0.13 - 0.08} = \frac{1.84}{0.05} = ₹ 36.80$$

## Investment Implications

We have learnt about the components of risk, consequences of diversification, and the relationship between risk and return. The investment implications of our discussion are as follows:

- Diversification is important. Owning a portfolio dominated by a small number of stocks is a risky proposition.
- While diversification is desirable, an excess of it is not. There is hardly any gain in extending diversification beyond 15 to 20 stocks.
- The performance of a well-diversified portfolio more or less mirrors the performance of the market as a whole.
- In a well-ordered market, investors are compensated primarily for bearing market risk, but not unique risk. To earn a higher expected rate of return, one has to bear a higher degree of market risk.

## SUMMARY

- Risk is present in virtually every decision. Assessing risk and incorporating the same in the final decision is an integral part of financial analysis.
- The **rate of return** on an asset for a given period (usually a period of one year) is defined as follows:

$$\text{Rate of return} = \frac{\text{Annual income} + \text{Ending price} - \text{Beginning price}}{\text{Beginning price}}$$

- Based on the probability distribution of the rate of return, two key parameters may be computed: expected rate of return and standard deviation.
- The **expected rate of return** is the weighted average of all possible returns multiplied by their respective probabilities. In symbols,

$$E(R_p) = \sum w_i E(R_i)$$

- Risk refers to the dispersion of a variable. It is commonly measured by the variance or the standard deviation.
- The **variance** of a probability distribution is the sum of the squares of the deviations of actual returns from the expected return, weighted by the associated probabilities. In symbols,

$$\sigma^2 = \sum_{i=1}^n p_i (R_i - \bar{R})^2$$

- **Standard deviation** is the square root of variance.
- The **normal distribution** is the most commonly used probability distribution in finance. It resembles a bell-shaped curve.

- The expected return on a portfolio is simply the weighted average of the expected returns on the assets comprising the portfolio. In general, when the portfolio consists of  $n$  securities, its expected return is:

$$\bar{R}_p = \sum_{i=1}^n w_i \bar{R}_i$$

- If returns on securities do not move in perfect lockstep, diversification reduces risk.
- As more and more securities are added to a portfolio, its risk decreases, but at a decreasing rate. The bulk of the benefit of diversification is achieved by forming a portfolio of about 15–20 securities.
- The following relationship represents a basic insight of modern portfolio theory:

$$\text{Total risk} = \text{Unique risk} + \text{Market risk}$$

- The **unique risk** of a security represents that portion of its total risk which stems from firm-specific factors. It can be washed away by combining it with other securities. Hence, unique risk is also referred to as diversifiable risk or **unsystematic risk**.
- The market risk of a security represents that portion of its risk which is attributable to economy-wide factors. It is also referred to as **systematic risk** (as it affects all securities) or non-diversifiable risk (as it cannot be diversified away).
- The market risk of a security reflects its sensitivity to market movements. It is called **beta**.

## QUESTIONS

- How is the rate of return on an asset defined?
- What is standard deviation? What are its important features?
- Why is standard deviation employed commonly in finance as a measure of risk?
- Describe the key features of normal distribution.
- Explain how diversification influences risk.
- Distinguish between unique risk and market risk.
- Define the standard deviation of the returns on a two-security portfolio.
- How is beta calculated?
- What is the relationship between risk and return as per CAPM?
- What is a defensive security, neutral security, and aggressive security?
- What is the effect of change in risk aversion on the security market line?
- 'The increase in the risk-premium of all stocks, irrespective of their beta, is the same, when risk aversion increases'. Comment.
- What are the investment implications of CAPM?

## SOLVED PROBLEMS

- 8.1** The stock of Box Limited performs well relative to other stocks during recessionary periods. The stock of Cox Limited, on the other hand, does well during growth periods. Both the stocks are currently selling for ₹ 100 per share. You assess the rupee return (dividend plus price) of these stocks for the next year as follows:

	<i>Economic Condition</i>			
	<i>High growth</i>	<i>Low growth</i>	<i>Stagnation</i>	<i>Recession</i>
Probability	0.3	0.4	0.2	0.1
Return on Box's stock	100	110	120	140
Return on Cox's stock	150	130	90	60

Calculate the expected return and standard deviation of investing:

- (a) ₹ 1,000 in the equity stock of Box Limited
- (b) ₹ 1,000 in the equity stock of Cox Limited
- (c) ₹ 500 each in the equity stock of Box Limited and Cox Limited.

*Solution*

- (a) 10 equity shares of Box Limited can be bought for ₹ 1,000. The probability distribution of overall return, when 10 equity shares of Box Limited are purchased will be as follows:

<i>Economic condition</i>	<i>Overall return</i>	<i>Probability</i>
High growth	10(100) = ₹ 1,000	0.3
Low growth	10(110) = ₹ 1,100	0.4
Stagnation	10(120) = ₹ 1,200	0.2
Recession	10(140) = ₹ 1,400	0.1

The expected return is:

$$0.3 (1,000) + 0.4 (1,100) + 0.2 (1,200) + 0.1 (1,400) = 300 + 440 + 240 + 140 = ₹ 1,120$$

The standard deviation of return is:

$$\begin{aligned} & [0.3 (1,000 - 1,120)^2 + 0.4 (1,100 - 1,120)^2 + 0.2 (1,200 - 1,120)^2 + \\ & 0.1 (1,400 - 1,120)^2]^{1/2} \\ & = [0.3 (14,400) + 0.4 (400) + 0.2 (6,400) + 0.1 (78,400)]^{1/2} \\ & = [4,320 + 160 + 1,280 + 7,840]^{1/2} \\ & = [13,600]^{1/2} = ₹ 116.6 \end{aligned}$$

- (b) 10 equity shares of Cox Limited can be bought for ₹ 1,000. The probability distribution of overall return, when 10 equity shares of Cox Limited are purchased will be as follows:

<i>Economic condition</i>	<i>Overall return</i>	<i>Probability</i>
High growth	$10(150) = ₹ 1,500$	0.3
Low growth	$10(130) = ₹ 1,300$	0.4
Stagnation	$10(90) = ₹ 900$	0.2
Recession	$10(60) = ₹ 600$	0.1

The expected return is:

$$0.3 (1,500) + 0.4 (1,300) + 0.2 (900) + 0.1 (600) = 450 + 520 + 180 + 60 = ₹ 1,210$$

The standard deviation of return is:

$$\begin{aligned} & [0.3 (1,500 - 1,210)^2 + 0.4 (1,300 - 1,210)^2 + 0.2 (900 - 1,210)^2 + \\ & 0.1 (600 - 1,210)^2]^{1/2} \\ & = [0.3 (84,100) + 0.4 (8,100) + 0.2 (96,100) + 0.1 (372,100)]^{1/2} \\ & = [25,230 + 3,240 + 19,220 + 37,210]^{1/2} \\ & = [84,900]^{1/2} = ₹ 291.4 \end{aligned}$$

- (c) If ₹ 500 each are invested in the equity stocks of Box Limited and Cox Limited, 5 shares will be bought of each company. The probability distribution of overall return, on this portfolio will be as follows:

<i>Economic condition</i>	<i>Overall return</i>	<i>Probability</i>
High growth	$5(100) + 5(150) = ₹ 1,250$	0.3
Low growth	$5(110) + 5(130) = ₹ 1,200$	0.4
Stagnation	$5(120) + 5(90) = ₹ 1,050$	0.2
Recession	$5(140) + 5(60) = ₹ 1,000$	0.1

The expected return is:

$$0.3 (1,250) + 0.4 (1,200) + 0.2 (1,050) + 0.1 (1,000)$$

$$= 375 + 480 + 210 + 100$$

$$= ₹ 1,165$$

The standard deviation of return is:

$$\begin{aligned} & [0.3 (1,250 - 1,165)^2 + 0.4 (1,200 - 1,165)^2 + 0.2 (1,050 - 1,165)^2 + \\ & 0.1(1,000 - 1,165)^2]^{1/2} \\ & = [0.3 (7,225) + 0.4 (1,225) + 0.2 (13,225) + 0.1 (27,225)]^{1/2} \\ & = [2167.5 + 490 + 2,645 + 2,722.5]^{1/2} \\ & = [8,025]^{1/2} = ₹ 89.6 \end{aligned}$$

- 8.2 The risk-free rate of return  $R_f$  is 9 percent. The expected rate of return on the market portfolio  $R_M$  is 13 percent. The expected rate of growth for the dividend of firm A is 7 percent. The last dividend paid on the equity stock of firm A was ₹ 2.00. The beta of firm A's equity stock is 1.2 (a) What is the equilibrium price of the equity stock of firm A? (b) How would the equilibrium price change when (i) the inflation premium increases by 2 percent, (ii) the expected growth rate increases by 3 percent, and (iii) the beta of A's equity rises to 1.3.

*Solution*

- (a) To calculate the equilibrium price of A's equity, we have to first obtain its required rate of return,  $R_A$

$$R_A = R_f + \beta_A (R_M - R_f) = 9 + 1.2(13 - 9) = 13.8 \text{ percent}$$

Combining this value of  $R_A$  with the given values of  $D_0$  (₹ 200) and  $g$  (7 percent), we get the equilibrium price of A's equity stock,  $P_A$ , as follows:

$$\begin{aligned} P_A &= \frac{D_0(1+g)}{R_A - g} = \frac{₹ 200(1.07)}{0.138 - 0.07} \\ &= ₹ 31.47 \end{aligned}$$

- (b) The change in the equilibrium price in response to variations in certain underlying factors is as follows:

- (i) Inflation premium increases by 2 percent. This raises  $R_A$  to 15.8 percent.

Hence the new equilibrium price is

$$P_A = \frac{₹ 2.00(1.07)}{0.158 - 0.07} = ₹ 24.32$$

- (ii) The expected growth rate increases by 3 percent. This means that the growth rate,  $g$ , becomes 10 percent. As a result, the new equilibrium price is:

$$P_A = \frac{₹ 2.00(1.10)}{0.138 - 0.10} = ₹ 57.89$$

- (iii) The beta of A's equity rises to 1.3. This makes the required return on A's equity equal to:  $R_A = 9 + 1.3(13 - 9) = 14.2$  percent. As a result, the new equilibrium price is:

$$P_A = \frac{₹ 2.00(1.07)}{0.142 - 0.07} = ₹ 29.72$$

8.3 The rates of return on stock A & market portfolio for 15 periods are given below

Period	Return on stock A(%)	Return on market portfolio (%)	Period	Return on stock A(%)	Return on market portfolio (%)
1	10	12	9	-9	1
2	15	14	10	14	12
3	18	13	11	15	-11
4	14	10	12	14	16
5	16	9	13	6	8
6	16	13	14	7	7
7	18	14	15	-8	10
8	4	7			

What is the beta for stock A?

What is the characteristic line for stock A?

*Solution*

Period	$R_A(%)$	$R_M(%)$	$R_A - \bar{R}_A$	$R_M - \bar{R}_M$	$(R_A - \bar{R}_A)(R_M - \bar{R}_M)$	$(R_M - \bar{R}_M)^2$
1	10	12	0	3	0	9
2	15	14	5	5	25	25
3	18	13	8	4	32	16
4	14	10	4	1	4	1
5	16	9	6	0	0	0
6	16	13	6	4	24	16
7	18	14	8	5	40	25
8	4	7	-6	-2	12	4
9	-9	1	-19	-8	152	64
10	14	12	4	3	12	9
11	15	-11	5	-20	-100	400
12	14	16	4	7	28	49
13	6	8	-4	-1	4	1
14	7	7	-3	-2	6	4
15	-8	10	-18	1	-18	1
$\Sigma R_A = 150$		$\Sigma R_M = 135$	$\Sigma (R_A - \bar{R}_A)(R_M - \bar{R}_M) = 221$		$\Sigma (R_M - \bar{R}_M)^2 = 575$	
$\bar{R}_A = 10$		$\bar{R}_M = 9$				

$$\sigma_M^2 = \frac{\Sigma(R_M - \bar{R}_M)^2}{n-1} = \frac{575}{14} = 41.07 \quad \text{Cov}_{A,M} = \frac{\Sigma(R_A - \bar{R}_A)(R_M - \bar{R}_M)}{n-1}$$

$$= \frac{221}{14} = 15.79$$

$$\text{Beta : } \beta_A = \frac{\text{Cov}_{A,M}}{\sigma_M^2} = \frac{15.79}{41.07} = 0.384$$

$$\text{Alpha} = \alpha_A = \bar{R}_A - \beta_A \bar{R}_M = 10 - 0.384 \times 9 = 6.54\%$$

The characteristic line for stock A is :  $R_A = 6.54 + 0.384 R_M$

## PROBLEMS

**8.1 Rate of Return** You are considering purchasing the equity stock of MVM Company. The current price per share is ₹ 10. You expect the dividend a year hence to be ₹ 1.00. You expect the price per share of MVM stock a year hence to have the following probability distribution.

Price a year hence	₹ 10	11	12
Probability	0.4	0.4	0.2

- (a) What is the expected price per share a year hence?
- (b) What is the probability distribution of the rate of return on MVM's equity stock?

**8.2 Expected Return and Standard Deviation** The stock of Alpha Company performs well relative to other stocks during recessionary periods. The stock of Beta Company, on the other hand, does well during growth periods. Both the stocks are currently selling for ₹ 50 per share. The rupee return (dividend plus price change) of these stocks for the next year would be as follows:

	<i>Economic condition</i>			
	<i>High growth</i>	<i>Low growth</i>	<i>Stagnation</i>	<i>Recession</i>
Probability	0.3	0.3	0.2	0.2
Return on Alpha stock	55	50	60	70
Return on Beta stock	75	65	50	40

Calculate the expected return and standard deviation of:

- (a) ₹ 1,000 in the equity stock of Alpha;
- (b) ₹ 1,000 in the equity stock of Beta;
- (c) ₹ 500 in the equity stock of Alpha and ₹ 500 in the equity stock of Beta;
- (d) ₹ 700 in the equity stock of Alpha and ₹ 300 in the equity of Beta.

Which of the above four options would you choose? Why?

**8.3 Beta and Characteristic Line** The returns on the equity stock of Auto Electricals Limited and the market portfolio over a 11 year period are given below:

<i>Year</i>	<i>Return on Auto Electricals Ltd. (%)</i>	<i>Return on Market Portfolio (%)</i>
1	15	12
2	-6	1
3	18	14
4	30	24
5	12	16
6	25	30
7	2	-3
8	20	24

9	18	15
10	24	22
11	8	12

---

- (a) Calculate the beta for the stock of Auto Electricals Limited.  
 (b) Establish the characteristic line for the stock of Auto Electricals Limited.

**8.4 Intrinsic Value** The risk-free return is 10 percent and the return on market portfolio is 15 percent. Stock A's beta is 1.5; its dividends and earnings are expected to grow at the constant rate of 8 percent. If the previous dividend per share of stock A was ₹ 2.00, what should be the intrinsic value per share of stock A?

**8.5 Beta** The risk-free return is 8 percent and the expected return on a market portfolio is 12 percent. If the required return on a stock is 15 percent, what is its beta?

**8.6 Marked Return** The risk-free return is 9 percent. The required return on a stock whose beta is 1.5 is 15 percent. What is the expected return on the market portfolio?

**8.7 Stock Price** The required return on the market portfolio is 12 percent. The beta of stock X is 2.0. The required return on the stock is 18 percent. The expected dividend growth on stock X is 5 percent. The price per share of stock X is ₹ 30. What is the expected dividend per share of stock X next year?

What will be the combined effect of the following on the price per share of stock X?

- (a) The inflation premium increases by 2 percent.
- (b) The decrease in the degree of risk-aversion reduces the differential between the return on market portfolio and the risk-free return by one-third.
- (c) The expected growth rate of dividend on stock X decrease to 4 percent.
- (d) The beta of stock X falls to 1.8.

**8.8 Asset Beta** A firm's equity beta is 1.1. Its tax rate is 30 percent and debt-equity ratio is 4:5. What is its asset beta?

**8.9 Average Return and Variability** Given the following returns, calculate the average returns, variances, and standard deviation of **A** and **B**.

Year	1	2	3	4	5	6
A	10%	18	-12	16	3	24
B	15%	22	2	-18	12	17

**8.10 Arithmetic and Geometric Returns** A stock generated the following returns over the last five years: 6%, 42%, -10%, 25%, -5%. Calculate the arithmetic mean return and geometric mean return.

**8.11 CAPM** The risk-free rate is 7 percent and the expected return on the market is 13 percent. What is the expected return on a stock that has a beta of 1.2?

- CAPM** The expected return on a stock that has a beta of 0.90 is 13.3 percent.
- 8.12** The expected return on the market is 14 percent. What is the risk-free return?

## MINICASE - I

The monthly closing share prices for 31 months for Tata Motors, Hero MotoCorp, Hindustan Unilever Ltd and Nifty are given below:

Month	Tata Motors	Hero MotoCorp	Hindustan Unilever	Nifty
2016 January	337	2565.65	817	7564
February	300	2499.9	830	6987
March	387	2945.7	870	7738
April	408	2897.4	868	7850
May	460	3098.9	848	8160
June	459	3178.25	899	8288
July	503	3203.15	923	8639
August	538	3541.35	917	8786
September	535	3413.7	868	8611
October	532	3352.1	839	8626
November	459	3166.05	844	8225
December	472	3043.65	826	8186
2017 January	524	3172.35	855	8561
February	457	3138.1	866	8880
March	466	3221.95	912	9174
April	459	3318.6	935	9304
May	476	3745.45	1067	9621
June	433	3701.35	1080	9521
July	445	3655.75	1156	10077
August	377	3995.1	1220	9918
September	402	3774.55	1174	9789
October	428	3849.9	1237	10335
November	404	3633.65	1272	10227
December	432	3785.15	1368	10531
2018 January	399.5	3691.45	1369	11028
February	369.9	3596.7	1318	10493
March	326.85	3542.8	1333	10114
April	340.4	3732.25	1509	10739
May	282.5	3544.9	1611	10736
June	269.3	3473.5	1641	10714
July	264.1	3294.45	1732	11357

- (a) What are the monthly returns on Tata Motors, Hero MotoCorp, Hindustan Unilever and Nifty? You may ignore the dividend yield.
- (b) What are the average returns (arithmetic and geometric) on Tata Motors, Hero MotoCorp, Hindustan Unilever Ltd and Nifty?

- (c) What are the standard deviations of the returns on Tata Motors, Hero MotoCorp, Hindustan Unilever and Nifty?
- (d) Calculate the betas of Tata Motors, Hero MotoCorp and Hindustan Unilever.

## MINICASE - II

The following is the information on price per share and dividend per share for NTPC Ltd, Escorts Ltd and MRF Ltd at the end of the financial years from 2008 to 2018:

Financial year ended	NTPC		ESCORTS		MRF	
	Price per share	Dividend per share	Price per share	Dividend per share	Price per share	Dividend per share
2008	196.60	3.50	85.70	0.00	3989.05	20.00
2009	179.85	3.60	35.25	0.00	1738.75	20.00
2010	207.25	3.80	149.65	1.00	6784.35	25.00
2011	193.10	3.80	141.65	1.50	6271.10	50.00
2012	162.75	4.30	68.60	1.50	9932.65	25.00
2013	141.95	4.25	49.50	1.20	11971.80	25.00
2014	119.90	6.00	115.25	1.20	21788.75	30.00
2015	146.85	2.50	127.35	0.60	38750.65	50.00
2016	128.85	3.35	139.25	1.20	38296.75	6.00
2017	166.00	4.36	538.75	1.20	60954.45	100.00
2018	169.70	4.90	818.10	1.50	73122.45	60.00

For each company calculate the following: (i) Annual returns for each year. (ii) Annual dividend yield and capital gain/loss percentage for each year. (iii) Arithmetic and geometric mean returns. (iv) Standard deviation of the rates of return.

## PRACTICAL ASSIGNMENT

Calculate the monthly returns for the past 30 months, ignoring the dividend yield for the company that you have chosen and Nifty. What are the average returns (arithmetic and geometric) for the company and Nifty? What is the standard deviation of the returns on the company and Nifty? What is the beta of the company? Can you explain the beta in terms of the company characteristics?

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<sup>1</sup> Note that

$$\sum_{i=1}^n (R_i - \bar{R})^2$$

is divided by  $n - 1$  not  $n$ . This is done technically to correct for the loss of one degree of freedom.

<sup>2</sup> Source: Ibbotson Associates, Inc. 2001 Yearbook

- 3 Since the portfolio in this case consists of only two securities, the proportion invested in security 2 is simply one minus the proportion invested in security 1.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter8/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter8/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## 9 CHAPTER

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# Risk and Return: Portfolio Theory and Asset Pricing Models

## Learning Objectives

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After studying this chapter you should be able to:

- ✓ Calculate the portfolio risk for a 2-security case and an  $n$ -security case.
- ✓ Explain the concepts of efficient frontier and optimal portfolio.
- ✓ Discuss the capital market line and security market line.
- ✓ Explain the arbitrage pricing theory.
- ✓ Discuss multifactor models.

In our discussion of the basics of risk and return in the [previous chapter](#), we learnt that:

- Much of the risk of a single security can be eliminated by diversification. So rational investors hold diversified portfolios.
- While diversification eliminates unsystematic risk (unique risk) it cannot eliminate systematic risk (market risk).
- The market risk of a stock is measured by its beta. According to the capital asset pricing model (CAPM), the expected return of a stock is linearly related to its beta.

Extending the previous discussion, this chapter provides an in-depth treatment of portfolio concepts and the CAPM. It also explores other asset pricing models.

## 9.1 ■ PORTFOLIO RISK

Just as the risk of an individual security is measured by the variance (or standard deviation) of its return, the risk of a portfolio too is measured by the variance (or standard deviation) of its return.

Although the expected return on a portfolio is the weighted average of the expected returns on the individual securities in the portfolio, portfolio risk (measured by variance or standard deviation of returns) is not the weighted average of the risks of the individual securities in the portfolio (except when the returns from the securities are uncorrelated).

In symbols,

$$E(R_p) = \sum_{i=1}^n w_i E(R_i) \quad (9.1)$$

But

$$\sigma_p^2 \neq \sum w_i^2 \sigma_i^2 \quad (9.2)$$

Thanks to the inequality shown in Eq. (9.2), investors can achieve the benefit of risk reduction through diversification. Before we discuss how this can be accomplished let us first understand how comovements in security returns are measured.

## Comovements in Security Returns

To develop the equation for calculating portfolio risk we need information on weighted individual security risks and weighted comovements between the returns on securities included in the portfolio.

Comovements between the returns on securities are measured by covariance (an absolute measure) and coefficient of correlation (a relative measure).

**Covariance** Covariance reflects the degree to which the returns on the two securities vary or change together. A positive covariance means that the returns on the two securities move in the same direction whereas a negative covariance implies that the returns on the two securities move in opposite direction. The covariance between the returns on any two securities  $i$  and  $j$  is calculated as follows:

$$\begin{aligned}\text{Cov}(R_i, R_j) = & p_1 [R_{i1} - E(R_i)] [R_{j1} - E(R_j)] \\ & + p_2 [R_{i2} - E(R_i)] [R_{j2} - E(R_j)] \\ & + \\ & \cdot \\ & + p_n [R_{in} - E(R_i)] [R_{jn} - E(R_j)]\end{aligned}\quad (9.3)$$

where  $p_1, p_2 \dots p_n$  are the probabilities associated with states 1, ...  $n$ ,  $R_{i1}, \dots R_{in}$  are the returns on security  $i$  in states 1, ...  $n$ ,  $R_{j1}, \dots R_{jn}$  are the returns on security  $j$  in states 1, ...  $n$ , and  $E(R_i)$  and  $E(R_j)$  are the expected returns on securities  $i$  and  $j$ .

*Example* The returns on securities 1 and 2 under five possible states of nature are given below:

State of nature	Probability	Return on security 1	Return on security 2
1	0.10	-10%	5%
2	0.30	15	12
3	0.30	18	19
4	0.20	22	15
5	0.10	27	12

The expected returns on securities 1 and 2 are as follows:

$$E(R_1) = 0.10 (-10\%) + 0.30 (15\%) + 0.30 (18\%) + 0.20 (22\%) + 0.10 (27\%) = 16\%$$

$$E(R_2) = 0.10 (5\%) + 0.30 (12\%) + 0.30 (19\%) + 0.20 (15\%) + 0.10 (12\%) = 14\%$$

The covariance between the returns on securities 1 and 2 is calculated below:

<i>State of nature</i>	<i>Probability</i>	<i>Return on security 1</i>	<i>Deviation of the return on security 1 from its mean</i>	<i>Return on security 2</i>	<i>Deviation of the return on security 2 from its mean</i>	<i>Product of the deviations times probability</i>
(1)	(2)	(3)	(4)	(5)	(6)	(2) × (4) × (6)
1	0.10	-10%	-26%	5%	-9%	23.4
2	0.30	15%	-1%	12%	-2%	0.6
3	0.30	18%	2%	19%	5%	3.0
4	0.20	22%	6%	15%	1%	1.2
5	0.10	27%	11%	12%	-2%	-2.2
						<b>Sum = 26.0</b>

Thus the covariance between the returns on the two securities is 26.0.

**Coefficient of Correlation** Covariance and correlation are conceptually analogous in the sense that both of them reflect the degree of comovement between two variables. Mathematically, they are related as follows:

$$\text{Cor}(R_i, R_j) \text{ or } \rho_{ij} = \frac{\text{Cov}(R_i, R_j)}{\sigma(R_i) \cdot \sigma(R_j)} \text{ or } \frac{\sigma_{ij}}{\sigma_i \cdot \sigma_j} \quad (9.4)$$

$$\sigma_{ij} = \rho_{ij} \cdot \sigma_i \cdot \sigma_j \quad (9.5)$$

where  $\text{Cor}(R_i, R_j) = \rho_{ij}$  is the correlation coefficient between the returns on securities  $i$  and  $j$ ,  $\text{Cov}(R_i, R_j) = \sigma_{ij}$  is the covariance between the returns on securities  $i$  and  $j$ , and  $\sigma(R_i), \sigma(R_j) = \sigma_i, \sigma_j$  are the standard deviations of the returns on securities  $i$  and  $j$ .

Thus the correlation coefficient is simply covariance divided by the product of standard deviations. The correlation coefficient can vary between -1.0 and +1.0. A value of -1.0 means perfect negative correlation or perfect comovement in the opposite direction; a value of 0 means no correlation or comovement whatsoever; a value of 1.0 means perfect correlation or perfect comovement in the same direction. [Exhibit 9.1](#) portrays graphically various types of correlation relationships.

## Calculation of Portfolio Risk

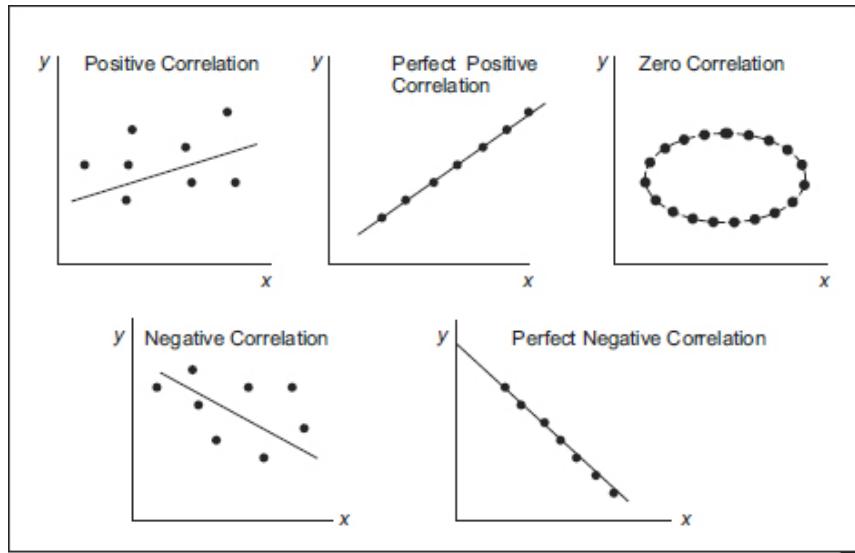
Now that we understand how to measure covariance and correlation, we will learn how to calculate portfolio risk. We will first look at the 2-security case and then generalise it to an  $n$ -security case.

**Portfolio Risk: 2-Security Case** The risk of a portfolio consisting of two securities is given by the following formula:

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2 \quad (9.6)$$

where  $\sigma_p^2$  is the variance of the portfolio return,  $w_1, w_2$  are the weights of securities 1 and 2 in the portfolio,  $\sigma_1^2, \sigma_2^2$  are the variances of the returns on securities 1 and 2, and  $\rho_{12} \sigma_1 \sigma_2$  is the covariance of the returns on securities 1 and 2.

### Exhibit 9.1 Graphical Portrayal of Various Types of Correlation Relationships



In words, Eq. (9.6) says that the variance of the returns on a 2-security portfolio is the sum of the weighted variance of the returns on the two securities plus the weighted covariance between the returns on the two securities.

*Example* A portfolio consists of two securities, 1 and 2, in the proportions 0.6 and 0.4. The standard deviations of the returns on securities 1 and 2 are  $\sigma_1 = 10$  percent and  $\sigma_2 = 16$  percent. The coefficient of correlation between

the returns on securities 1 and 2 is 0.5. What is the standard deviation of the portfolio return?

$$\begin{aligned}\sigma_p &= [0.6^2 \times 10^2 + 0.4^2 \times 16^2 + 2 \times 0.6 \times 0.4 \times 0.5 \times 10 \times 16]^{1/2} \\ &= 10.7 \text{ percent}\end{aligned}$$

The portfolio variance may be viewed as the sum of the four cells in a  $2 \times 2$  matrix:

	Security 1	Security 2
Security 1	$w_1^2 \sigma_1^2$	$w_1 w_2 \rho_{12} \sigma_1 \sigma_2$
Security 2	$w_2 w_1 \rho_{21} \sigma_2 \sigma_1$	$w_2^2 \sigma_2^2$

The entry in the top left box,  $w_1^2 \sigma_1^2$ , is the product of the square of the proportion invested in security 1 ( $w_1^2$ ) and the variance of the returns on security 1 ( $\sigma_1^2$ ); likewise, the entry in the bottom right box,  $w_2^2 \sigma_2^2$ , is the product of the square of the proportion invested in security 2 ( $w_2^2$ ) and the variance of the returns on security 2 ( $\sigma_2^2$ ).

The entries in the other two boxes are the same. They are the product of the proportion invested in security 1 ( $w_1$ ), the proportion invested in security 2 ( $w_2$ ), and the covariance of the returns on the two securities (which may be expressed as  $\rho_{12} \sigma_1 \sigma_2$  or  $\rho_{21} \sigma_2 \sigma_1$ ).

Once you have filled in the four cells of the  $2 \times 2$  matrix, you have to simply add the entries in these boxes to get the portfolio variance.

**Portfolio Risk:  $n$ -Security Case** The variance and standard deviation of the return of an  $n$ -security portfolio are:

$$\sigma_p^2 = \sum \sum w_i w_j \rho_{ij} \sigma_i \sigma_j \quad (9.7)$$

$$\sigma_p = [\sum \sum w_i w_j \rho_{ij} \sigma_i \sigma_j]^{1/2} \quad (9.8)$$

where  $\sigma_p^2$  is the variance of portfolio return,  $\sigma_p$  is the standard deviation of portfolio return,  $w_i$  is the proportion of portfolio invested in security  $i$ ,  $w_j$  is the proportion of portfolio invested in security  $j$ ,  $\rho_{ij}$  is the coefficient of correlation between the returns on securities  $i$  and  $j$ ,  $\sigma_i$  is the standard

deviation of return on security  $i$ , and  $\sigma_j$  is the standard deviation of return on security  $j$ .

*Example* A portfolio consists of 3 securities, 1, 2, and 3. The proportions of these securities are:  $w_1 = 0.5$ ,  $w_2 = 0.3$ , and  $w_3 = 0.2$ . The standard deviations of returns on these securities (in percentage terms) are:  $\sigma_1 = 10$ ,  $\sigma_2 = 15$ , and  $\sigma_3 = 20$ . The correlation coefficients among security returns are:  $\rho_{12} = 0.3$ ,  $\rho_{13} = 0.5$ ,  $\rho_{23} = 0.6$ . What is the standard deviation of portfolio return?

$$\begin{aligned}\sigma_p &= [w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + w_3^2\sigma_3^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2 + 2w_1w_3\rho_{13}\sigma_1\sigma_3 + 2w_2w_3\rho_{23}\sigma_2\sigma_3]^{1/2} \\ &= [0.5^2 \times 10^2 + 0.3^2 \times 15^2 + 0.2^2 \times 20^2 + 2 \times 0.5 \times 0.3 \times 10 \times 15 + 2 \times 0.5 \times 0.2 \\ &\quad \times 0.3 \times 20 + 2 \times 0.3 \times 0.2 \times 0.6 \times 15 \times 20]^{1/2} \\ &= 10.7 \text{ percent}\end{aligned}$$

The relationship embodied in [Eq. \(9.7\)](#) is not as complicated as it appears. It is the sum of  $n^2$  terms found in the  $n \times n$  matrix shown in [Exhibit 9.2](#).

Notice that in [Exhibit 9.2](#) there are  $n$  variance terms (the diagonal terms) and  $n(n-1)$  covariance terms (the non-diagonal terms). If  $n$  is just two, there are two variance terms and two covariance terms. However, as  $n$  increases, the number of covariance terms is much larger than the number of variance terms. For example, when  $n$  is 10, there are 10 (that is  $n$ ) variance terms and 90 (that is  $n(n-1)$ ) covariance terms. Hence the variance of a well-diversified portfolio is largely determined by the covariance terms. If covariance terms are likely to be negative, it may be possible to get rid of risk almost wholly by resorting to diversification. Unfortunately, security prices tend to move together. This means that most covariance terms are positive. Hence, irrespective of how widely diversified a portfolio is, its risk does not fall below a certain level.

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## Exhibit 9.2 | $n \times n$ Matrix

	1	2	3	...	$n$
1	$w_1^2 \sigma_1^2$	$w_1 w_2 \rho_{12} \sigma_1 \sigma_2$	$w_1 w_3 \rho_{13} \sigma_1 \sigma_3$	...	$w_1 w_n \rho_{1n} \sigma_1 \sigma_n$
2	$w_2 w_1 \rho_{21} \sigma_2 \sigma_1$	$w_2^2 \sigma_2^2$	$w_2 w_3 \rho_{23} \sigma_2 \sigma_3$	...	$w_2 w_n \rho_{2n} \sigma_2 \sigma_n$
3	$w_3 w_1 \rho_{31} \sigma_3 \sigma_1$	$w_3 w_2 \rho_{32} \sigma_3 \sigma_2$	$w_3^2 \sigma_3^2$	...	
:	:	:			:
$n$	$w_n w_1 \rho_{n1} \sigma_n \sigma_1$				$w_n^2 \sigma_n^2$

## 9.2 ■ EFFICIENT FRONTIER AND OPTIMAL PORTFOLIO

### Efficient Frontier

Now that we know how to calculate the risk and return of a portfolio, let us understand how the efficient frontier is delineated. We will first look at the 2-security case and then consider the  $n$ -security case.

**Efficient Frontier for a Two Security Case** Suppose an investor is evaluating two securities, A and B.

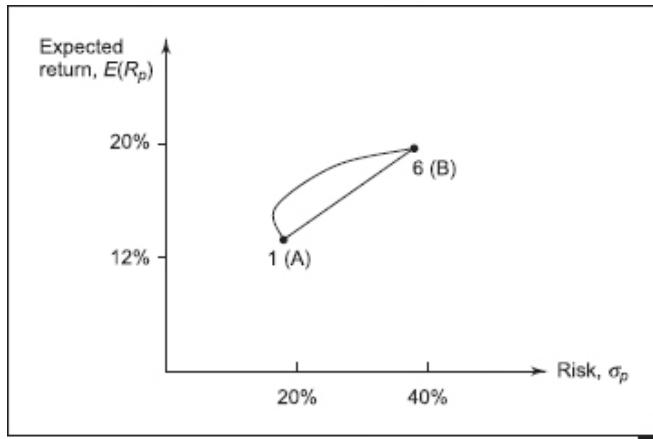
	Security A	Security B
Expected return	12%	20%
Standard deviation of return	20%	40%
Coefficient of correlation		-0.20

The investor can combine securities A and B in a portfolio in a number of ways by simply changing the proportions of funds allocated to them. Some of the options available to him are shown below:

Portfolio	Proportion of A $w_A$	Proportion of B $w_B$	Expected return $E(R_p)$	Standard deviation $\sigma_p$
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%

The six options described above are plotted graphically in [Exhibit 9.3](#).

### Exhibit 9.3 | Portfolio Options

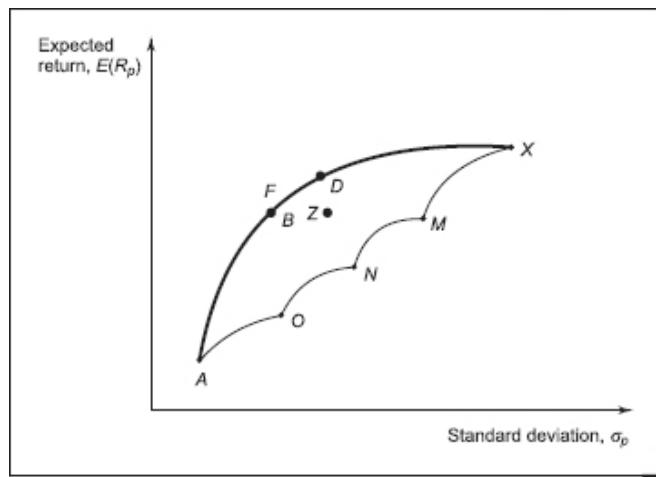


**Efficient Frontier for the  $n$ -Security Case** In a 2-security case, a curved line delineates all possible portfolios. In a multi-security case, the collection of all the possible portfolios is represented by the broken-egg shaped region, referred to as the feasible region, shown in [Exhibit 9.4](#). 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 9.4](#) 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  $\sigma_p$ , (ii) the same  $\sigma_p$  and a higher  $E(R_p)$ , or (iii) a higher  $E(R_p)$  and a lower  $\sigma_p$ . Thus, in [Exhibit 9.4](#) 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.

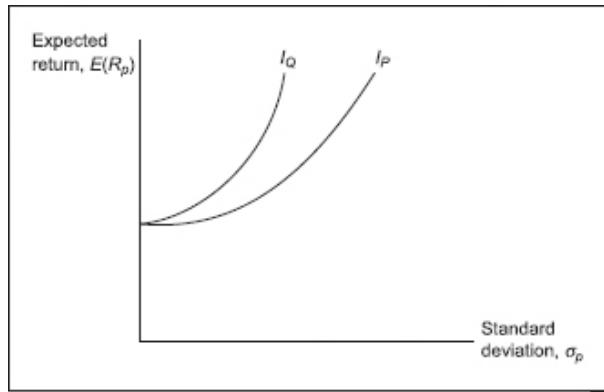
## Optimal Portfolio

Once the efficient frontier is delineated, the next question is: What is the optimal portfolio for the investor? To determine the optimal portfolio on the efficient frontier, the investor's risk-return tradeoff must be known. [Exhibit 9.5](#) presents two illustrative indifference curves which reflect risk-return tradeoff functions – note that all points lying on an indifference curve provide the same level of satisfaction. The indifference curves  $I_p$  and  $I_q$  represent the risk-return tradeoffs of two hypothetical investors,  $P$  and  $Q$ . Both  $P$  and  $Q$ , like most investors, are risk-averse. They want higher returns to bear more risk.  $Q$  is however more risk-averse than  $P$ .  $Q$  wants a higher expected return for bearing a given amount of risk as compared to  $P$ . In general, the steeper the slope of the indifference curve, the greater the degree of risk aversion.

### Exhibit 9.4 Feasible Region

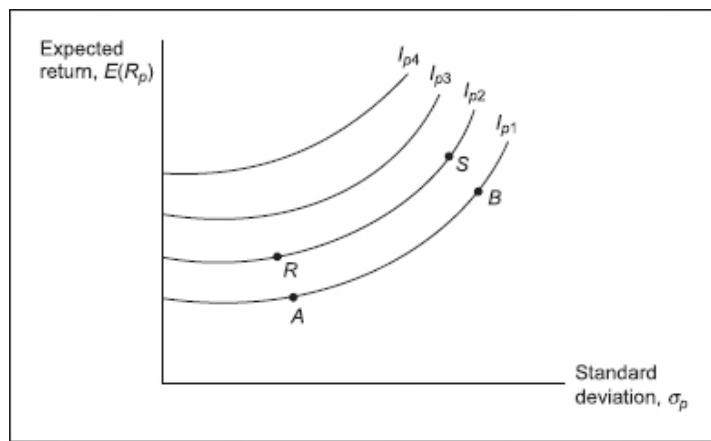


## Exhibit 9.5 Risk-Return Indifference Curves



Each person has a map of indifference curves. Exhibit 9.6 shows the indifference map for  $P$ . In this figure, four risk-return indifference curves,  $I_{p1}$ ,  $I_{p2}$ ,  $I_{p3}$  and  $I_{p4}$  are shown. All the points lying on a given indifference curve offer the same level of satisfaction. For example, points  $A$  and  $B$ , which lie on the indifference curve  $I_{p1}$  offer the same level of satisfaction; likewise, points  $R$  and  $S$ , which lie on the indifference curve  $I_{p2}$ , offer the same level of satisfaction. The level of satisfaction increases as one moves leftward. The indifference curve  $I_{p2}$  represents a higher level of satisfaction as compared to the indifference curve  $I_{p1}$ ; the indifference curve  $I_{p4}$  represents a higher level of satisfaction when compared to the indifference curve  $I_{p3}$ ; and so on.

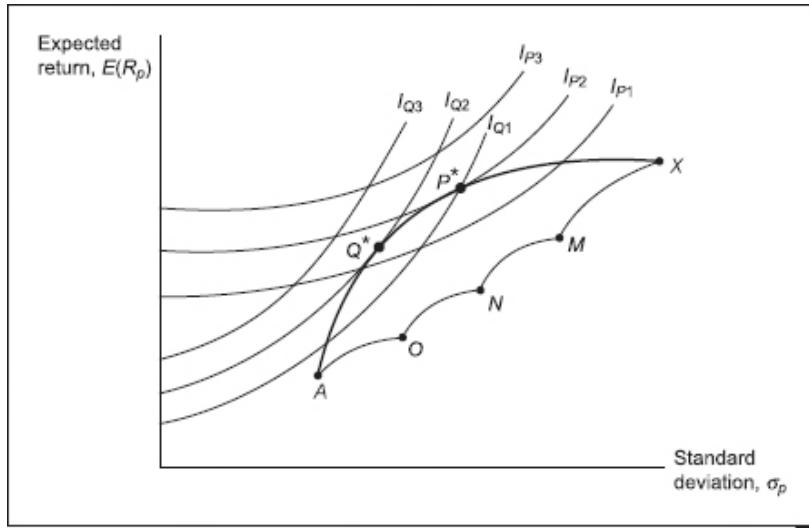
## Exhibit 9.6 Utility Indifference Curves



Given the efficient frontier and the risk-return indifference curves, the optimal portfolio is found at the point of tangency between the efficient

frontier and a utility indifference curve. This point represents the highest level of utility the investor can reach. In [Exhibit 9.7](#) two investors  $P$  and  $Q$ , confronted with the same efficient frontier, but having different utility indifferences curves ( $I_{p1}$ ,  $I_{p2}$  and  $I_{p3}$  for  $P$  and  $I_{q1}$ ,  $I_{q2}$  and  $I_{q3}$  for  $Q$ ) are shown to achieve their highest utilities at points  $P^*$  and  $Q^*$  respectively.

### Exhibit 9.7 Optimal Portfolio



**Optimal Portfolio with Lending and Borrowing** Let us introduce yet another opportunity. Suppose that the investor can also lend and borrow money at a risk-free rate  $R_f$  percent which is shown in [Exhibit 9.8](#). If he lends a portion of his funds at  $R_f$  and invests the balance in  $S$  ( $S$  is the point on the efficient frontier of risky portfolios where the straight line emanating from  $R_f$  is tangential to the efficient frontier of risky portfolios), he can obtain any combination of risk and return along the line that connects  $R_f$  and  $S$ . Further, if he borrows some money and invests it along with his own funds, he can reach a point like  $G$ , beyond  $S$ , as shown in [Exhibit 9.8](#). Thus, with the opportunity of lending and borrowing, the efficient frontier changes. It is no longer  $AFX$ . Rather, it becomes  $R_f SG$  because  $R_f SG$ , as is clear from [Exhibit 9.8](#), 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  $R_f SG$  offers a higher expected return for the same standard deviation; likewise, compared to  $B$  on  $AFX$ ,  $E$  on  $R_f SG$  offers the same expected return with a lower standard deviation; and so on.

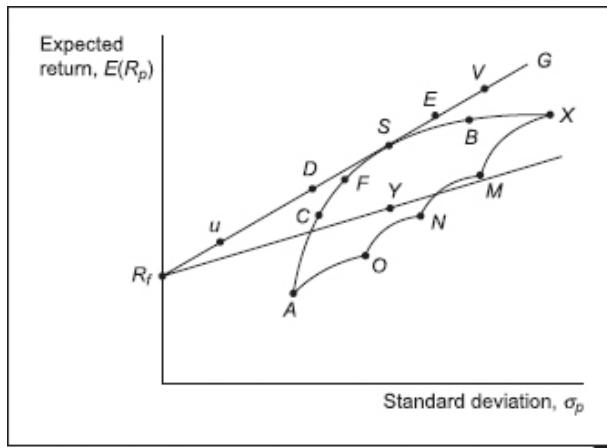
Since  $R_f$  SG dominates AFX, every investor would do well to choose some combination of  $R_f$  and S. A conservative investor may choose a point like U, whereas an aggressive investor may choose a point like V. However, note that both of them choose some combination of  $R_f$  and S. While the conservative 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 the weight assigned to S is more than 1).

Thus, the task of portfolio selection can be separated into two steps.

- Identification of S, the optimal portfolio of risky securities.
- 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 proposed by James Tobin, a Nobel laureate in Economics.

### Exhibit 9.8 Lending and Borrowing Opportunity



## 9.3 ■ CAPITAL ASSET PRICING MODEL

Harry Markowitz, a Nobel laureate in Economics, 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? 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.

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.

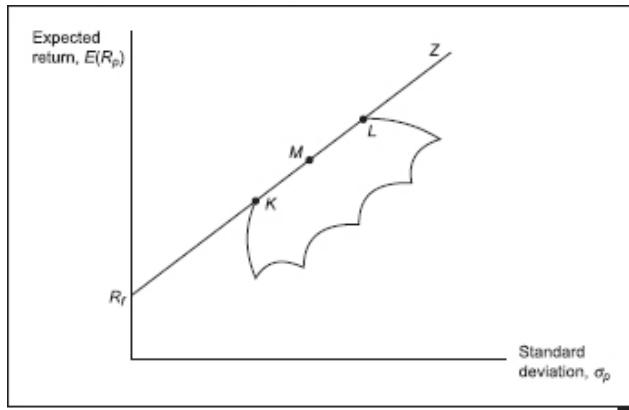
Looking at these assumptions, one may feel that the CAPM is unrealistic. However, the value of a model depends not on the realism of its assumptions, but on the validity of its conclusions. Extensive empirical analysis suggests that there is merit in the CAPM.

## 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 9.9](#). 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.

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.

### Exhibit 9.9 Adjustment of the Efficient Frontier



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:

$$E(R_j) = R_f + \lambda\sigma_j \quad (9.9)$$

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

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

$$\lambda = \frac{E(R_M) - R_f}{\sigma_M} \quad (9.10)$$

where  $\lambda$ , 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:

$$E(R_i) = R_f + \left[ \frac{E(R_M) - R_f}{\sigma_M^2} \right] \sigma_{iM} \quad (9.11)$$

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,  $\sigma_M^2$  is the variance of return on market portfolio, and  $\sigma_{iM}$  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:  $\sigma_{iM}$

In Eq. (9.11), 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 ( $\beta$ ), by taking advantage of the relationship:

$$\beta_i = \frac{\sigma_{iM}}{\sigma_M^2} \quad (9.12)$$

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

$$E(R_i) = R_f + [E(R_M) - R_f] \beta_i \quad (9.13)$$

In words, the SML relationship says:

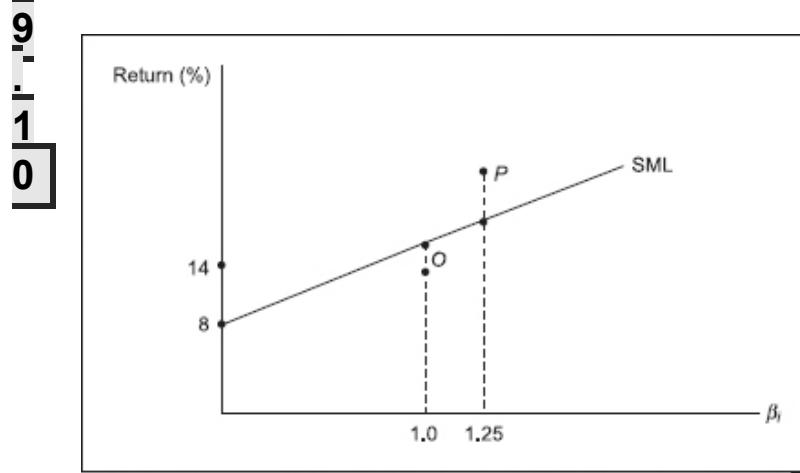
Expected return on security  $i$  = Risk-free return + Market risk premium  $\times$   
Beta of security  $i$

The SML which reflects the expected return-beta relationship is shown in [Exhibit 9.10](#). 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  $\alpha$ .

### Exhibit

### 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:

$$E(R_i) = R_f + \beta_i [E(R_M) - R_f] \quad (9.14)$$

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.

$$\bar{R}_i = v_0 + v_1 \beta_i + e_i \quad (9.15)$$

where  $\bar{R}_i$  is the realised return on security  $i$ ,  $v_0$  is the intercept,  $\beta_i$  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  $\beta_i^2$ , if substituted for  $\beta_i$ , 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  $\frac{E(R_M) - R_f}{R_M - R_f}$
- 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  $\underline{R_M - R_f}$ . 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 return 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:

- Beta can be estimated with short data; risk-free rate can be easily established; the market risk premium can be computed, as information is available for a long period.
- 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 Brealey and 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.

## 9.4 ■ ARBITRAGE PRICING THEORY AND MULTIFACTOR MODELS

### Arbitrage Pricing Theory

While the CAPM represents a seminal contribution to the field of finance, many empirical studies have pointed towards its deficiencies in explaining the relationship between risk and return.

A key challenge to the CAPM came from a set of studies that have suggested that it is possible to rely on certain firm or security characteristics and earn superior returns even after adjustment for risk as measured by beta. Examples: Banz found that small cap stocks outperformed large cap stocks on a risk-adjusted basis; Basu found that low *P/E* stocks outperformed high *P/E* stocks, after adjustment for risk; more recently, Fama and French documented that “value stocks” (stocks with high book-to-market price ratios) generated larger returns than “growth stocks” (stocks with low book-to-market ratios), on a risk-adjusted basis.

In an efficient market such return differentials should not exist. Does it mean that the markets are not particularly efficient for long periods of time? Or, does it mean that the markets are efficient but a single-factor model such as the CAPM does not capture risk adequately?

Since it is unlikely that markets are inefficient for extended periods of time, financial economists began looking for alternative risk-return models, beyond the CAPM. In particular, they asked: What happens if many factors are required to specify the equilibrium relationship between risk and return? Stephen Ross developed the Arbitrage Pricing Theory (APT) that can include any number of risk factors. The APT is based on complex mathematical and statistical analysis that is beyond the scope of this text. Although the APT is theoretically superior to the CAPM, its practical applications have been rather limited. Perhaps its usage may increase in future, so you should at least have an intuitive idea about it.

According to the SML, a stock’s expected rate of return is equal to the risk-free rate plus a risk premium which is the market risk premium times the stock’s beta coefficient. Thus,

$$E(R_i) = R_f + (E(R_M) - R_f)\beta_i \quad (9.16)$$

The historical realised return,  $R_i$ , however, will generally be different from the expected return. It may be expressed as follows:

$$R_i = E(R_i) + (R_M - E(R_M))\beta_i + e_i \quad (9.17)$$

Thus, the realised return,  $R_i$ , is equal to the expected return,  $E(R_i)$ , plus a positive or negative element,  $R_M - E(R_M)\beta_i$  which depends jointly on whether the market performed better or worse than was expected and the stock's beta, plus a random error term,  $e_i$ .

Note that Eq. (9.17) represents the **return generating process** whereas Eq. (9.16) represents the **equilibrium risk-return relationship** as per the CAPM.

Now, the market's realised return,  $R_M$ , is, in turn, influenced by a number of factors such as GDP, inflation level, corporate profitability, investor sentiment, and so on. Further, these factors affect different groups of stocks in different ways. So, one could specify the expected and realised returns on individual stocks as a function of different fundamental economic factors.

The expected rate of return on a stock, according to the APT, is:

$$E(R_j) = R_f + (E(R_1) - R_f)\beta_{1j} + \dots + (E(R_j) - R_f)\beta_{jj} \quad (9.18)$$

In this equation  $E(R_j)$  is the expected rate of return on a portfolio that is sensitive only to the  $j$ th economic factor ( $\beta_{Pj} = 1.00$ ), but has zero sensitivity to every other factor. For example,  $E(R_2) - R_f$  is the risk premium on a portfolio with ( $\beta_{P2} = 1.0$ ) and all other  $\beta_{Pj} = 0$ .

Note that Eq. (9.18) is the **equilibrium risk-return relationship** in APT. It is equivalent of the CAPM's Security Market Line. The APT, unlike the CAPM, permits a stock's return to be a function of multiple factors.

The realised rate of return equation in APT, which represents the **return generating function** is as follows:

$$R_i = E(R_i) + (F_1 - E(F_1))\beta_{1i} + \dots + (F_j - E(F_j))\beta_{ji} + e_i \quad (9.19)$$

where  $R_i$  is the realised rate of return on stock  $i$ ,  $E(R_i)$  is the expected rate of return on stock  $i$ ,  $F_j$  is the realised value of economic factor  $j$ ,  $E(F_j)$  is the expected value of economic factor  $j$ ,  $\beta_{ij}$  is the sensitivity of stock  $i$  to economic factor  $j$ , and  $e_i$  is a random term that reflects the effect of unique events on stock  $i$ .

Thus, the realised return on any stock is equal to the expected return on the stock *plus* increments or decrements that depend on unexpected

changes in fundamental economic factors times the sensitivity of the stock to these changes *plus* a random term.

To illustrate the APT, assume that there are three risk factors that determine the returns on all stocks: inflation, gross domestic production, and the aggregate degree of risk aversion (measured as the spread between the yields of low-grade bonds and treasury bonds). Further, assume the following:

- $R_f$ , the risk-free rate, is 8%.
- $E(R_1)$ , the expected rate of return on a portfolio with unit sensitivity to inflation ( $\beta_{P1} = 1.0$ ), and zero sensitivities to GDP and degree of risk aversion, is 14%.
- $E(R_2)$ , the expected rate of return on a portfolio with unit sensitivity to GDP ( $\beta_{P2} = 1.0$ ), and zero sensitivities to inflation and degree of risk aversion, is 12%.
- $E(R_3)$ , the expected rate of return on a portfolio with unit sensitivity to degree of risk aversion ( $\beta_{P3} = 1.0$ ), and zero sensitivities to inflation and GDP, is 7%.

Now consider two stocks, A and B, with the following factor sensitivities.

	Sensitivity to Factor		
	Inflation	GDP	Degree of Risk Aversion
Stock A	0.8	1.3	-0.6
Stock B	0.6	0.7	-0.8

The expected rate of return on stocks A and B would be as follows:

$$\text{Stock A: } E(R_A) = 8\% + (14\% - 8\%) 0.8 + (12\% - 8\%) 1.3 + (7\% - 8\%) (-0.6) = 18.6\%$$

$$\text{Stock B: } E(R_B) = 8\% + (14\% - 8\%) 0.6 + (12\% - 8\%) 0.7 + (7\% - 8\%) (-0.8) = 15.2\%$$

APT is theoretically superior to CAPM in several ways:

- (i) APT allows for several economic factors to determine individual stock returns, whereas the CAPM assumes that the effect of all factors, barring those unique to the firm, is captured in a single measure, viz., the volatility of the stock in relation to the market portfolio.
- (ii) APT makes fewer assumptions unlike the CAPM; it does not require the following assumptions:
  - the utility functions of investors are quadratic;
  - security returns are normally distributed;
  - all investors hold the market portfolio;
  - the market portfolio comprising of all risky assets is mean-variance efficient.

The APT only assumes that the capital market is perfectly competitive and that investors always prefer more wealth to less wealth with certainty.

Comparison of CAPM and APT		
	CAPM	APT
Nature of relation	Linear	Linear
Number of risk factors	1	$j$
Factor risk premium	$[E(R_M) - R_f]$	$[E(R_i) - R_f]$
Factor risk sensitivity	$\beta_i$	$\beta_{ij}$
Zero-beta return	$R_f$	$R_f$

**Empirical Evidence** Unlike the CAPM, the APT does not specify *a priori* what the underlying risk factors are. So, a test of APT calls for first discovering the basic risk factors by employing multivariate techniques like factor analysis and then examining whether these basic risk factors correspond to some economic or behavioural variables.

Empirical studies of this kind so far suggest that there is hardly any consistency in terms of (i) the number of basic factors, (ii) the interpretation that may be put on these factors (typically, the factors identified are artificial constructs representing several economic variables), and (iii) the stability of these factors from test to test.

## Multifactor Models

Given the practical difficulties in using the above approach, researchers have followed a different approach that captures the essence of the APT. In this approach, the researcher chooses *a priori* the exact number and identity of risk factors and specifies the **multifactor model** of the following kind.

$$R_{it} = a_i + [ b_{i1} F_{1t} + b_{i2} F_{2t} + \dots + b_{ik} F_{kt} ] + e_{it} \quad (9.20)$$

where  $R_{it}$  is the return on security  $i$  in period  $t$ ,  $F_{jt}$  is the return associated with the  $j$ th risk factor in period  $t$ ,  $b_{it}$  is the sensitivity of return on security  $i$  to factor  $j$ .

The advantage of a factor model like this is that the researcher can specify the risk factors; the disadvantage of such a model is that there is very little theory to guide it. Hence, developing a useful factor model is as much an art as science.

The variety of multifactor models employed in practice may be divided into two broad categories: macro-economic based risk factor models and micro-economic based risk factor models.

**Macroeconomic Based Risk Factor Models** These models consider risk factors that are macroeconomic in nature. Typical of such approach is the following model proposed by Chen, Roll, and Ross in their classic paper, "Economic Forces and the Stock Market," published in the April 1986 issue of *Journal of Business*.

$$R_{it} = a_i + b_{i1} R_m + b_{i2} MP_t + b_{i3} DEI_t + b_{i4} UI_t + b_{i5} UPR_t + b_{i6} UTS_t + e_{it} \quad (9.21)$$

where  $R_m$  is the return on a value weighted index of NYSE – listed stocks,  $MP$  is the monthly growth rate in the US industrial production,  $DEI$  is the change in inflation, measured by the US consumer price index,  $UI$  is the difference between actual and expected levels of inflation,  $UPR$  is the unanticipated change in the bond credit spread (Baa yield – RFR), and  $UTS$  is the unanticipated term structure shift (long term RFR – short term RFR).

**Microeconomic Based Risk Factor Models** Instead of specifying risk in macroeconomic terms, you can delineate risk in microeconomic terms. Typical of this approach is the following model proposed by Fama and French in their celebrated paper "Common Risk Factors in the Returns

on Stocks and Bonds," published in the January 1993 issue of the *Journal of Financial Economics*:

$$(R_{it} - RFR_t) = \alpha_i + b_{i1}(R_{mt} - RFR_t) + b_{i2}SMB_t + b_{i3}HML_t + e_{it} \quad (9.22)$$

In this model, in addition to  $(R_{mt} - RFR_t)$ , the excess return on a stock market portfolio, there are two other microeconomic risk factors:  $SMB_t$  and  $HML_t$ .  $SMB_t$  (i.e., small minus big) is the return on a portfolio of small capitalisation stocks less the return on a portfolio of large capitalisation stocks and  $HML_t$  (i.e., high minus low) is the return on a portfolio of stocks with high ratios of book-to-market values less the return on a portfolio of low book-to-market value stocks.

In this model,  $SMB$  is intended to capture the risk associated with firm size while  $HML$  is meant to reflect risk differentials associated with "value" (i.e., high book-to-market ratio) and "growth" (i.e., low book-to-market ratio) stocks.

**Choice of Model** Compared to the CAPM, multifactor models explain past returns better. However, when it comes to predicting expected returns, the evidence is ambiguous. It appears that the gains from having multiple factors are offset by the errors committed in estimating the factor loadings and the factor betas. The widespread use of the CAPM stems from its intuitive appeal and its simplicity.

## SUMMARY

- Covariance and correlation are conceptually analogous in the sense that both of them reflect the degree of comovement between the variables.
- The standard deviation of a two-security portfolio is:

$$\sigma_p = [w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{12}\sigma_1\sigma_2]^{1/2}$$

- The standard deviation of an  $n$ -security portfolio is:

$$\sigma_p = [\sum \sum w_i w_j \rho_{ij} \sigma_i \sigma_j]^{1/2}$$

- A portfolio is efficient if (and only if) there is no alternative with (i) the same  $E(R_p)$  and a lower  $\sigma_p$  or (ii) the same  $\sigma_p$  and a higher  $E(R_p)$  or (iii) a higher  $E(R_p)$  and a lower  $\sigma_p$ .
- Each person has a map of indifference curves. All the points lying on a given indifference curve offer the same level of satisfaction.
- Given the efficient frontier and the risk-return indifference curves, the optimal portfolio is found at the tangency between the efficient frontier and a utility

indifference curve.

- If lending and borrowing can be done at the risk-free rate, the efficient frontier is simply the straight line from the risk-free rate which is tangential to the broken-egg shaped feasible region.
- The **capital market line** equation is:  $E(R_i) = R_f + \lambda\sigma_j$
- The **security market line** equation is:  $E(R_i) = R_f + [E(R_M) - R_f] \beta_i$
- The empirical evidence in favour of the **Capital Asset Pricing Model (CAPM)** is mixed. Yet, the CAPM is the most widely used risk return model because it is simple and intuitively appealing and its basic message that diversifiable risk does not matter is accepted by nearly everyone.
- The **Arbitrage Pricing Theory (APT)** assumes that the return on any stock is linearly related to a set of systematic factors:

$$R_i = E(R_i) + (F_1 - E(F_1))\beta_{i1} + \dots + (F_j - E(F_j))\beta_{ij} + e_i$$

- The equilibrium relationship according to APT is

$$E(R_i) = R_f + (E(R_1) - R_f)\beta_{i1} + \dots + (E(R_j) - R_f)\beta_{ij}$$

- The APT does not **a priori** specify what the underlying risk factors are. A **multifactor model**, on the other hand, chooses **a priori** the exact number and identity of risk factors.
- The variety of multifactor models employed in practice fall into two categories: **macro-economic based risk factor models** and **micro-economic based risk factor models**.

## QUESTIONS

1. What is the risk of a 2-security portfolio?  $n$ -security portfolio?
2. What is covariance? coefficient of correlation?
3. What is an efficient portfolio?
4. Explain the nature of a risk-return indifference curve.
5. What is the efficient frontier, when investors can lend or borrow at the risk-free rate?
6. State the assumptions underlying the CAPM.
7. What is the capital market line? Security market Line?
8. What is the empirical evidence on the CAPM?
9. Define the return-generating process and the equilibrium risk-return relationship as per the APT.
10. What is a multifactor model? Describe the types of multifactor models used in practice?

## SOLVED PROBLEMS

9.1 The returns on two assets under four possible states of nature are given below:

<i>State of nature</i>	<i>Probability</i>	<i>Return on asset 1</i>	<i>Return on asset 2</i>
1	0.10	5%	0%
2	0.30	10%	8%
3	0.50	15%	18%
4	0.10	20%	26%

- (a) What is the standard deviation of the return on asset 1? asset 2?
- (b) What is the covariance between the returns on assets 1 and 2?
- (c) What is the coefficient of correlation between the returns on assets 1 and 2?

*Solution:*

- (a) The expected return on assets 1 and 2 is:

$$\begin{aligned} E(R_1) &= 0.1 (5\%) + 0.3 (10\%) + 0.5 (15\%) + 0.1 (20\%) \\ &= 13\% \end{aligned}$$

$$\begin{aligned} E(R_2) &= 0.1 (0\%) + 0.3 (8\%) + 0.5 (18\%) + 0.1 (26\%) \\ &= 14\% \end{aligned}$$

The standard deviation of the returns on assets 1 and 2 are

$$\begin{aligned} \sigma_1 &= [0.1 (5 - 13)^2 + 0.3 (10 - 13)^2 + 0.5 (15 - 13)^2 + 0.1 (20 - 13)^2]^{1/2} = 4\% \\ \sigma_2 &= [0.1 (0 - 14)^2 + 0.3 (8 - 14)^2 + 0.5 (18 - 14)^2 + 0.1 (26 - 14)^2]^{1/2} \\ &= [19.6 + 10.8 + 8 + 14.4]^{1/2} = 7.27\% \end{aligned}$$

- (b) The covariance between the returns on assets 1 and 2 is calculated below

<i>State of nature</i>	<i>Probability</i>	<i>Return of asset 1</i>	<i>Deviation of the return on asset 1 from its mean</i>	<i>Return on asset 2</i>	<i>Deviation of the return on asset 2 from its mean</i>	<i>Product of deviations times Probability</i>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	0.10	5%	-8%	0%	-14%	11.2
2	0.30	10%	-3%	8%	-6%	5.4
3	0.50	15%	2%	18%	4%	4
4	0.10	20%	7%	26%	12%	8.4
						Sum = 29.0

Thus the covariance between the returns of the two assets is 29.0

- (c) The coefficient of correlation between the returns on assets 1 and 2 is:

$$\frac{\text{Covariance}_{12}}{\sigma_1 \times \sigma_2} = \frac{29}{4 \times 7.27} = 0.997$$

9.2 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  $\rho_{12} = 0.4$ ,  $\rho_{13} = 0.6$ ,  $\rho_{23} = 0.7$ . What is the standard deviation of portfolio return?

*Solution:*

$$\begin{aligned}\sigma_p &= [w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + 2 w_1 w_2 \rho_{12} \sigma_1 \sigma_2 + 2 w_1 w_3 \rho_{13} \sigma_1 \sigma_3 + 2 w_2 w_3 \rho_{23} \sigma_2 \sigma_3]^{1/2} \\ &= [0.3^2 \times 6^2 + 0.5^2 \times 9^2 + 0.2^2 \times 10^2 + 2 \times 0.3 \times 0.5 \times 0.4 \times 6 \times 9 + 2 \times 0.3 \times 0.2 \times 0.6 \times 6 \times 10 + 2 \times 0.5 \times 0.2 \times 0.7 \times 9 \times 10]^{1/2} \\ &= [3.24 + 20.25 + 4 + 6.48 + 4.32 + 12.6]^{1/2} = 7.13\%\end{aligned}$$

9.3 The following information is available.

	Stock A	Stock B
Expected return	16%	12%
Standard deviation	15%	8%
Coefficient of correlation		0.60

- (a) What is the covariance between stocks A and B?
- (b) What is the expected return and risk of a portfolio in which A and B have weights of 0.6 and 0.4?

*Solution:*

$$\begin{aligned}(a) \text{ Covariance } (A,B) &= \rho_{AB} \times \sigma_A \times \sigma_B \\ &= 0.60 \times 15 \times 8 = 72 \\ (b) \text{ Expected return} &= 0.6 \times 16 + 0.4 \times 12 = 14.4\% \\ \text{Risk (standard deviation)} &= [w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2 \text{Cov}(A,B)]^{1/2} \\ &= [0.6^2 \times 225 + 0.4^2 \times 64 + 272]^{1/2} \\ &= 15.34\%\end{aligned}$$

9.4 The following table gives an analyst's expected return on two stocks for particular market returns:

Market Return	Aggressive Stock	Defensive Stock
6%	2%	8%
20	30	16

- (a) What are the betas of the two stocks?
- (b) What is the expected return on each stock if the market return is equally likely to be 6% or 20%?
- (c) If the risk-free rate is 7% and the market return is equally likely to be 6% or 20% what is the SML?
- (d) What are the alphas of the two stocks?

*Solution:*

- (a) The betas of the two stocks are:

$$\text{Aggressive stock} = \frac{30\% - 2\%}{20\% - 6\%} = 2$$

$$\text{Defensive stock} = \frac{16\% - 8\%}{20\% - 6\%} = 0.571$$

- (b) The expected return on the two stocks are:

$$\text{Aggressive stock : } 0.5 \times 2\% + 0.5 \times 30\% = 16\%$$

$$\text{Defensive stock : } 0.5 \times 8\% + 0.5 \times 16\% = 12\%$$

- (c) The expected return on the market portfolio is:

$$0.5 \times 6\% + 0.5 \times 20\% = 13\%$$

Since the risk-free rate is 7%, the market risk premium is:  $13\% - 7\% = 6\%$

So, the SML is:

$$\text{Required return}_i = 7\% + \beta_i \times 6\%$$

- (d) The alphas of the two stocks are calculated below

*Stock A*

$$\text{Expected return} = 16\%$$

$$\text{Beta} = 2$$

$$\text{Required return} = 7\% + 2 \times 6\% = 19\%$$

$$\text{Alpha} = 16\% - 19\% = -3\%$$

*Stock B*

$$\text{Expected return} = 12\%$$

$$\text{Beta} = 0.571$$

$$\text{Required return} = 7\% + 0.571 \times 6\% = 10.426\%$$

$$\text{Alpha} = 12\% - 10.426\% = 1.574\%$$

## PROBLEMS

- 9.1 Correlation** The returns on two assets under four possible states of nature are given below:

<i>State of nature</i>	<i>Probability</i>	<i>Return on asset 1</i>	<i>Return on asset 2</i>
1	0.20	-5%	10%
2	0.30	15%	12%
3	0.40	18%	14%
4	0.10	22%	18%

- (a) What is the standard deviation of the return on asset 1 and on asset 2?
- (b) What is the covariance between the returns on assets 1 and 2?
- (c) What is the coefficient of correlation between the returns on assets 1 and 2?

- 9.2 Portfolio Return** The returns on 4 stocks, *A*, *B*, *C*, and *D* over a period of 6 years have been as follows:

	1	2	3	4	5	6
A	10%	12%	-8%	15%	-2%	20%
B	8%	4%	15%	12%	10%	6%
C	7%	8%	12%	9%	6%	12%
D	9%	9%	11%	4%	8%	16%

Calculate the return on:

- (a) portfolio of one stock at a time
- (b) portfolios of two stocks at a time
- (c) portfolios of three stocks at a time
- (d) a portfolio of all the four stocks

Assume equiproportional investment.

**9.3 Portfolio Standard Deviation** A portfolio consists of 4 securities, 1, 2, 3, and 4. The proportions of these securities are:  $w_1 = 0.2$ ,  $w_2 = 0.3$ ,  $w_3 = 0.4$ , and  $w_4 = 0.1$ . The standard deviations of returns on these securities (in percentage terms) are :  $\sigma_1 = 4$ ,  $\sigma_2 = 8$ ,  $\sigma_3 = 20$ , and  $\sigma_4 = 10$ . The correlation coefficients among security returns are:  $\rho_{12} = 0.3$ ,  $\rho_{13} = 0.5$ ,  $\rho_{14} = 0.2$ ,  $\rho_{23} = 0.6$ ,  $\rho_{24} = 0.8$ , and  $\rho_{34} = 0.4$ . What is the standard deviation of portfolio return?

**9.4 Correlation** Stock P and Q will provide the following returns under different states of the economy.

<i>State of Economy</i>	<i>Probability</i>	<i>Return on Stock P</i>	<i>Return on Stock Q</i>
Bear	0.3	-4%	12%
Normal	0.4	14	17
Bull	0.3	26	6

What is the correlation between the two stocks?

**9.5 Portfolio Standard Deviation** Stock A has an expected return of 12 percent and a standard deviation of 2 percent per year. Stock B has an expected return of 15 percent and a standard deviation of 25 percent per year.

If the correlation between the returns of Stock A and Stock B is 0.4, what is the standard deviation of a portfolio comprising of A and B in equal proportions.

**9.6 Beta and CAPM** The risk-free rate is 8 percent and the expected return on the market portfolio is 14 percent. A portfolio that comprises the risk-free security and the market portfolio has an expected return of 11 percent and a standard deviation of 12 percent.

What is the expected return on a security that has a correlation of 0.6 with the market portfolio and a standard deviation of 25 percent?

## MINICASE

You have recently graduated as a major in finance and have been hired as a financial planner by Radiant Securities, a financial services company. Your boss has assigned you the task of investing ₹ 1,000,000 for a client who has a 1-year investment horizon. You have been asked to consider only the following investment alternatives: T-bills, stock A, stock B, stock C, and market index.

The economics cell of Radiant Securities has developed the probability distribution for the state of the economy and the equity researchers of Radiant Securities have estimated the rates of return under each state of the economy. You have gathered the following information from them:

Returns on Alternative Investments						
<i>State of the Economy</i>	<i>Probability</i>	T-Bills	Stock A	Stock B	Stock C	<i>Market Portfolio</i>
■ Recession	0.2	6.0%	(15.0%)	30.0%	(5.0%)	(10.0%)
■ Normal	0.5	6.0	20.0	5.0	15.0	16.0
■ Boom	0.3	6.0	40.0	(15.0)	25.0	30.0

Your client is a very curious investor who has heard a lot relating to portfolio theory and asset pricing theory. He requests you to answer the following question:

- (a) What is the expected return and the standard deviation of return for stocks A, B, C, and the market portfolio?
- (b) What is the covariance between the returns on A and B? Returns on A and C?
- (c) What is the coefficient of correlation between the returns on A and B? Returns on A and C?
- (d) What is the expected return and standard deviation on a portfolio in which stocks A and B are equally weighted? In which the weights assigned to stocks A, B, and C are 0.4, 0.4, and 0.2 respectively?
- (e) The beta coefficients for the various alternatives, based on historical analysis, are as follows:

<i>Security</i>	<i>Beta</i>
T-bills	0.00
A	1.20
B	(0.70)
C	0.90

- (i) What is the SML relationship?
- (ii) What is the alpha for stocks A, B, and C?
- (f) Suppose the following historical returns have been earned for the stock market and the stock of company D.

<i>Period</i>	<i>Market</i>	<i>D</i>
1	(5%)	(12%)
2	4	6

3	8	12
4	15	20
5	9	6

What is the beta for stock *D*? How would you interpret it?

- (g) What is Capital Market Line (CML)? Security Market Line (SML)?
- (h) What is the basic difference between the CAPM and the APT?

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter9/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter9/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Options and Their Valuation

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Define the key terms associated with options.
- ✓ Show the payoffs associated with call and put options.
- ✓ Discuss the factors that determine the value of options.
- ✓ Explain the binomial model for option valuation.
- ✓ Explain the Black-Scholes model for option valuation.

An option gives its owner the right to buy or sell an underlying asset on or before a given date at a fixed price. For example, you may enjoy the option to buy a certain apartment on or any time before December 31 of the current year at a price of ₹ 6 million.

There can be as many different option contracts as the number of items to buy or sell. Stock options, commodity options, foreign exchange options, and interest rate options are traded on and off organised exchanges across the globe.

Options belong to a broader class of assets called contingent claims. A contingent claim is an asset whose payoff in future depends on (or is contingent upon) the outcome of some uncertain event.

The most popular model for pricing options is the Black-Scholes model which was published in 1973, the year in which the Chicago Board of Options Exchange (CBOE), the first organised options exchange 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. Black- Scholes model is widely used by option traders. Such a rapid translation of theory to practice on such an extensive scale is perhaps without a precedent in the history of finance. The option pricing model has played an important role in advancing the frontiers of finance.

An understanding of the basic principles of option pricing is essential for every manager, for the following reasons: (a) Most projects permit managerial intervention in response to changing market conditions. Put differently, they have options embedded in them – these options are called “real options.” A basic understanding of financial options is helpful in managing the value inherent in “real options.” (b) Financial derivatives (options and futures) are used for managing risk. (c) Option pricing theory provides valuable insights in choosing the right capital structure. (d) An understanding of financial options is helpful in evaluating employee stock options.

This chapter describes how options work, discusses the payoffs of various types of options, explores the factors determining option values, and explains the binomial model and the Black-Scholes model.

## 10.1 ■ HOW OPTIONS WORK

An option is a special contract under which the option owner enjoys the right to buy or sell something without the obligation to do so. Options have a special terminology associated with them.

- The option to buy is a **call option** (or just call) and the option to sell is a **put option** (or just put).
- The **option holder** is the buyer of the option and the **option writer** is the seller of the option.
- The fixed price at which the option holder can buy and/or sell the underlying asset is called the **exercise price** or **strike price**.
- The date when the option expires or matures is referred to as the **expiration date** or **maturity date**. After the expiration date, the option is worthless.
- The act of buying or selling the underlying asset as per the option contract is called **exercising the option**.
- A **European option** can be exercised only on the expiration date whereas an **American option** can be exercised on or before the expiration date.
- Options traded on an exchange are called **exchange-traded options** and options not traded on an exchange are called **over-the-counter options**.
- Options are said to be **at the money** (ATM) or **in the money** (ITM) or **out of the money** (OTM) as shown below:

	<i>Call option</i>	<i>Put option</i>
ATM	Exercise price = Market price	Exercise price = Market price
ITM	Exercise price < Market price	Exercise price > Market price
OTM	Exercise price > Market price	Exercise price < Market price.

Exchange-traded options are standardised in terms of quantity, trading cycle, expiration date, strike prices, type of option, and mode of settlement. For example, option contracts on individual securities on the National Stock Exchange shall have a maximum of three-month trading cycle, shall expire

on the last Thursday of the month, shall be American style, and shall be cash settled. The lot size and the number of strike prices are stock specific.

[Exhibit 10.1](#) shows the quotations for call options and put options on Reliance Industries Limited drawn from the *Bhavcopy of NSE*.

The value of an option, if it were to expire immediately, is called its **intrinsic value**. The excess of the market price of any option over its intrinsic value is called the **time value of the option**. To illustrate, suppose the market price of a share is ₹ 260, the exercise price of a call option on the share is ₹ 250, and the market price of the call option is ₹ 15. In this case, the intrinsic value of the option is ₹ 10 (₹ 260 – ₹ 250) and the time value of the option is ₹ 5 (₹ 15 – ₹ 10).

## Exhibit

### Call Options on NSE

1  
0  
-  
1

Instrument	Symbol	Expiry _DT	Strike _PR	Option _TYP	Open	High	Low	Close	Settle _PR	Contr-acts	Val_in-LAKH	Open_INT	Chg_in_OI	Time Stamp
OPTSTK	RELIANCE	27-Sep-18	1300	CE	16.8	20.75	12.4	12.95	12.95	9309	122498.28	3093000	769000	3-Sep-18
OPTSTK	RELIANCE	27-Sep-18	1400	CE	3.95	4.85	3.15	3.35	3.35	3014	42311.21	2351000	419000	3-Sep-18
OPTSTK	RELIANCE	27-Sep-18	1180	PE	8.75	11.95	6.35	11.2	11.2	3455	41088.22	853000	404000	3-Sep-18
OPTSTK	RELIANCE	27-Sep-18	1200	PE	14.85	17.4	9.6	16.45	16.45	6601	80102.5	1508000	372000	3-Sep-18
OPTSTK	RELIANCE	25-Oct-18	1260	CE	53.55	57	48	48	48	10	131.3	50000	-1000	3-Sep-18
OPTSTK	RELIANCE	25-Oct-18	1400	CE	13.75	15.7	10.9	11	11	310	4382.88	334000	231000	3-Sep-18
OPTSTK	RELIANCE	25-Oct-18	1100	PE	8	8	7.5	7.95	7.95	14	155.11	14000	14000	3-Sep-18
OPTSTK	RELIANCE	25-Oct-18	1200	PE	24.65	30	24.7	30	30	5	61.36	9000	3000	3-Sep-18
OPTSTK	RELIANCE	29-Nov-18	1300	CE	41	43.55	41	42.05	42.05	40	536.82	40000	40000	3-Sep-18

## **10.2 ■ OPTIONS AND THEIR PAYOFFS JUST BEFORE EXPIRATION**

This section looks at the features of European call and put options and their payoffs just before expiration, from the point of view of the option holder as well as the option writer. In addition, it discusses combination options.

## Call Option

The most common type of option, the *call option*, gives the option holder the right to buy an asset at a fixed price during a certain period. While there is no restriction on the kind of asset, the most popular type of call option is the option on stocks. For example, investors can buy call options on Infosys stock (and many other stocks) on the National Stock Exchange. A typical call option on Infosys stock entitles the investor to buy 100 shares of Infosys on or before say July 28, 20X0 at an exercise price of ₹ Y. Such an option is valuable if there is some likelihood that the price of the common (equity) stock of Infosys will rise above ₹ Y on or before July 28, 20X0. To provide protection to the option holder, the option contract generally specifies that the exercise price and the number of shares will be adjusted for stock splits and stock dividends. For example, if the Infosys stock splits 2 to 1, the option contract will be for 200 shares at an exercise price of ₹ Y/2. Of course, no adjustment is made for cash dividends. Remember that the holder of a call option is not entitled to receive cash dividends.

**Payoff of a Call Option** What is the payoff of a European call option? To answer this question let us look at the possible payoffs of the call option just before expiration<sup>1</sup>. The payoff of the call option ( $C$ ) just before expiration depends on the relationship between the stock price ( $S_1$ ) and the exercise price ( $E$ ). Formally

$$C = S_1 - E \text{ if } S_1 > E \quad (10.1)$$

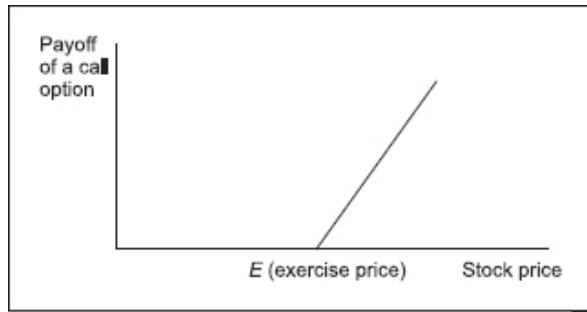
$$C = 0 \text{ if } S_1 \leq E \quad (10.2)$$

This means  $C = \text{Max}(S_1 - E, 0)$ . [Exhibit 10.2](#) shows graphically the value of call option. When  $S_1 \leq E$ , the call is said to be “out of money” and is worthless. When  $S_1 > E$ , the call is said to be “in the money” and its value is  $S_1 - E$ .

## Put Option

The opposite of a call option is a *put option*. While the call option gives the holder the right to buy a stock at a fixed price, the put option gives the holder the right to sell a stock at a fixed price. For example, a put option on the Infosys stock may give its holder the right to sell 100 shares of Infosys on or before July 28, 20X0 at a price of ₹ Y per share. Such an option is valuable if there is some possibility that the price of Infosys stock will fall below ₹ Y per share on or before July 28, 20X0.

### Exhibit 10.2 Payoff of a Call Option

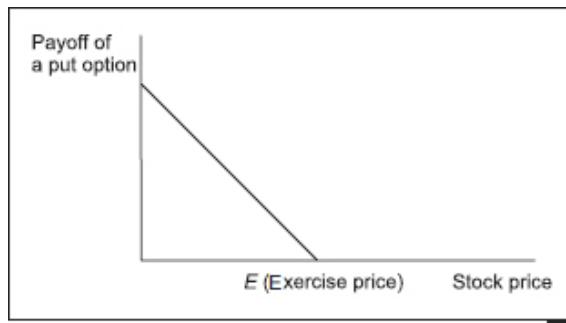


**Payoff of a Put Option** The payoff of a put just before expiration depends on the relationship between the exercise price ( $E$ ) and the price of the underlying stock ( $S_1$ ). If  $S_1 < E$ , the put option has a value of  $S_1 - E$ , and is said to be “in the money”. On the other hand if  $S_1 \leq E$ , the put option is worthless and is said to be “out of money”. Thus the payoff of a put option just before expiration is:

Value of the put option	If $S_1 < E$	If $S_1 \leq E$
	$E - S_1$	0

Put differently, just before expiration the payoff of a put option is  $\text{Max}(E - S_1, 0)$ . [Exhibit 10.3](#) plots the relationship between the value of the underlying stock and the payoff of the put option.

### **Exhibit 10.3 | Payoff of a Put Option**



## Seller's Position

We discussed the payoff of call and put options from the point of view of the option buyer (or holder). Let us now look at the options from the point of view of the option writer (or seller).

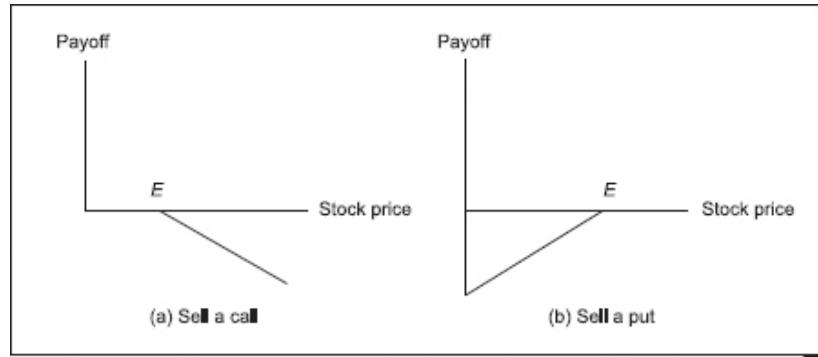
A writer of a call option collects the option premium from the buyer (holder) of the option. In return, he is obliged to deliver the shares, should the option buyer exercise the option. If the stock price ( $S_1$ ) is less than the exercise price ( $E$ ) on the expiration date, the option holder will not exercise the option. In this case, the option writer's liability is nil. On the other hand, if the stock price ( $S_1$ ) is more than the exercise price ( $E$ ), the option holder will exercise the option. Hence the option writer loses  $S_1 - E$ .

What is the payoff from the point of view of the seller (or writer) of a put option? If the price of the stock ( $S_1$ ) is equal to or more than the exercise price ( $E$ ), the holder of the put option will not exercise the option. Hence the option writer's liability is nil. On the other hand, if  $S_1 < E$ , the holder of the put option will exercise the option. Hence the option writer loses  $E - S_1$ . The payoffs for “selling a call” and “selling a put” from the seller’s point of view are plotted in [Exhibit 10.4](#).

## Combinations

Puts and calls represent basic options. They serve as building blocks for developing more complex options. [Exhibit 10.5](#) shows the payoff for a combination of (i) buying a stock and (ii) buying a put option on the stock.

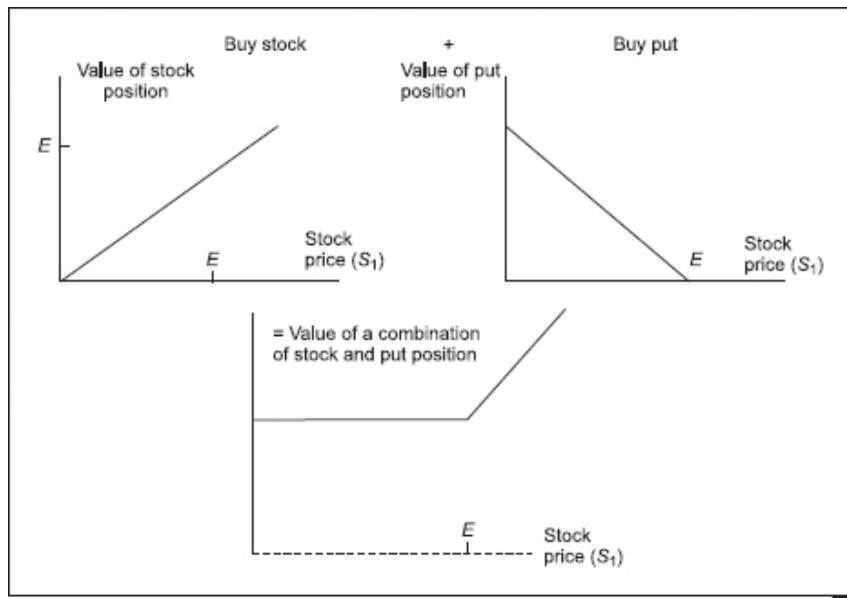
### Exhibit 10.4 Payoffs to the Seller of Options



The algebra corresponding to this combination is as follows:

Payoffs Just Before Expiration Date		
	If $S_1 < E$	If $S_1 > E$
(1) Put option	$E - S_1$	0
+		
(2) Equity stock	$S_1$	$S_1$
= Combination	$E$	$S_1$

## Exhibit 10.5 | Payoffs of a Combination of Buying Equity and Put Option



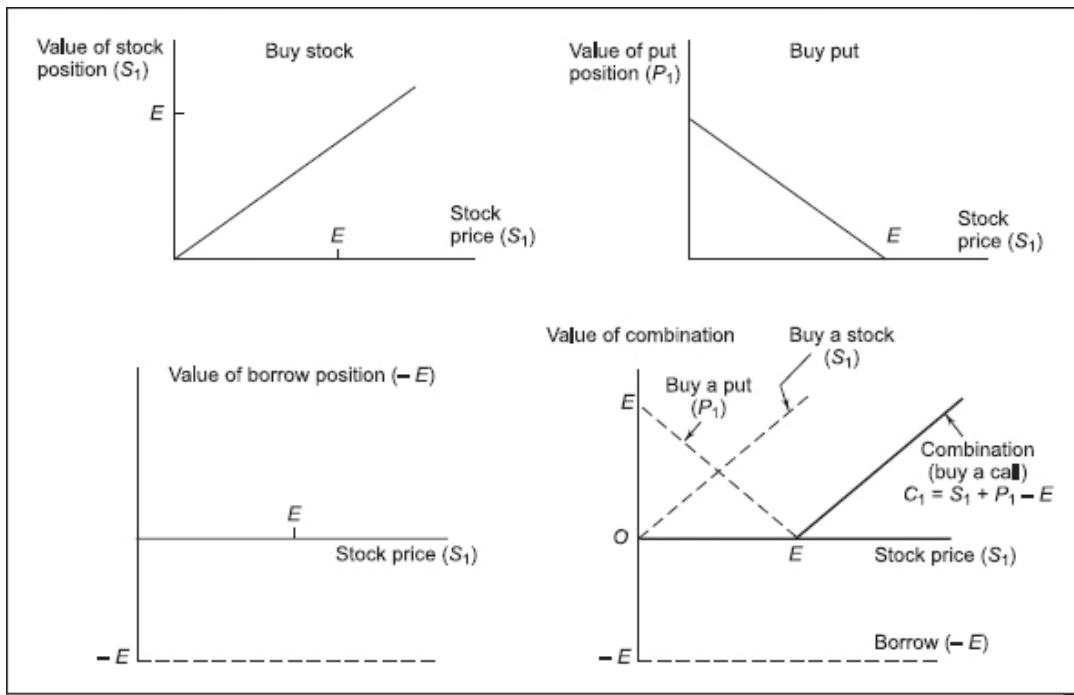
Thus, if you buy a stock along with a put option on that stock (exercisable at price  $E$ ), your payoff will be  $E$  if the price of the stock is less than  $E$ ; otherwise your payoff will be  $S_1$ .

Consider a more complex combination that consists of (i) buying a stock, (ii) buying a put option on that stock, and (iii) borrowing an amount equal to the exercise price. The payoff from this combination is identical to the payoff from buying a call option. The algebra of this equivalence is shown as follows:

	Payoffs Just Before Expiration Date	
	If $S_1 < E$	If $S_1 > E$
(1) Buy the equity stock	$S_1$	$S_1$
(2) Buy a put option	$E - S_1$	0
(3) Borrow an amount equal to the exercise price	- $E$	- $E$
(1) + (2) + (3) = Buy a call option	0	$S_1 - E$

The payoffs from the individual components and the combination are shown in [Exhibit 10.6](#).

## Exhibit 10.6 | Graphical Representation of the Put Call Parity Theorem



If  $C_1$  is the terminal value of the call option (remember that  $C_1 = \text{Max}(S_1 - E, 0)$ ),  $P_1$  the terminal value of the put option (remember that  $P_1 = \text{Max}(E - S_1, 0)$ ),  $S_1$  the price of the stock, and  $E$  the amount borrowed, we know from the preceding analysis that:

$$C_1 = S_1 + P_1 - E \quad (10.3)$$

This is referred to as the **put-call parity theorem**.

## **10.3 ■ FACTORS DETERMINING OPTION VALUES**

In the previous section, we looked at the payoffs of options just before the expiration date. Now we determine the current value of European options.

## Boundaries

Before we identify the factors determining option values, it is helpful to specify the boundaries within which the value of an option falls.

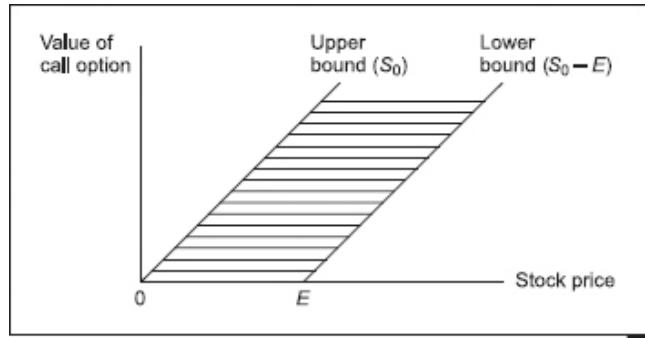
The minimum value at which a call option sells before the expiration date, say, at time zero, is  $\text{Max}(0, S_0 - E)$ . This means that  $C_0$ , the value of a call option, can never fall below zero (this happens when  $S_0 < E$ ). Also, it means that the value of a call option cannot fall below  $S_0 - E$  (this happens when  $S_0 > E$ ). To see why this is so, consider a call option with  $E = 150$ ,  $S_0 = 250$ , and  $C_0 = 75$ . In this case it pays an investor to buy the call option for 75, exercise it for 150, and finally sell the stock for 250. By doing so he earns a profit of:

$$S_0 - (C_0 + E) = 250 - (75 + 150) = 25$$

This profit, reflecting arbitrage profit, comes without incurring any risk or cost. Such a profit cannot occur in a well functioning financial market. Hence in such a market  $C_0$  cannot sell for less than  $S_0 - E$ .

What is the upper limit for the option price? A call option entitles the holder to buy the underlying stock on payment of a certain exercise price. Hence its value cannot be greater than that of the underlying stock. If it were so, the investor would be better off by buying the stock directly. The upper and lower bounds for the value of a call option are shown in [Exhibit 10.7](#).

### Exhibit 10.7 | Upper and Lower Bounds for the Value of Call Option



## Key Factors

As indicated above, the price of a call option must fall in the shaded region of [Exhibit 10.7](#). Put formally,

$$\text{Max}(S_0 - E, 0) \leq C_0 \leq S_0 \quad (10.4)$$

Where exactly in the shaded region will the value of a call option be? The precise location of the option value depends on five key factors:

- Exercise price
- Expiration date
- Stock price
- Stock price variability
- Interest rate.

**Exercise Price** By now it is obvious that, other things being constant, the higher the exercise price the lower the value of the call option. Remember that the value of a call option can never be negative, regardless of how high the exercise price is set. Further it has a positive value if there is some possibility that the stock price will be higher than the exercise price before the expiration date.

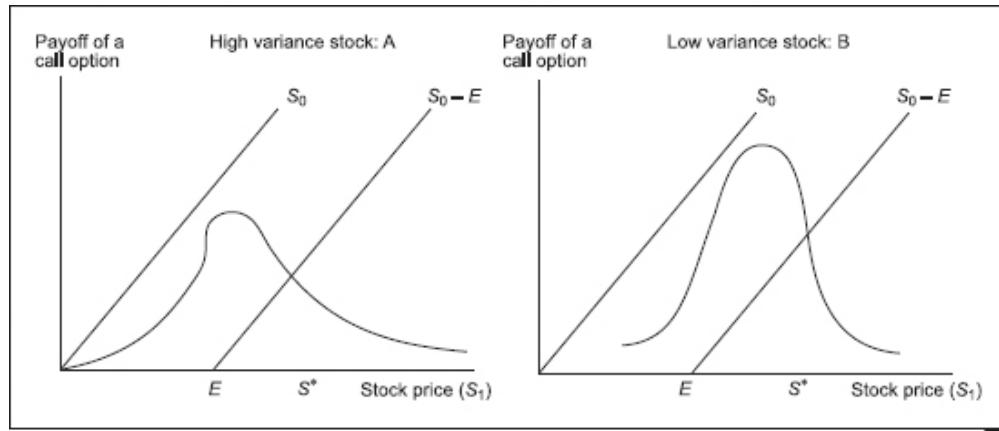
**Expiration Date** Other things being equal, the longer the time to expiration date the more valuable the call option. Consider two American calls with maturities of one year and two years. The two-year call obviously is more valuable than the one-year call because it gives its holder one more year within which it can be exercised.

**Stock Price** The value of a call option, other things being constant, increases with the stock price. This point is obvious from the figures showing the relationship between the stock price and the value of call option.

**Variability of the Stock Price** A call option has value when there is a possibility that the stock price exceeds the exercise price before the expiration date. Other things being equal, the higher the variability of the stock price, the greater the likelihood that the stock price will exceed the exercise price. This point is graphically illustrated in [Exhibit 10.8](#).

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## Exhibit 10.8 | Value of Call Options for Low Variability and High Variability Stocks



In this figure the price distribution of two stocks, *A* and *B*, is given. While both *A* and *B* have the same expected value ( $S^*$ ), *A* has a higher variance than *B*. Given an exercise price of  $E$ , a call option on *A* is more valuable than that on *B*. This is so because the holder of a call option gains when the stock price exceeds the exercise price and does not lose when the stock price is less than the exercise price.

So fundamental is this point that it calls for another illustration. Consider the probability distribution of the price of two stocks, *P* and *Q*, just before the call option (with an exercise price of 80) on them expires.

<i>P</i>		<i>Q</i>	
Price	Probability	Price	Probability
60	0.5	50	0.5
80	0.5	90	0.5

While the expected price of stock *Q* is same as that of stock *P*, the variance of *Q* is higher than that of *P*. The call option (exercise price: 80) on stock *P* is worthless as there is no likelihood that the price of stock *P* will exceed 80. However, the call option on stock *Q* is valuable because there is a distinct possibility that the stock price will exceed the exercise price.

Remember that there is a basic difference between holding a stock and holding a call option on the stock. If you are a risk-averse investor you try to avoid buying a high variance stock, as it exposes you to the possibility of negative returns. However, you will like to buy a call option on that stock because you receive the profit from the right tail of the probability distribution, while avoiding the loss on the left tail. Thus, regardless of your

risk disposition, you will find a high variance in the underlying stock desirable.

**Interest Rate** When you buy a call option you do not pay the exercise price until you decide to exercise the call option. Put differently, the payment, if any, is made in future. The higher the interest rate, the greater the benefit will be from delayed payment and vice versa. So the value of a call option is positively related to the interest rate.

## Functional Relationship

The manner in which the five variables discussed above influence the value of a call option is shown in the following relationship:

$$C_0 = f[S_0, E, \sigma^2, t, r_f]$$

+ - + + +

(10.5)

where  $C_0$  is the value of the call option,  $S_0$  is the price of the underlying stock (or asset),  $E$  is the exercise price,  $\sigma^2$  is the variance of the return on the underlying stock,  $t$  is the time left for expiration, and  $r_f$  is the risk-free interest rate.

The sign (+, -) put below a variable denotes the nature of its influence on the value of the call option. You must be eager to know the precise relationship between these variables and the value of call option. Fisher Black and Myron Scholes developed their celebrated option pricing model which expresses this relationship. Before we look at their model, it is helpful to understand the two-state or binomial option valuation model.

## 10.4 ■ BINOMIAL MODEL FOR OPTION VALUATION

The standard DCF (discounted cash flow) procedure involves two steps, viz., estimation of expected future cash flows and discounting of these cash flows using an appropriate cost of capital. There are problems in applying this procedure to option valuation. While it is difficult (though feasible) to estimate expected cash flows, it is impossible to determine the opportunity cost of capital because the risk of an option is virtually indeterminate as it changes every time the stock price varies.

Since options cannot be valued by the standard DCF method, financial economists struggled to develop a rigorous method for valuing options for many years. Finally, a real break through occurred when Fisher Black and Myron Scholes<sup>2</sup> published their famous model in 1973. The basic idea underlying their model is to set up a portfolio which imitates the call option in its payoff. The cost of such a portfolio, which is readily observed, must represent the value of the call option.

The key insight underlying the Black and Scholes model may be illustrated through a single-period binomial (or two-state) model. The following assumptions may be employed to develop this model.

- The stock, currently selling for  $S$ , can take two possible values next year,  $uS$  or  $dS$  ( $uS > dS$ )
- An amount of  $B$  can be borrowed or lent at a rate of  $r$  the risk-free rate. The interest factor  $(1 + r)$  may be represented, for the sake of simplicity, as  $R$ .
- The value of  $R$  is greater than  $d$  but smaller than  $u$  ( $d < R < u$ ). This condition ensures that there is no risk-free arbitrage opportunity.
- The exercise price is  $E$ .

The value of the call option, just before expiration, if the stock price goes up to  $uS$ , is

$$C_u = \text{Max}(uS - E, 0) \quad (10.6)$$

Likewise, the value of the call option, just before expiration, if the stock price goes down to  $dS$  is

$$C_d = \text{Max}(dS - E, 0) \quad (10.7)$$

Let us now set up a portfolio consisting of  $\Delta$  delta shares of the stock and  $B$  rupees of borrowing. Since this portfolio is set up in such a way that it

has a payoff identical to that of a call option at time 1, the following equations will be satisfied:

$$\text{Stock price rises: } \Delta uS - RB = C_u \quad (10.8)$$

$$\text{Stock price falls: } \Delta dS - RB = C_d \quad (10.9)$$

Solving Eqs. (10.8) and (10.9) for  $\Delta$  (also called the option delta) and  $B$ , we get

$$\Delta = \frac{C_u - C_d}{S(u - d)} = \frac{\text{Spread of possible option prices}}{\text{Spread of possible share prices}} \quad (10.10)$$

$$B = \frac{dC_u - uC_d}{(u - d)R} \quad (10.11)$$

Since the portfolio (consisting of  $\Delta$  shares and  $B$  debt) has the same payoff as that of a call option, the value of the call option is

$$C = \Delta S - B \quad (10.12)$$

Note that the value of option is found out by looking at the value of a portfolio of shares and loan that imitates the option in its payoff. So this may be referred to as the option equivalent calculation.

To illustrate the application of the binomial model consider the following data for Pioneer's stock:

$$S = 200, u = 1.4, d = 0.9$$

$$E = 220, r = 0.10, R = 1.10$$

$$C_u = \text{Max}(uS - E, 0) = \text{Max}(280 - 220, 0) = 60$$

$$C_d = \text{Max}(dS - E, 0) = \text{Max}(180 - 220, 0) = 0$$

Given the above data, we can get the values of  $\Delta$  and  $B$  by using Eqs. (10.10) and (10.11).

$$\Delta = \frac{C_u - C_d}{(u - d)S} = \frac{60}{0.5(200)} = 0.6$$

$$B = \frac{dC_u - uC_d}{(u - d)R} = \frac{0.9(60)}{0.5(1.10)} = 98.18$$

Thus the portfolio consists of 0.6 of a share plus a borrowing of 98.18 (entailing a repayment of  $98.18(1.1) = 108$  after one year). The identity of the payoffs of the portfolio and call option is shown below:

	<i>Portfolio</i>	<i>Call Option</i>
When $u$ occurs	$1.4 \leq 200 \leq 0.6 - 108 = 60$	$C_u = 60$
When $d$ occurs	$0.9 \leq 200 \leq 0.6 - 108 = 0$	$C_d = 0$

---

Given the equivalence of the call option and the portfolio, the value of the call option is:

$$C = \Delta S - B = 0.6 \leq 200 - 98.18 = 21.82$$

Note that we could establish the value of the call option without any idea about the probability that the stock would go up or come down. An optimistic investor may think that the probability of an upward move is high whereas a pessimistic investor may think that it is low. Yet the two will agree that the value of the call option is 21.82. Why? The answer lies in the fact that the current stock price of 200 already incorporates the views of the optimists as well as the pessimists. And the option value, in turn, depends on the stock price.

## Risk-Neutral Valuation

Why should the call option on Pioneer stock sell for ₹ 21.82? If the option price exceeds ₹ 21.82, you can make a certain profit by borrowing ₹ 98.18, selling a call option, and buying 0.6 of a share of Pioneer's stock. Likewise, if the option price is less than ₹ 21.82, you can make a certain profit by selling 0.6 of a share of Pioneer's stock, lending ₹ 98.18, and buying a call option. In either case you have an opportunity to make money without incurring any risk. Put differently, you have a money machine.

Since there cannot be a money machine, the equilibrium price of the call option is ₹ 21.82. Note that we established the equilibrium price of the call option without knowing anything about the attitude of investors toward risk. The price of the option does not depend on the investor attitude toward risk. It does not matter whether investors love risk or hate risk.

This suggests that there is an alternative method for valuing the option. In this alternative method, called the risk-neutral valuation method, we assume that investors are risk-neutral (indifferent to risk), calculate the expected future value of the option, and convert it into its present value by using the risk-free rate.

If investors are risk-neutral, the expected return on the equity stock of Pioneer must be equal to the risk-free rate.

$$\text{Expected return on Pioneer's stock} = 10 \text{ percent}$$

Since Pioneer's stock can either rise by 40 percent to 280 or fall by 10 percent to 180, we can calculate the probability of a price rise in the hypothetical risk-neutral world.

$$\text{Expected return} = [\text{Probability of rise} \times 40\%] + [(1 - \text{Probability of rise}) \times -10\%] = 10\%$$

Therefore the probability of rise is 0.40<sup>3</sup>. This is called the risk-neutral probability.

We know that if the stock price rises, the call option has a value of ₹ 60 and if the stock price falls the call option has a value of ₹ 0.

Hence, if investors are risk-neutral, the call option's expected future value is:

$$\begin{aligned} & \text{Probability of rise} \times ₹ 60 + (1 - \text{Probability of rise}) \times ₹ 0 \\ &= 0.40 \times ₹ 60 + 0.60 \times ₹ 0 = ₹ 24. \end{aligned}$$

The current value of the call option is the present value of the expected future value:

$$\frac{\text{Expected future value}}{1 + \text{Risk-free rate}} = \frac{\text{₹ } 24}{(1.10)} = \text{₹ } 21.82$$

Not surprisingly, this is exactly the answer we got by using the option equivalent method.

Thus, we have two ways of calculating the value of an option in the binomial world.

**Option Equivalent Method** Find a portfolio of shares and loan that imitates the option in its payoff. Since the two alternatives have identical payoffs in the future, they must command the same price today.

**Risk Neutral Method** Assume that investors are risk-neutral, so that the expected return on the stock is the same as the risk-free interest rate. Calculate the expected future value of the option and discount it at the risk-free interest rate.

## 10.5 ■ BLACK AND SCHOLES MODEL

The above analysis was based on the assumption that there were two possible values for the stock price at the end of one year. If we assume that there are two possible stock prices at the end of each 6-month period, the number of possible end-of-year prices increases. As the period is further shortened (from 6-months to 3-months or 1 month), we get more frequent changes in stock price and a wider range of possible end-of-year prices. Eventually, we would reach a situation where prices change more or less continuously, leading to a continuum of possible prices at the end of the year. Theoretically, even for this situation we could set up a portfolio which has a payoff identical to that of a call option. However, the composition of this portfolio will have to be changed continuously as the year progresses.

Calculating the value of such a portfolio and through that the value of the call option in such a situation appears to be an unwieldy task, but Black and Scholes developed a formula that does precisely that. Their formula is:

$$C_0 = S_0 N(d_1) - \frac{E}{e^{rt}} N(d_2) \quad (10.13)$$

where  $C_0$  is the equilibrium value of a call option now,  $S_0$  is the price of the stock now,  $E$  is the exercise price,  $e$  is the base of natural logarithm,  $r$  is the annualised continuously compounded risk-free interest rate,  $t$  is the length of time in years to the expiration date, and  $N(d)$  is the value of the cumulative normal density function.

$$d_1 = \frac{\ln(S_0/E) + (r + 1/2\sigma^2)t}{\sigma\sqrt{t}} \quad (10.14)$$

$$d_2 = \frac{\ln(S_0/E) + (r - 1/2\sigma^2)t}{\sigma\sqrt{t}} = d_1 - \sigma\sqrt{t} \quad (10.15)$$

where  $\ln$  is the natural logarithm and  $\sigma$  is the standard deviation of the continuously compounded annual rate of return on the stock.

Though one of the most complicated formulae in finance, it is one of the most practical. The formula has great appeal because four of the parameters, namely,  $S_0$ ,  $E$ ,  $r$ , and  $t$  are observable. Only one of the parameters, namely,  $\sigma^2$ , has to be estimated. Note that the value of a call option is affected by neither the risk aversion of the investor nor the expected return on the stock.

You may have guessed by now that the Black-Scholes model, like other important models in economics and finance, is based on a set of simplifying assumptions. Yes, you are right. The assumptions underlying the Black-Scholes model are as follows:

- The call option is the European option
- The stock price is continuous and is distributed lognormally
- There are no transaction costs and taxes
- There are no restrictions on or penalties for short selling
- The stock pays no dividend
- The risk-free interest rate is known and is constant.

These assumptions may appear very severe. However when some of them do not hold, a variant of the Black-Scholes model applies. Further, empirical studies indicate that the Black-Scholes model applies to American options as well.

Though the Black-Scholes model appears difficult it is fairly easy to apply. This may be illustrated with an example.

Consider the following data for a certain stock

- Price of stock now =  $S_0 = ₹ 60$
- Exercise price =  $E = ₹ 56$
- Standard deviation of continuously compounded annual returns =  $\sigma = 0.3$
- Years to maturity =  $t = 0.5$
- Interest rate per annum = 0.14

Applying the Black-Scholes model involves four steps:

*Step 1* Calculate  $d_1$  and  $d_2$

$$d_1 = \frac{\ln\left(\frac{S_0}{E}\right) + \left[r + \frac{\sigma^2}{2}\right]t}{\sigma\sqrt{t}}$$

$$= \frac{0.068993 + 0.0925}{0.2121} = \frac{0.161493}{0.2121} = 0.7614$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

$$= 0.7614 - 0.2121 = 0.5493$$

*Step 2* Find  $N(d_1)$  and  $N(d_2)$ .  $N(d_1)$  and  $N(d_2)$  represent the probabilities that a random variable that has a standardised normal distribution will assume values less than  $d_1$  and  $d_2$ . The simplest way to find  $N(d_1)$  and  $N(d_2)$  is to use the Excel function NORMSDIST.

$$N(d_1) = N(0.7614) = 0.7768$$

$$N(d_2) = N(0.5493) = 0.7086$$

If you don't have easy access to the Excel function NORMSDIST, you can get a very close approximation by using the Normal Distribution given in Table A.5 in [Appendix A](#) at the end of the book. The procedure for doing that may be illustrated with respect to  $N(0.7614)$  as follows:

1. 0.7614 lies between 0.75 and 0.80.
2. According to the table,  $N(0.75) = 1 - 0.2264$   
 $= 0.7736$  and  $N(0.80) = 1 - 0.2119 = 0.7881$
3. For a difference of 0.05 ( $0.80 - 0.75$ ) the cumulative probability increases by 0.0145 ( $0.7881 - 0.7736$ )
4. The difference between 0.7614 and 0.75 is 0.0114
5. So,  $N(0.7614) = N(0.75) + \frac{0.0114}{0.05} \times 0.0145 = 0.7736 + 0.0033 = 0.7769$

This value is indeed a close approximation for the true value 0.7768.

**Step 3** Estimate the present value of the exercise price, using continuous discounting principle

$$\frac{E}{e^{rt}} = \frac{\text{₹ } 56}{e^{0.14 \times 0.5}} = \text{₹ } 52.21$$

**Step 4** Plug the numbers obtained in the previous steps in the Black-Scholes formula

$$\begin{aligned} C_0 &= \text{₹ } 60 \times 0.7768 - \text{₹ } 52.21 \times 0.7086 \\ &= \text{₹ } 46.61 - \text{₹ } 37.00 = \text{₹ } 9.61 \end{aligned}$$

A **spreadsheet** calculation of the above is as under:

	A	B	C
1	Price of stock now $S_0$		60
2	Exercise price $E$		56
3	Standard deviation of continuously compounded annual return $\sigma$		0.3
4	Years to maturity $t$		0.5
5	Interest rate per annum $r$		0.14
6	$d_1 = (\ln(C1/C2)+(C5+(C3^2)/2)*C4)/(C3*(C4^0.5))$	0.7613	
7	$d_2 = C6 - C3*(C4^0.5)$	0.5492	
8	Equilibrium value of call option now $C_0 = C1*NORMSDIST(C6)-(C2/EXP(C5*C4))*NORMSDIST(C7)$	9.61	

**Value of Put Option** According to the put-call parity theorem, the value of put option is:

$$P_0 = C_0 - S + \frac{E}{e^{rt}} \quad (10.16)$$

Given the formula for  $C_0$  in [Eq. \(10.13\)](#),

$$\begin{aligned}
 P_0 &= S_0 N(d_1) - \frac{E}{e^{rt}} N(d_2) - S + \frac{E}{e^{rt}} \\
 &= S_0(N(d_1) - 1) + \frac{E}{e^{rt}} (1 - N(d_2))
 \end{aligned} \tag{10.17}$$

**Option Delta or Hedge Ratio** We discussed the concept of option delta ( $\Delta$ ) earlier. It is also called the hedge ratio. It is the change in the option price for a one rupee change in the share price. A call option has a positive hedge ratios,  $N(d_1)$ , as shown in Eq. (10.13), whereas a put option has a negative hedge ratio,  $(N(d_1) - 1)$ , as shown in Eq. (10.17).

**Implied Volatility** Black–Scholes formula requires five inputs:  $S_0$ ,  $E$ ,  $r$ ,  $t$ , and  $\sigma$ . Out of these, the first four ( $S_0$ ,  $E$ ,  $r$ ,  $t$ ) can be observed directly. Only  $\sigma$ , the volatility of the stock price, cannot be observed directly. Practitioners use two approaches to estimate  $\sigma$ . The first approach involves using historical data. The second approach involves ‘backing out’ the value of  $\sigma$  using the Black–Scholes formula itself. This means that you use the option price quoted in the market as an input and then solve for the volatility. Such an estimate of stock’s volatility is called the *implied volatility*. The implied volatility from one option price can be used to value other options on that stock which have the same expiration date. Options with different expiration dates can also be valued, if the volatility is not expected to change.

## 10.6 ■ APPLICATIONS OF OPTION PRICING IN FINANCIAL MANAGEMENT

Option pricing is applied mainly in the following areas of corporate finance: analysis of real options embedded in strategies and projects, risk management, capital structure decisions, and compensation plans.

**Real Options** Suppose an oil company has a license to explore oil in a particular oil basin for three years. The exploration costs is ₹ 500 crore. If the price of oil remains firm, it is worthwhile to incur this cost; on the other hand, if the price of oil remains soft, it is not worthwhile to do so.

Since the company has a license that is valid for three years, it need not take the decision now. It can wait till it has a better insight into the demand for oil. Thus, the license is similar to a call option. It gives the oil company the right to buy something (in this case the right to explore oil at a fixed cost of ₹ 500 crore) any time during the next three years. This license is a *real option* because the underlying asset is a real asset (oil exploration) and not a financial asset.

There are many types of real options, such as the option to enhance the capacity of a plant, to enter new markets, to bring out new products, to change the output mix, to change the input mix, to mothball the plant, and to abandon the project.

**Risk Management** Suppose Reliance Industries plans to raise ₹ 1,000 crore of bonds a year from now to meet the cost of new plant which is under construction. The plant will be viable if the interest rates remain at current levels. However, if the interest rates rise, the viability of the plant may be jeopardised. To hedge against interest rate risk, Reliance Industries can buy put options on treasury bonds—these options give Reliance Industries Limited the right to sell treasury bonds carrying a certain interest rate at a predetermined price.

If the interest rates rise in a year, Reliance Industries will suffer a loss because its bonds would have to be issued at a higher interest rate, but it will have a countervailing gain on its put options. Thus by purchasing puts, Reliance Industries can protect itself against adverse movement in interest rates.

**Capital Structure Decision** The capital structure decision, which is concerned with the debt-equity mix, is an important financial decision. Option pricing illuminates some facets of this decision. To illustrate, consider a firm that has debt which requires a final redemption payment of ₹ 100 crore in one year. If the value of the firm in a year from now is ₹ 101 crore, then it can meet its debt obligation and have ₹ 1 crore left for stockholders. Should the value of the firm a year from now be less than ₹ 100 crore, then it may file for bankruptcy and turn over its assets to the creditors, leaving nothing for the stockholders. Put differently, the claim of stockholders is similar to a call option. They have the right to buy the assets for ₹ 100 crore (the redemption value of debt) in 1 year when the debt matures.

Now, suppose that the owner-managers have a choice between two projects, A and B. Project A has hardly any risk; it will result in an asset value of either ₹ 99 crore or ₹ 101 crore and both the outcomes are equiprobable. Project B is highly risky; it will result in an asset value of either ₹ 50 crore or ₹ 150 crore and both the outcomes are equiprobable.

Which project would the owner-managers choose? Clearly they will choose B over A, because while the downside of both the projects is the same (zero) for them, the upside of B (₹ 50 crore) is far greater than the upside of A (a mere ₹ 1 crore) for them. Remember that the value of equity, like the value of call option, increases with the risk of the underlying asset. Potential lenders recognise that owner-managers have an incentive to choose risky projects. So, they impose restrictive loan contracts to prevent managers from undertaking excessively risky projects.

Thus, option-pricing theory explains why managers might want to invest in risky projects and why lenders impose restrictive contracts. It also explains why firms issue convertible bonds, as discussed in a later chapter.

**Compensation Plans** Stock options are used as a part of compensation plan in many companies. So, it is important for the board of directors to understand the pros and cons of granting stock options to employees.

## SUMMARY

- An **option** gives its owner the right to buy or sell an asset on or before a given date at a specified price. An option that gives the right to buy is called a **call option**; an option that gives the right to sell is called a **put option**.

- A **European option** can be exercised only on the expiration date whereas an **American option** can be exercised on or before the expiration date.
- The payoff of a call option on an equity stock just before expiration is equal to:

$$\text{Max} \left[ \begin{array}{l} \text{Stock} \\ \text{price} \end{array} - \begin{array}{l} \text{Exercise} \\ \text{price}, 0 \end{array} \right]$$

- The payoff of a put option on an equity stock just before expiration is equal to:

$$\text{Max} \left[ \begin{array}{l} \text{Exercise} \\ \text{price} \end{array} - \begin{array}{l} \text{Stock} \\ \text{price}, 0 \end{array} \right]$$

- Puts and calls represent basic options. They serve as building blocks for developing more complex options.
- The **value of a call option** is a function of five variables: (i) price of the underlying asset, (ii) exercise price, (iii) variability of return, (iv) time left to expiration, and (v) risk-free interest rate.
- The value of a call option as per the **binomial model** is equal to the value of the hedge portfolio (consisting of equity and borrowing) that has a payoff identical to that of the call option.
- The value of a call option as per the **Black and Scholes model** is:

$$C_0 = S_0 N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

## QUESTIONS

1. From the point of view of the option holder, discuss the payoffs of a call option and a put option just before expiration.
2. What are the payoffs of a call option and a put option just before expiration, from the point of view of the writer (seller) of the option?
3. Explain the put-call parity theorem.
4. Discuss the key determinants of the value of a call option.
5. Establish the value of a call option with the help of the binomial method.
6. What is the value of a call option as per the Black and Scholes model? What assumptions underlie the Black and Scholes model?
7. Discuss the procedure for calculating the value of a call option as per the Black and Scholes model.

## SOLVED PROBLEMS

- 10.1 Consider the following data:

$$S = 60, u = 1.4, d = 0.8$$

$$E = 50, r = 0.12, R = 1.12$$

What is the value of the call option?

**Solution** The values of  $\Delta$  (hedge ratio) and  $B$  (amount borrowed) can be obtained as follows:

$$\Delta = \frac{C_u - C_d}{(u-d)S}$$

$$B = \frac{dC_u - uC_d}{(u-d)R}$$

$$C_u = \text{Max} (60 \times 1.4 - 50, 0) = 34$$

$$C_d = \text{Max} (60 \times 0.8 - 50, 0) = 0$$

$$\Delta = \frac{34 - 0}{(1.4 - 0.8)60} = \frac{34}{36} = 0.944$$

$$B = \frac{0.8 \times 34 - 1.4 \times 0}{(1.4 - 0.8)1.12} = 40.48$$

$$C = \Delta S - B = 0.944 \times 60 - 40.48 = 16.16$$

10.2 The following information is available for the equity stock of Prakash Limited.

$$S_0 = ₹ 120, E = ₹ 110, r_f = 0.12, \sigma = 0.40$$

Calculate the price of a 6 month call option as per the Black-Scholes model.

**Solution**

$$C_0 = S_0 N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

$$d_1 = \frac{\ln\left[\frac{S_0}{E}\right] + \left[r + \frac{1}{2}\sigma^2 t\right]}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

$$d_1 = \frac{\ln\left[\frac{120}{110}\right] + \left[0.12 + \frac{1}{2} \times 0.16\right] 0.5}{0.4\sqrt{0.5}}$$

$$= \frac{0.0870 + 0.10}{0.2828} = 0.6612$$

$$d_2 = 0.6612 - 0.2828 = 0.3784$$

$$N(d_1) = N(0.6612) = 0.7457$$

$$N(d_2) = N(0.3784) = 0.6474$$

$$\frac{E}{e^{rt}} = \frac{110}{e^{0.12 \times 0.5}} = \frac{110}{1.0618} = 103.60$$

$$C_0 = ₹ 120 \times 0.7457 - ₹ 103.60 \times 0.6474 = ₹ 22.41$$

## PROBLEMS

**10.1 Value of Call Option** Consider the following data:

$$S = 100, u = 1.5, d = 0.8$$

$$E = 105, r = 0.12, R = 1.12$$

What is the value of the call option?

**10.2 Rise** A stock is currently selling for ₹ 40. The call option on the stock exercisable a year from now at a striking price of ₹ 45 is currently selling for ₹ 8. The risk-free interest rate is 10 percent. The stock can either rise or fall after a year. It can fall by 20 percent. How much can it rise?

**10.3 Value of Call Option** The following data is available for Thermal Plastics Limited, a company that is not expected to pay dividend for a year:

$$S_0 = 120, E = 110, r = 0.14, t = 1.0, \sigma = 0.4$$

What is the value of the call option as per the Black and Scholes model?

**10.4 Value of Call Option** The standard deviation of the continuously compounded stock returns for Olympic Corporation is estimated to be 20 percent per year. The stock of Olympic Corporation currently sells for ₹ 80 and the effective annual interest rate is 15.03 percent. What is the value of a 1 year call option on the stock of Olympic Corporation if the exercise price is ₹ 82?

**10.5 Value of Put Option** In problem 4 what is the value of a 1year put option on the stock of Olympic Corporation if the exercise price is ₹ 85?

## MINICASE

Delphi Capital Management (DCM) is an investment management firm which, inter alia, offers portfolio management service to high networth individuals. Avinash Joshi, managing director of DCM, realised that many clients have interest in using options, but often do not understand the risks and rewards associated with these instruments.

You have joined DCM about six months ago. After majoring in finance you worked for a well known securities firm where you received good exposure to derivative instruments, before joining DCM. Appreciating your expertise, Avinash Joshi has asked you to educate and guide clients interested in using options.

You have been approached by Pradeep Sharma, an eminent surgeon and long-time client of DCM, who wants to understand about options and the strategies based on options. You have decided to use the following data of Newage Hospitals Limited, a company in which Pradeep Sharma has equity shares, to guide him.

Stock Price : 325						
Strike Price	Jan	Calls			Puts	
		Feb	March	Jan	Feb	March
280	48	53	-*	-	-	-
300	34	38	41	2	4	6
320	15	18	20	6	9	-
340	5	8	14	17	19	21
360	2	4	5	-	40	-

\* A blank means that no quotation is available.

To educate your client you have to develop answers for the following questions:

- (a) What do the following terms mean: call option, put option, strike price (exercise price), and expiration date?
- (b) Which options are in-the-money and which options are out-of-the-money?
- (c) Assume that Pradeep Sharma owns 1000 shares of Newage Hospitals. What are the relative pros and cons of selling a call against the position using (i) January /340 calls (ii) March / 300.
- (d) What is the maximum profit, maximum loss, and break-even price associated with the strategy of simultaneously buying March / 340 call while selling March / 360 call?
- (e) What are the implications for Pradeep Sharma if he simultaneously writes March / 340 call and buys March / 300 puts?
- (f) What impact do the following have on the value of call option?
  - (i) Current price, (ii) Exercise price, (iii) Option term to maturity, (iv) Risk-free rate, and (v) Variability of the stock price.
- (g) What should be the value of the March / 320 call as per the Black-Scholes model? Assume that  $t = 3$  months,  $r_f = 6$  percent, and  $\sigma = 0.30$ .

## Appendix 10A

### Exotic Options

In recent years there has been a veritable explosion in the range of option instruments. Many of these options have unusual features, so they are called “exotic options”. A sampling of them is given below:

**Asian Options:** The payoffs of these options depend on the average price of the underlying asset during some portion of the life of the option. For example, the payoff of such an option may be either equal to the average stock price over the last three months minus the exercise price or zero, whichever is higher. Such options have appealed to the firms that wish to hedge a profit stream which is dependent on the average price of some commodity over a period of time.

**Barrier Options:** The payoff of a barrier option depends not only on what the price of the underlying asset is at the time of option expiration but also on whether the price of the underlying asset has crossed some “barrier”. For example, a *down-and-out-option* is a barrier option that becomes worthless no sooner when the stock price falls below some barrier price. Likewise, a *down-and-in-option* does not provide a payoff unless the price of the underlying asset falls below some barrier at least once during the life of the option.

**Binary Options:** A binary option provides a fixed payoff, depending on the fulfillment of some condition. For example, a binary put option may pay off ₹ 100 if the stock price at maturity is less than the exercise price.

**Lookback Options** The payoff of a lookback option depends on the maximum or minimum price of the underlying asset during the life of the option. For example, the payoff of a lookback call option may be equal to the maximum stock price during the life of the option minus the exercise price.

### PRACTICAL ASSIGNMENT

Obtain the quote for a 3-month call option on the stock of your chosen company. Calculate the implied volatility ( $\sigma$ ) of the stock's return, assuming  $r = 8\%$ .

- 
- <sup>1</sup> Recall that such an option can be exercised only on the expiration date, not before.
  - <sup>2</sup> Fisher Black and Myron Scholes, “The Pricing of Options and Corporate Liabilities,” *Journal of Political Economy*, vol.81 (May-June 1973).
  - <sup>3</sup> Note that this is the probability of rise in our hypothetical risk-neutral world. Since real world investors are risk-averse and not risk-neutral, they will require a higher

expected return from a risky stock. Hence the true probability of rise will be greater than 0.40.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter10/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter10/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## PART-IV

### Capital Budgeting

11

Techniques of Capital Budgeting

12

Estimation of Project Cash Flows

13

Risk Analysis in Capital Budgeting

14

The Cost of Capital

15

Capital Budgeting: Extensions

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## Techniques of Capital Budgeting

### Learning Objectives

After studying this chapter you should be able to:

- ✓ Discuss DCF criteria like net present value, benefit-cost ratio, internal rate of return, and modified internal rate of return.
- ✓ Explain the properties of the NPV rule.
- ✓ Discuss the problems with IRR.
- ✓ Discuss non-DCF criteria like the payback period and accounting rate of return.

A truck manufacturer is considering investment in a new plant; an airliner is planning to buy a fleet of jet aircrafts; a commercial bank is thinking of an ambitious computerisation programme; a pharmaceutical firm is evaluating a major R&D programme. All these situations involve a capital expenditure decision. Essentially, each of them represents a scheme for investing resources which can be analysed and appraised reasonably independently. The basic characteristic of a capital expenditure (also referred to as capital investment or capital project or just project) is that it typically involves a current outlay (or current and future outlays) of funds in the expectation of a stream of benefits extending far into future.

This definition of capital expenditure is not necessarily synonymous with how capital expenditure is defined in accounting. A capital expenditure, from the accounting point of view, is an expenditure that is shown as an asset on the balance sheet. This asset, except in the case of a non-depreciable asset like land, is depreciated over its life. In accounting, the classification of an expenditure as capital expenditure or revenue expenditure is governed by certain conventions, by some provisions of law, and by the management's desire to enhance or depress reported profits. Often, outlays on research and development, major advertising campaign, and reconditioning of plant and machinery may be treated as revenue expenditure for accounting purposes, even though they are expected to

generate a stream of benefits in future and, therefore, qualify for being capital expenditures as per our definition.

Capital expenditures represent the growing edge of a business. Capital expenditures have three distinctive features: (i) They have long-term consequences. (ii) They often involve substantial outlays. (iii) It may be difficult or expensive to reverse them.

Thanks to these characteristics, capital budgeting is perhaps the most important issue in corporate finance. How a firm finances its investments (the capital structure decision) and how it manages its short-term operations (the working capital decision) are definitely issues of concern, but how it allocates its capital (the capital budgeting decision) really reflects its strategy and its business. That is why the process of capital budgeting is also referred to as strategic asset allocation.

Given the crucial significance of capital budgeting decisions, it is not surprising that firms spend considerable time in planning these decisions and involve top executives from production, engineering, marketing, and so on, in evaluating capital expenditure proposals—these decisions are too important to be left to financial managers alone.

Most firms have numerous investment opportunities before them. Some are valuable while others are not. The essence of financial management is to identify which are which. The primary goal of this chapter is to introduce you to techniques of capital budgeting which are helpful in identifying valuable investment opportunities.

## 11.1 ■ CAPITAL BUDGETING PROCESS

Capital budgeting is a complex process which may be divided into the following phases:

- Identification of potential investment opportunities
- Assembling of proposed investments
- Decision making
- Preparation of capital budget and appropriations
- Implementation
- Performance review

**Identification of Potential Investment Opportunities** The capital budgeting process begins with the identification of potential investment opportunities. Typically, the planning body (it may be an individual or a committee organised formally or informally) develops estimates of future sales which serve as the basis for setting production targets. This information, in turn, is helpful in identifying required investments in plant and equipment, research and development, distribution, and so on.

For imaginative identification of investment ideas it is helpful to (i) monitor external environment regularly to scout investment opportunities, (ii) formulate a well-defined corporate strategy based on a thorough analysis of strengths, weaknesses, opportunities, and threats, (iii) share corporate strategy and perspectives with persons who are involved in the process of capital budgeting, and (iv) motivate employees to make suggestions.

**Assembling of Investment Proposals** Investment proposals identified by the production department and other departments are usually submitted in a standardised capital investment proposal form. Generally, most of the proposals, before they reach the capital budgeting committee or somebody which assembles them, are routed through several persons. The purpose of routing a proposal through several persons is primarily to ensure that the proposal is viewed from different angles. It also helps in creating a climate for bringing about co-ordination of interrelated activities.

Investment proposals are usually classified into various categories for facilitating decision-making, budgeting, and control. An illustrative classification is given below.

1. Replacement investments
2. Expansion investments

3. New product investments
4. Obligatory and welfare investments

**Decision Making** A system of rupee gateways usually characterises capital investment decision making. Under this system, executives are vested with the power to okay investment proposals up to certain limits. For example, in one company the plant superintendent can okay investment outlays up to ₹ 200,000, the works manager up to ₹ 500,000, and the managing director up to ₹ 2,000,000. Investments requiring higher outlays need the approval of the board of directors.

**Preparation of Capital Budget and Appropriations** Projects involving smaller outlays and which can be decided by executives at lower levels are often covered by a blanket appropriation for expeditious action. Projects involving larger outlays are included in the capital budget after necessary approvals. Before undertaking such projects an appropriation order is usually required. The purpose of this check is mainly to ensure that the funds position of the firm is satisfactory at the time of implementation. Further, it provides an opportunity to review the project at the time of implementation.

**Implementation** Translating an investment proposal into a concrete project is a complex, time-consuming, and risk-fraught task. Delays in implementation, which are common, can lead to substantial cost-overruns. For expeditious implementation at a reasonable cost, the following are helpful.

*Adequate formulation of projects* The major reason for delay is inadequate formulation of projects. Put differently, if necessary homework in terms of preliminary studies and comprehensive and detailed formulation of the project is not done, many surprises and shocks are likely to spring on the way. Hence, the need for adequate formulation of the project cannot be over-emphasised.

*Use of the principle of responsibility accounting* Assigning specific responsibilities to project managers for completing the project within the defined time-frame and cost limits is helpful for expeditious execution and cost control.

*Use of network techniques* For project planning and control several network techniques like PERT (Programme Evaluation Review Technique)

and CPM (Critical Path Method) are available. With the help of these techniques, planning and, monitoring becomes easier.

**Performance Review** Performance review, or post-completion audit, is a feedback device. It is a means for comparing actual performance with projected performance. It may be conducted, most appropriately, when the operations of the project have stabilised. It is useful in several ways: (i) it throws light on how realistic were the assumptions underlying the project; (ii) it provides a documented log of experience that is highly valuable for future decision-making; (iii) it helps in uncovering judgmental biases; and (iv) it induces a desired caution among project sponsors.

## 11.2 ■ PROJECT CLASSIFICATION

Project analysis entails time and effort. The costs incurred in this exercise must be justified by the benefits from it. Certain projects, given their complexity and magnitude, may warrant a detailed analysis; others may call for a relatively simple analysis. Hence firms normally classify projects into different categories. Each category is then analysed somewhat differently.

While the system of classification may vary from one firm to another, the following categories are found in most classifications.

**Mandatory Investments** These are expenditures required to comply with statutory requirements. Examples of such investments are pollution control equipment, medical dispensary, fire-fighting equipment, creche in factory premises, and so on. These are often non-revenue producing investments. In analysing such investments the focus is mainly on finding the most cost-effective way of fulfilling a given statutory need.

**Replacement Projects** Firms routinely invest in equipments meant to replace obsolete and inefficient equipments, even though they may be in a serviceable condition. The objective of such investments is to reduce costs (of labour, raw material, and power), increase yield, and improve quality. Replacement projects can be evaluated in a fairly straightforward manner, though at times the analysis may be quite detailed.

**Expansion Projects** These investments are meant to increase capacity and/or widen the distribution network. Such investments call for an explicit forecast of growth. Since this can be risky and complex, expansion projects normally warrant more careful analysis than replacement projects. Decisions relating to such projects are taken by the top management.

**Diversification Projects** These investments are aimed at producing new products or services or entering into entirely new geographical areas. Often diversification projects entail substantial risks, involve large outlays, and require considerable managerial effort and attention. Given their strategic importance, such projects call for a very thorough evaluation, both quantitative and qualitative. Further, they require a significant involvement of the board of directors.

**Research and Development Projects** Traditionally, R&D projects absorbed a very small proportion of capital budget in most Indian

companies. Things, however, are changing. Companies are now allocating more funds to R&D projects, more so in knowledge-intensive industries. R&D projects are characterised by numerous uncertainties and typically involve sequential decision making. Hence the standard discounted cash flow analysis is not applicable to them. Such projects are decided on the basis of managerial judgment. Firms which rely more on quantitative methods use decision tree analysis and option analysis to evaluate R&D projects.

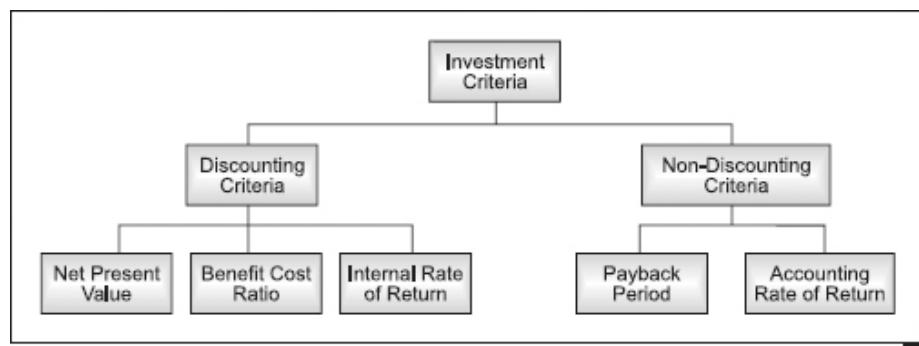
**Miscellaneous Projects** This is a catch-all category that includes items like interior decoration, recreational facilities, executive aircrafts, landscaped gardens, and so on.

Corporate social responsibility (CSR) projects or contributions, which are now assuming greater significance, may also be included here. There is no standard approach for evaluating these projects and decisions regarding them are based on personal preferences of top management.

## 11.3 ■ INVESTMENT CRITERIA

A wide range of criteria has been suggested to judge the worthwhileness of investment projects. The important investment criteria, classified into two broad categories - discounting criteria and non-discounting criteria - are shown in [Exhibit 11.1](#). The discounting criteria take into account the time value of money whereas the non-discounting criteria ignore the time value of money. Subsequent sections describe and evaluate these criteria in some detail.

**Exhibit 11.1** Investment Criteria



## 11.4 ■ NET PRESENT VALUE

Net present value is perhaps the most important concept of finance. It is used to evaluate investment and financing decisions that involve cash flows occurring over multiple periods. The net present value (NPV) of a project is the sum of the present values of all the cash flows - positive as well as negative - that are expected to occur over the life of the project. The general formula of NPV is:

$$NPV = \sum_{t=1}^n \frac{C_t}{(1+r)^t} - \text{Initial investment} \quad (11.1)$$

where  $C_t$  is the cash flow at the end of year  $t$ ,  $n$  is the life of the project, and  $r$  is the discount rate.

To illustrate the calculation of net present value, consider a project which has the following cash flow stream:

Year	Cash flow
0	₹ (1,000,000)
1	200,000
2	200,000
3	300,000
4	300,000
5	350,000

The cost of capital<sup>1</sup>,  $r$ , for the firm is 10 percent. The net present value of the proposal is:

$$NPV = \frac{200,000}{(1.10)^1} + \frac{200,000}{(1.10)^2} + \frac{300,000}{(1.10)^3} + \frac{300,000}{(1.10)^4} + \frac{350,000}{(1.10)^5} - 1,000,000 = -5,272$$

The net present value represents the net benefit over and above the compensation for time and risk. Hence the decision rule associated with the net present value criterion is: Accept the project if the net present value is positive and reject the project if the net present value is negative. (If the net present value is zero, it is a matter of indifference.)

A spreadsheet calculation of the above is as follows. Note that the formula for NPV in Excel returns only the sum of the present values of a stream of future cash flows. So, the initial outflow should be added to the

NPV formula to get the net present value in the sense that we are using that term.

	A	B	C	D	E	F	G
1	Year	0	1	2	3	4	5
2	Cash flow	-1,000,000	200,000	200,000	300,000	300,000	350,000
3	Cost of capital	10%		= NPV(B3,C2: G2) + B2	→	(5,272)	

## Properties of the NPV Rule

The net present value has certain properties that make it a very attractive decision criterion:

**Net Present Values Are Additive** The net present value of a package of projects is simply the sum of the net present values of individual projects included in the package. This property has several implications:

- The value of a firm can be expressed as the sum of the present values of projects in place as well as the net present value of prospective projects:  
$$\text{Value of a firm} = \sum \text{Present values of projects} + \sum \text{NPV of expected future projects}$$
The first term on the right hand side of this equation captures the value of **assets in place** and the second term the value of **growth opportunities**.
- When a firm terminates an existing project which has a negative NPV based on its expected future cash flows, the value of the firm increases by that amount. Likewise, when a firm undertakes a new project that has a negative NPV, the value of the firm decreases by that amount.
- When a firm divests itself of an existing project, the price at which the project is divested affects the value of the firm. If the price is greater/less than the present value of the anticipated cash flows of the project the value of the firm will increase/decrease with the divestiture.
- When a firm makes an acquisition and pays a price in excess of the present value of the expected cash flows from the acquisition it is like taking on a negative NPV project and hence will diminish the value of the firm.
- When a firm takes on a new project with a positive NPV, its effect on the value of the firm depends on whether its NPV is in line with expectation. Hindustan Unilever Limited, for example, is expected to take on high positive NPV projects and this expectation is reflected in its value. Even if the new projects taken on by Hindustan Unilever Limited have positive NPV, the value of the firm may drop if the NPV is not in line with the high expectation of investors.

## Intermediate Cash Flows Are Invested at the Cost of Capital

The NPV rule assumes that the intermediate cash flows of a project - that is,

cash flows that occur between the initiation and the termination of the project - are reinvested at a rate of return equal to the cost of capital.

**NPV Calculation Permits Time Varying Discount Rates** So far we assumed that the discount rate remains constant over time. This need not be always the case. The NPV can be calculated using time-varying discount rates. The general formula of NPV is as follows:

$$NPV = \sum_{t=1}^n \frac{C_t}{(1+r_t)^t} - \text{Initial investment} \quad (11.2)$$

where  $C_t$  is the cash flow at the end of year  $t$ , and  $r_t$  is the discount rate for the period  $t$ .

In even more general terms, NPV is expressed as follows:

$$NPV = \sum_{t=1}^n \frac{C_t}{\prod_{j=1}^t (1+r_j)} - \text{Initial investment} \quad (11.3)$$

where  $C_t$  is the cash flow at the end of year  $t$ ,  $r_j$  is the one period discount rate applicable to period  $j$ , and  $n$  is the life of the project.

The discount rate may change over time for the following reasons: (a) The level of interest rates may change over time - the term structure of interest rates sheds light on expected rates in future. (b) The risk characteristics of the project may change over time, resulting in changes in the cost of capital. (c) The financing mix of the project may vary over time, causing changes in the cost of capital.

To illustrate, assume that you are evaluating a 5-year project involving software development. You believe that the technological uncertainty associated with this industry leads to higher discount rates in future.

Discount rate	14%	15%	16%	18%	20%
Investment	-12000				
Cash flow	4,000	5,000	7,000	6,000	5,000

The present value of the cash flows can be calculated as follows:

PV of $C_1$	= 4,000 / 1.14	= 3509
PV of $C_2$	= 5,000 / (1.14 * 1.15)	= 3814
PV of $C_3$	= 7,000 / (1.14 * 1.15 * 1.16)	= 4603
PV of $C_4$	= 6,000 / (1.14 * 1.15 * 1.16 * 1.18)	= 3344
PV of $C_5$	= 5,000 / (1.14 * 1.15 * 1.16 * 1.18 * 1.20)	= 2322

$$\begin{aligned} \text{NPV of project} & 1.16 * 1.18 * 1.20) \\ & = 3509 + 3814 + 4603 + \quad = ₹ 5592 \\ & 3344 + 2322 - 12000 \end{aligned}$$

## **Limitations**

Despite its advantages and a direct linkage to the objective of value maximisation, the NPV rule has its opponents who point towards some limitations:

- The NPV is expressed in absolute terms rather than relative terms and hence does not factor in the scale of investment. Thus, project A may have an NPV of ₹ 5,000 while project B has an NPV of ₹ 2,500, but project A may require an investment of ₹ 50,000 whereas project B may require an investment of just ₹ 10,000. Advocates of NPV, however, argue that what matters is the surplus value, over and above the hurdle rate, irrespective of what the investment is.
- The NPV rule does not consider the life of the project. Hence, when mutually exclusive projects with different lives are being considered, the NPV rule is biased in favour of the longer term project.

## 11.5 ■ BENEFIT-COST RATIO

Benefit-cost ratio, also called profitability index, may be defined in two ways:

$$\text{Benefit-cost ratio : BCR} = \frac{\text{PVB}}{I} \quad (11.4)$$

$$\text{Net benefit-cost ratio: NBCR} = \frac{\text{PVB} - I}{I} = \text{BCR} - 1 \quad (11.5)$$

where PVB is the present value of benefits and  $I$  is the initial investment.

To illustrate the calculation of these measures, let us consider a project which is being evaluated by a firm that has a cost of capital of 12 percent.

Initial investment:	₹ 100,000
Benefits:	
Year 1	25,000
Year 2	40,000
Year 3	40,000
Year 4	50,000

The benefit cost ratio measures for this project are:

$$\text{BCR} = \frac{\frac{25,000}{(1.12)} + \frac{40,000}{(1.12)^2} + \frac{40,000}{(1.12)^3} + \frac{50,000}{(1.12)^4}}{100,000} = 1.145$$

$$\text{NBCR} = \text{BCR} - 1 = 0.145$$

The two benefit-cost ratio measures, because the difference between them is simply unity, give the same signals. The following decision rules are associated with them.

<i>When BCR</i>	<i>or NBCR</i>	<i>Rule is</i>
>1	>0	Accept
=1	=0	Indifferent
<1	<0	Reject

## **Evaluation**

The proponents of benefit-cost ratio argue that since this criterion measures net present value per rupee of outlay (bang per buck), it can discriminate better between large and small investments and hence is preferable to the net present value criterion.

How valid is this argument? Henry Weingartner, who examined this criterion theoretically, finds that: (i) Under unconstrained conditions, the benefit-cost ratio criterion will accept and reject the same projects as the net present value criterion. (ii) When the capital budget is limited in the current period, the benefit-cost ratio criterion may rank projects correctly in the order of decreasingly efficient use of capital. However, its use is not recommended because it provides no means for aggregating several smaller projects into a package that can be compared with a large project. (iii) When cash outflows occur beyond the current period, the benefit-cost ratio criterion is unsuitable as a selection criterion.

## 11.6 ■ INTERNAL RATE OF RETURN

The internal rate of return (IRR) of a project is the discount rate which makes its NPV equal to zero. Put differently, it is the discount rate which equates the present value of future cash flows with the initial investment. It is the value of  $r$  in the following equation:

$$\text{Investment} = \sum_{t=1}^n \frac{C_t}{(1+r)^t} \quad (11.6)$$

where  $C_t$  is the cash flow at the end of year  $t$ ,  $r$  is the internal rate of return (IRR), and  $n$  is the life of the project.

In the NPV calculation we assume that the discount rate (cost of capital) is known and determine the NPV. In the IRR calculation, we set the NPV equal to zero and determine the discount rate that satisfies this condition.

To illustrate the calculation of IRR, consider the cash flows of a project being evaluated by Techtron Limited:

Year	0	1	2	3	4
Cash flow	(100,000)	30,000	30,000	40,000	45,000

The IRR is the value of  $r$  which satisfies the following equation:

$$100,000 = \frac{30,000}{(1+r)^1} + \frac{30,000}{(1+r)^2} + \frac{40,000}{(1+r)^3} + \frac{45,000}{(1+r)^4}$$

The calculation of  $r$  involves a process of trial and error. We try different values of  $r$  till we find that the right-hand side of the above equation is equal to 100,000. Let us, to begin with, try  $r = 15$  percent. This makes the right-hand side equal to:

$$\frac{30,000}{(1.15)^1} + \frac{30,000}{(1.15)^2} + \frac{40,000}{(1.15)^3} + \frac{45,000}{(1.15)^4} = 100,801$$

This value is slightly higher than our target value, 100,000. So we increase the value of  $r$  from 15 percent to 16 percent. (In general, a higher  $r$  lowers and a smaller  $r$  increases the right-hand side value). The right-hand side becomes:

$$\frac{30,000}{(1.16)^1} + \frac{30,000}{(1.16)^2} + \frac{40,000}{(1.16)^3} + \frac{45,000}{(1.16)^4} = 98,636$$

Since this value is now less than 100,000, we conclude that the value of  $r$  lies between 15 percent and 16 percent. For most of the purposes this indication suffices.

If a single point estimate of  $r$  is needed, use the following interpolation procedure:

1. Determine the net present value of the two closest rates of return.

(NPV / 15 percent)	801
(NPV / 16 percent)	(1,364)

2. Find the sum of the absolute values of the net present values obtained in step 1:

$$801 + 1364 = 2165$$

3. Calculate the ratio of the net present value at the smaller discount rate, identified in step 1, to the sum obtained in step 2:

$$\frac{801}{2,165} = 0.37$$

4. Add the number obtained in step 3 to the smaller discount rate:

$$15 + 0.37 = 15.37 \text{ percent}$$

The internal rate of return, calculated in this manner, is a very close approximation to the true internal rate of return.

The decision rule for IRR is as follows:

Accept : If the IRR is greater than the cost of capital

Reject : If the IRR is less than the cost of capital

The spreadsheet calculation of IRR is given below:

	A	B	C	D	E	F
1	Year	0	1	2	3	4
2	Cash flow	(100,000)	30,000	30,000	40,000	45,000
3		= IRR(B2:F2)		→	15.37%	

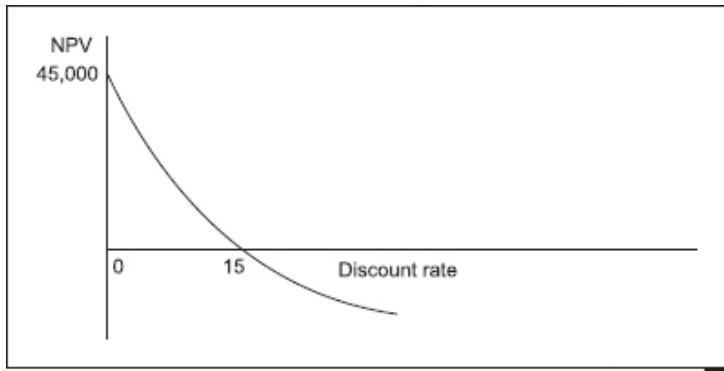
## NPV and IRR

By now you may have noticed that the IRR rule is quite similar to the NPV rule. To see the link between them, let us plot the values of NPV for the project of Techtron Limited for different discount rates. The NPV profile is shown in [Exhibit 11.2](#) where the NPV is plotted on the vertical or y-axis and the discount rate on the horizontal or x-axis. The NPV profile provides valuable insights:

- The IRR is the point at which the NPV profile crosses the x axis.
- The slope of the NPV profile reflects how sensitive the project is to discount rate changes.

Do the IRR and the NPV rules lead to identical decisions? Yes, provided two conditions are satisfied. First, the cash flows of the project must be **conventional**, implying that the first cash flow (initial investment) is negative and the subsequent cash flows are positive. Second, the project must be **independent**, meaning that the project can be accepted or rejected without reference to any other project.

**Exhibit 11.2** NPV Profile



## Problems with IRR

There are problems in using IRR when the cash flows of the project are not conventional or when two or more projects are being compared to determine which one is the best. In the first case it is difficult to define ‘what is IRR’ and in the second case IRR can be misleading. Further, IRR cannot distinguish between lending and borrowing. Finally, IRR is difficult to apply when short-term interest rates differ from long-term interest rates.

**Non-conventional Cash Flows** Consider a project which has the following cash flow stream associated with it:

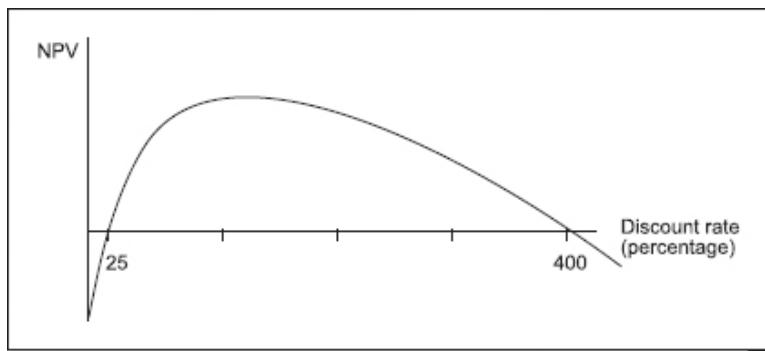
Project	Cash flow		
	$C_0$	$C_1$	$C_2$
M	- 160,000	+ 1,000,000	- 1,000,000

The IRR equation for this cash flow stream is:

$$-160,000 + \frac{1,000,000}{(1+r)} - \frac{1,000,000}{(1+r)^2} = 0$$

There are two roots of this equation viz., 1.25 and 5.00. The IRRs corresponding these roots are 25 percent and 400 percent. This is illustrated by the NPV profile shown in [Exhibit 11.3](#).

### Exhibit 11.3 Multiple Internal Rates of Return



In [Exhibit 11.3](#), the NPV is zero at two discount rates, viz., 25 percent and 400 percent. Which of these is the correct IRR? We can't say. There is no unambiguously correct answer. This is the problem of multiple rate of return and in such cases the IRR rule breaks down.

As if this were not enough, there can also be cases in which no IRR exists. For example, project P has a positive NPV for all discount rates and hence no IRR:

Project	Cash flow			IRR, Percent	NPV	
	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>		at 15%	at 30%
P	+ 15,000	- 45,000	+ 37,500	None	4225	2574

Several modifications of the IRR rule have been suggested for such cases. These modifications are neither adequate nor necessary, for the simple solution lies in using the NPV rule.

**Mutually Exclusive Projects** Often firms have to choose from two or more mutually exclusive projects. In such cases IRR can be misleading.

Consider projects P and Q

Project	Cash flow		IRR	NPV (assuming r = 12 percent)
	C <sub>0</sub>	C <sub>1</sub>		
P	- 10,000	20,000	100%	7,857
Q	- 50,000	75,000	50%	16,964

Both the projects are good, but Q, with its higher NPV, contributes more to the value of the firm. Yet from an IRR point of view P looks better than Q. Hence the IRR rule seems unsuitable for ranking projects of different scale.

The IRR rule, of course, can be salvaged in such cases by considering the IRR on the incremental cash flow. Here is how we do it. Looking at P, the project which requires the smaller outlay, we find that it is highly attractive because its IRR is 100 percent, far above the cost of capital which is 12 percent. Now we ask: What is the rate of return on the incremental cash flow if we switch from P (the low-outlay project) to Q (the high-outlay project)? The incremental cash flow associated with such a switch is:

$$\frac{C_0}{-40,000} \quad \frac{C_1}{55,000}$$

The IRR of this cash flow stream is 37.5 percent, much above the cost of capital. Hence it is desirable to switch from P to Q.

Thus, unless you look at the incremental cash flow, IRR is not a reliable rule for ranking projects of different scales.

IRR is also unreliable for ranking projects which have different patterns of cash flow over time. Consider two projects, X and Y, being evaluated by a firm that has a cost of capital of 10 percent.

Project	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	IRR	NPV at 10%
X	-110,000	+31,000	+40,000	+50,000	+70,000	22%	36,613
Y	- 110,000	+71,000	+40,000	+40,000	+20,000	25%	31,316

Both the projects look good but X, with its higher NPV, contributes more to the value of the firm. Yet from an IRR point of view Y looks more attractive. Hence the IRR rule can be misleading when a choice has to be

made between mutually exclusive projects which have different patterns of cash flow over time.

Of course, in this case too the IRR rule can be salvaged by considering the IRR on the incremental cash flow.

As the previous examples suggest, when mutually exclusive projects are evaluated it is much simpler to use the NPV rule rather than the IRR rule with such involved additional computations.

**Lending versus Borrowing** The IRR rule cannot distinguish between lending and borrowing and hence a high IRR need not necessarily be a desirable thing.

To illustrate this point, let us consider two projects *A* and *B*:

Project	Cash flow		IRR	NPV at 10% discount rate
	$C_0$	$C_1$		
<i>A</i>	- 4000	+ 6000	50%	1455
<i>B</i>	+ 4000	- 7000	75%	- 2364

The IRR for project *A* is 50 percent, whereas the IRR for project *B* is 75 percent. This means that *B* is a more attractive project, when *B* is actually a highly undesirable project. Why? *A* involves investing ₹ 4000 at a rate of return of 50 percent, whereas *B* involves borrowing ₹ 4000 at a rate of return of 75 percent. Yet if we go by the IRR figures, *B* appears more attractive than *A*.

## Differences Between Short-term and Long-term Interest Rates

Recall our general formula for calculating NPV:

$$NPV = \sum_t \frac{C_t}{\prod_{j=1}^t (1+r_j)} - \text{Initial investment}$$

Thus, the cash flow for year 1,  $C_1$ , is discounted at the opportunity cost of capital for year 1,  $r_1$ ; the cash flow for year 2,  $C_2$ , is discounted at the opportunity cost of capital for year 2,  $r_2$  and again at  $r_1$ ; so on and so forth.

The IRR rule says that a project should be accepted if its IRR is greater than the opportunity cost of capital. But what should we do when there are several opportunity costs? Should we compare IRR with  $r_1$  or  $r_2$  or  $r_3$  ... or  $r_n$ ? We have to, in effect, compute a complex weighted average of various rates to get a number comparable to IRR. Given the difficulty in doing so, it makes sense to ignore IRR, when short-term interest rates differ from long-term interest rates, and simply calculate NPV.

## **Redeeming Qualities**

Despite its deficiencies, IRR is immensely popular in practice, even more than NPV. It perhaps fills a need that NPV does not. Managers as well as financial analysts are wonted to think in terms of rates of return rather than absolute rupee values. Although IRR can be misleading, the result can be readily interpreted by all parties. As Samuel Weaver says: "The resulting IRR can be mentally compared to expected inflation, the current borrowing rates, the cost of capital, an equity's portfolio return, and so on." No wonder surveys suggest that the IRR is the most popular investment evaluation technique.

Further, in certain situations, the IRR offers a practical advantage over NPV. You can't estimate the NPV unless you know the discount rate, but you can still calculate the IRR. Suppose you don't know the discount rate but you find that the project has an IRR of 35 percent. You would perhaps accept the project because it is unlikely that the discount rate would be that high. The pros and cons of IRR are summarised below:

<i>Pros</i>	<i>Cons</i>
■ Closely related to NPV	■ May lead to multiple rates of return
■ Easy to understand and interpret	■ May result in incorrect decisions in comparing mutually exclusive projects

## 11.7 ■ MODIFIED INTERNAL RATE OF RETURNS (MIRR)

Despite NPV's conceptual superiority, managers seem to prefer IRR over NPV because IRR is intuitively more appealing as it is a percentage measure. Is there a percentage measure that overcomes the shortcomings of the regular IRR? Yes, there is one and it is called the modified IRR or MIRR.

The procedure for calculating MIRR is as follows:

**Step 1:** Calculate the present value of the costs (PVC) associated with the project, using the cost of capital ( $r$ ) as the discount rate:

$$PVC = \sum_{t=0}^n \frac{\text{Cash outflow}_t}{(1+r)^t} \quad (11.7)$$

**Step 2:** Calculate the terminal value (TV) of the cash inflows expected from the project:

$$TV = \sum_{t=0}^n \text{Cash inflow}_t (1+r)^{n-t} \quad (11.8)$$

**Step 3:** Obtain the MIRR by solving the following equation:

$$PVC = \frac{TV}{(1+MIRR)^n} \quad (11.9)$$

To illustrate the calculation of MIRR let us consider an example. Pentagon Limited is evaluating a project that has the following cash flow stream associated with it:

Year	0	1	2	3	4	5	6
Cash flow	-120	-80	20	60	80	100	120

The cost of capital for Pentagon is 15 percent. The present value of costs is:

$$120 + \frac{80}{(1.15)} = 189.6$$

The terminal value of cash inflows is:

$$\begin{aligned} & 20(1.15)^4 + 60(1.15)^3 + 80(1.15)^2 + 100(1.15) + 120 \\ & = 34.98 + 91.26 + 105.76 + 115 + 120 = 467 \end{aligned}$$

The MIRR is obtained as follows:

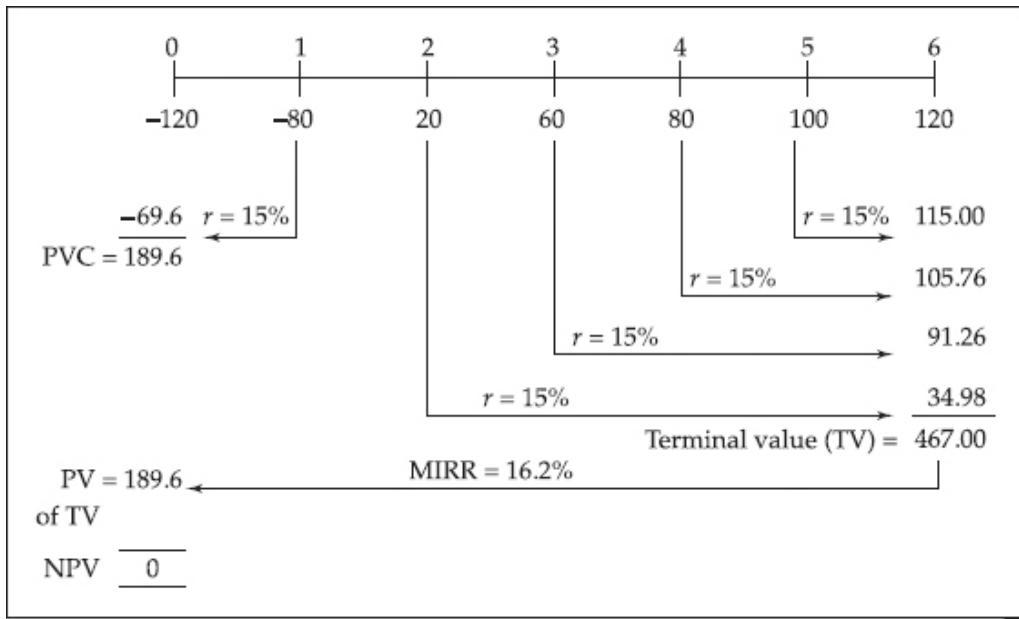
$$189.6 = \frac{467}{(1 + \text{MIRR})^6}$$

$$(1 + \text{MIRR})^6 = 2.463$$

$$1 + \text{MIRR} = 2.463^{1/6} = 1.162$$

$$\text{MIRR} = 1.162 - 1 = 0.162 \text{ or } 16.2 \text{ percent}$$

The time line diagram for this problem is given below.



## Evaluation

MIRR is superior to the regular IRR in two ways. First, MIRR assumes that project cash flows are reinvested at the cost of capital, whereas the regular IRR assumes that project cash flows are reinvested at the project's own IRR. Since reinvestment at cost of capital (or some other explicit rate) is more realistic than reinvestment at IRR, MIRR reflects better the true profitability of a project. Second, the problem of multiple rates does not exist with MIRR.

Thus, MIRR is a distinct improvement over the regular IRR. Is it as good as NPV in choosing between mutually exclusive projects? Without getting into technicalities, let us note the following:

- If the mutually exclusive projects are of the same size, NPV and MIRR lead to the same decision irrespective of variations in life.
- If the mutually exclusive projects differ in size there is a possibility of conflict.

What is the verdict? MIRR is better than the regular IRR in measuring the true rate of return. However, for choosing among mutually exclusive projects of different size, NPV is a better alternative in measuring the contribution of each project to the value of the firm.

## 11.8 ■ PAYBACK PERIOD

The payback period is the length of time required to recover the initial cash outlay on the project. For example, if a project involves a cash outlay of ₹ 600,000 and generates cash inflows of ₹ 100,000, ₹ 150,000, ₹ 150,000, and ₹ 200,000, in the first, second, third, and fourth years, respectively, its payback period is 4 years because the sum of cash inflows during 4 years is equal to the initial outlay. When the annual cash inflow is a constant sum, the payback period is simply the initial outlay divided by the annual cash inflow. For example, a project which has an initial cash outlay of ₹ 1,000,000 and a constant annual cash inflow of ₹ 300,000 has a payback period of: ₹ 1,000,000/300,000 =  $3\frac{1}{3}$  years.

According to the payback criterion, the shorter the payback period, the more desirable the project. Firms using this criterion generally specify the maximum acceptable payback period. If this is  $n$  years, projects with a payback period of  $n$  years or less are deemed worthwhile and projects with a payback period exceeding  $n$  years are considered unworthy.

## Evaluation

A widely used investment criterion, the payback period seems to offer the following advantages:

- It is simple, both in concept and application. It does not use involved concepts and tedious calculations and has few hidden assumptions.
- It is a rough and ready method for dealing with risk. It favours projects which generate substantial cash inflows in earlier years and discriminates against projects which bring substantial cash inflows in later years but not in earlier years. Now, if risk tends to increase with futurity - in general, this may be true - the payback criterion may be helpful in weeding out risky projects.
- Since it emphasises earlier cash inflows, it may be a sensible criterion when the firm is pressed with problems of liquidity.

The limitations of the payback criterion, however, are very serious:

- It fails to consider the time value of money. Cash inflows, in the payback calculation, are simply added without suitable discounting. This violates the most basic principle of financial analysis which stipulates that cash flows occurring at different points of time can be added or subtracted only after suitable compounding/discounting.
- It ignores cash flows beyond the payback period. This leads to discrimination against projects which generate substantial cash inflows in later years. To illustrate, consider the cash flows of two projects, A and B:

Year	Cash flow of A	Cash flow of B
0	₹ (100,000)	₹ (100,000)
1	50,000	20,000
2	30,000	20,000
3	20,000	20,000
4	10,000	40,000
5	10,000	50,000
6	—	60,000

The payback criterion prefers A, which has a payback period of 3 years in comparison to B which has a payback period of 4 years, even though B has very substantial cash inflows in years 5 and 6.

- It is a measure of project's capital recovery, not profitability.

- Though it measures a project's liquidity, it does not indicate the liquidity position of the firm as a whole, which is more important. Weingartner writes: "The usually designated speculative and/or precautionary motive of firms to hold liquid or near liquid funds in order to seize upon unexpected opportunities is a different motive from that which requires each new investment separately to recover its original cost within a short period."<sup>2</sup>

A major shortcoming of the conventional payback period is that it does not take into account the time value of money. To overcome this limitation, the **discounted payback period** has been suggested. In this modified method, cash flows are first converted into their present values (by applying suitable discounting factors) and then added to ascertain the period of time required to recover the initial outlay on the project. [Exhibit 11.4](#) illustrates the calculation of discounted payback period. Looking at the last column in this exhibit, we find that the discounted payback period is between 3 and 4 years.

## **Reasons for Popularity of Payback Period**

Despite its serious shortcomings the payback period is widely used in appraising investments. Why? It appears that the payback measure serves as a proxy for certain types of information which are useful in investment decision-making.

1. The payback period may be regarded roughly as the reciprocal for the internal rate of return when the annual cash inflow is constant and the life of the project fairly long.
2. The payback period is somewhat akin to the break-even point. A rule of thumb, it serves as a useful shortcut in the process of information generation and evaluation.
3. The payback period conveys information about the rate at which the uncertainty associated with a project is resolved. The shorter the payback period, the faster the uncertainty associated with the project is resolved. The longer the payback period, the slower the uncertainty associated with the project is resolved. Decision-makers, it may be noted, prefer an early resolution of uncertainty. Why? An early resolution of uncertainty enables the decision-maker to take prompt corrective action, adjust his consumption patterns, and modify/change other investment decisions.

### **Exhibit 11.4 Calculation of Discounted Payback Period**

Year	Cash Flow	Discounting Factor @10%	Present Value	Cumulative Net Cash Flow after Discounting
0	-10,000	1.000	-10,000	-10,000
1	3,000	0.909	2,727	-7,273
2	3,000	0.826	2,478	-4,795
3	4,000	0.751	3,004	-1,791
4	4,000	0.683	2,732	941
5	5,000	0.621	3,105	
6	2,000	0.565	1,130	
7	3,000	0.513	1,539	

## 11.9 ■ ACCOUNTING RATE OF RETURN

The accounting rate of return, also called the average rate of return, is defined as:

$$\frac{\text{Profit after tax}}{\text{Book value of the investment}}$$

The numerator of this ratio may be measured as the average annual post-tax profit over the life of the investment and the denominator as the average book value of investment in the project. To illustrate the calculation consider a project:

Year	<i>Book value of investment</i>	<i>Profit after tax</i>
1	₹ 90,000	₹ 20,000
2	80,000	22,000
3	70,000	24,000
4	60,000	26,000
5	50,000	28,000

The accounting rate of return is:

$$\frac{1/5(20,000 + 22,000 + 24,000 + 26,000 + 28,000)}{1/5(90,000 + 80,000 + 70,000 + 60,000 + 50,000)} = 34 \text{ percent}$$

Obviously, the higher the accounting rate of return, the better the project. In general, projects which have an accounting rate of return equal to or greater than a pre-specified cut-off rate of return - which is usually between 20 percent and 30 percent - are accepted; others are rejected.

## Evaluation

Traditionally a popular investment appraisal criterion, the accounting rate of return has the following virtues:

- It is simple to calculate.
- It is based on accounting information which is readily available and familiar to businessmen.
- While it considers benefits over the entire life of the project, it can be used even with limited data. As one executive put it: "The discounted cash flow methods call for estimates of costs and revenues over the whole project life. This is difficult. Very often we can't estimate the life. We have been using machines longer than their life by good maintenance. Changes in costs and revenues cannot be predicted. Due to these difficulties we use the accounting rate of return. Here we take our best estimates for 2-3 years and calculate the average return. Once the project is established, the balance between cost and revenue can be maintained in normal circumstances".

Its shortcomings, however, seem to be considerable:

- It is based upon accounting profit, not cash flow.
- It does not take into account the time value of money. To illustrate this point, consider two investment proposals *A* and *B*, each requiring an outlay of ₹ 100,000. Both the proposals have an expected life of 4 years after which their salvage value would be nil.

Year	A				B			
	Book value	Depreciation	Profit after tax	Cash flow	Book value	Depreciation	Profit after tax	Cash flow
0	100,000	0	0	(100,000)	100,000	0	0	(100,000)
1	75,000	25,000	40,000	65,000	75,000	25,000	10,000	35,000
2	50,000	25,000	30,000	55,000	50,000	25,000	20,000	45,000
3	25,000	25,000	20,000	45,000	25,000	25,000	30,000	55,000
4	0	25,000	10,000	35,000	0	25,000	40,000	65,000

Both the proposals, with an accounting rate of return equal to 40 percent, look alike from the accounting rate of return point of view. However, project *A*, because it provides benefits earlier, is much more desirable. While the payback period criterion gives no weightage to more distant benefits, the accounting rate of return criterion seems to give them too much weightage.

- The accounting rate of return measure is internally inconsistent. While the numerator of this measure represents profit belonging to equity and preference stockholders, its denominator represents the total investment in the project which is supported by equity, preference, and debt.
- The accounting rate of return does not provide any guidance on what the target rate of return should be.

## 11.10 ■ INVESTMENT APPRAISAL IN PRACTICE

A survey of corporate finance practices in India by Manoj Anand, reported in the October-December 2002 issue of *Vikalpa*, revealed that the following methods (in order of decreasing importance) are followed by companies to evaluate investment proposals.

<i>Method</i>	<i>% of companies considering as very important or important</i>
■ Internal rate of return	85.00
■ Payback period	67.50
■ Net present value	66.30
■ Break-even analysis	58.20
■ Profitability index	35.10

A survey of capital budgeting practices in Indian companies by Roopali Batra and Satish Verma, reported in the March 2017 issue of *IIMB Management Review*, revealed the following:

- Companies prefer multiple criteria for investment appraisal.
- The mean usage (on a scale of 1 to 5) of various criteria across all sizes of capital budget are as follows: Payback period (3.77); Accounting rate of return (2.17); Net present value (3.75); Internal rate of return (3.74); Modified internal rate of return (2.23); Adjusted present value (1.82); Discounted payback period (2.32); Profitability index (2.32); NPV adjusted with real options analysis (1.71); Economic value added (1.66).
- While payback period is used across all budget sizes, advanced techniques such as real options, MIRR, and adjusted present value (APV), are likely to be used more with the increase in the size of capital budget.
- Weighted average cost of capital (WACC) is the most preferred discount rate and the CAPM model is the most popular model for estimating the cost of equity.

## SUMMARY

- Investment criteria fall into two categories: discounting criteria and non-discounting criteria. Net present value (**NPV**), benefit cost ratio (**BCR**), and internal rate of return (**IRR**), are the most popular discounting criteria. **Payback period** and **accounting rate of return** are the major non-discounting criteria.
- The **NPV** of a project is the sum of the present values of all the cash flows of the project. A project is worthwhile if its  $NPV > 0$ ; otherwise not.
- The **BCR** of a project is the present value of its benefits (cash inflows) divided by the present value of its costs (cash outflows). A project is worthwhile if its  $BCR > 1$ ; otherwise not.
- The **IRR** of a project is the discount rate which makes its **NPV** equal to zero. A project is worthwhile if its **IRR** exceeds the cost of capital; otherwise not.
- The **payback period** is the length of time required to recover the initial outlay on the project.
- The **accounting rate of return** is the average profit after tax divided by the average book value of the investment over the life of the project.
- **NPV** and **IRR** are the most important criteria in practice with accounting rate of return and payback period being used as supplementary criteria.

## QUESTIONS

1. NPV Why are capital expenditures deemed very important?
2. Discuss the phases of capital budgeting.
3. Describe the commonly found categories in project classification.
4. What is NPV?
5. What are the implications of the additivity property of NPV?
6. Discuss the general formula of NPV when discount rates vary over time.
7. What are the limitations of NPV?
8. What are the two ways of defining the benefit-cost ratio?
9. Evaluate the benefit-cost ratio as an investment criterion.
10. What is IRR and how is it calculated?
11. Discuss the problems associated with IRR.
12. What are the redeeming qualities of IRR?
13. How is modified IRR calculated?
14. Why is MIRR superior to the regular IRR?
15. What is payback period?
16. Evaluate payback period as an investment criterion.
17. Why is payback period so popular, despite its shortcomings?
18. What is discounted payback period?
19. How is accounting rate of return calculated?

20. What are the pros and cons of accounting rate of return?
21. Discuss how investment appraisal is done in practice.

## SOLVED PROBLEMS

11.1 The expected cash flows of a project are as follows:

<i>Year</i>	<i>Cash flow</i>
0	- 100,000
1	20,000
2	30,000
3	40,000
4	50,000
5	30,000

The cost of capital is 12 percent. Calculate the following: (a) net present value, (b) benefit-cost ratio, (c) internal rate of return, (d) modified internal rate of return, (e) payback period, and (f) discounted payback period.

*Solution*

a. The net present value is:

$$\begin{aligned} & -100,000 + 20,000 / (1.12) + 30,000 / (1.12)^2 + 40,000 / (1.12)^3 + 50,000 / (1.12)^4 \\ & + 30,000 / (1.12)^5 \\ & = -100,000 + 17,860 + 23,910 + 28,480 + 31,800 + 17,010 = 19,060 \end{aligned}$$

b. The benefit-cost ratio is:

$$119,060 / 100,000 = 1.19$$

c. Try a discount rate of 18 percent. The NPV at 18 percent discount rate is 1750. Try a discount rate of 19 percent. The NPV at 19 percent discount rate is:

- ₹ 780.

Hence the IRR is:

$$\begin{aligned} & 18\% + \frac{1750}{2530} \times 1\% \\ & = 18.69\% \end{aligned}$$

d. The future value of benefits when compounded at 12 percent is:

$$\begin{aligned} & 20,000 (1.12)^4 + 30,000 (1.12)^3 + 40,000 (1.12)^2 + 50,000 (1.12) + 30,000 \\ & = 209,790 \\ & 100,000 (1 + r^*)^5 = 209,790 \\ & r^* = 15.97\% \end{aligned}$$

Hence the MIRR is 15.97%

e. The payback period is slightly more than 3 years.

f. The discounted payback period is slightly less than 4 years.

## PROBLEMS

**11.1 NPV** Sulabh International is evaluating a project whose expected cash flows are as follows:

Year	Cash flow (₹)
0	-1000,000
1	100,000
2	200,000
3	300,000
4	600,000
5	300,000

- (a) What is the NPV of the project, if the discount rate is 14 percent for the entire period?
- (a) What is the NPV of the project if the discount rate is 12 percent for year 1 and rises every year by 1 percent?

**11.2 IRR** What is the internal rate of return of an investment which involves a current outlay of ₹ 300,000 and results in an annual cash inflow of ₹ 60,000 for 7 years?

**11.3 IRR** What is the internal rate of return of the following cash flow stream?

Year	Cash flow (₹)
0	(3,000)
1	9,000
2	(3,000)

**11.4 Minimum Cash Flow** If an equipment costs ₹ 500,000 and lasts 8 years, what should be the minimum annual cash inflow before it is worthwhile to purchase the equipment? Assume that the cost of capital is 10 percent.

**11.5 Investment Value** How much can be paid for a machine which brings in an annual cash inflow of ₹ 25,000 for 10 years? Assume that the discount rate is 12 percent.

**11.6 NPV** The cash flows associated with three projects, P, Q, and R, are given below:

Year	Net cash flow (₹)		
	P	Q	R
0	(2,000)	(2,000)	(2,000)
1	1,400	500	500
2	600	1,100	500
3	400	900	1,600

Calculate the net present value of each project at discount rates of 0 percent, 5 percent, 10 percent, 15 percent, 25 percent, and 30 percent. Plot the results on a graph paper.

- 11.7 NPV, IRR, and MIRR** Phoenix Company is considering two mutually exclusive investments, Project *P* and Project *Q*. The expected cash flows of these projects are as follows:

Year	Project <i>P</i> ₹)	Project <i>Q</i> ₹)
0	(1,000)	(1,600)
1	(1,200)	200
2	(600)	400
3	(250)	600
4	2,000	800
5	4,000	100

- (a) Construct the NPV profiles for Projects *P* and *Q*.
- (b) What is the IRR of each project?
- (c) Which project would you choose if the cost of capital is 10 percent? 20 percent?
- (d) What is each project's MIRR if the cost of capital is 12 percent?

- 11.8 NPV and IRR** Your company is considering two mutually exclusive projects, *A* and *B*. Project *A* involves an outlay of ₹ 100 million which will generate an expected cash inflow of ₹ 25 million per year for 6 years. Project *B* calls for an outlay of ₹ 50 million which will produce an expected cash inflow of ₹ 13 million per year for 6 years. The company's cost of capital is 12 percent.

- (a) Calculate the NPV and IRR of each project.
- (b) What is the NPV and IRR of the differential project (project *A* over *B*)?

- 11.9 Investment Criteria** Your company is considering two projects, *M* and *N*, each of which requires an initial outlay of ₹ 50 million. The expected cash inflows from these projects are:

Year	Project <i>M</i>	Project <i>N</i>
1	11	38
2	19	22
3	32	18
4	37	10

- (a) What is the payback period for *M* and *N*?

- (b) What is the discounted payback period for  $M$  and  $N$  if the cost of capital is 12 percent?
- (c) If the two projects are independent and the cost of capital is 12 percent, which project(s) should the firm invest in?
- (d) If the two projects are mutually exclusive and the cost of capital is 10 percent, which project should the firm invest in?
- (e) If the two projects are mutually exclusive and the cost of capital is 15 percent, which project should the firm invest in?
- (f) If the cost of capital is 14 percent, what is the modified IRR of each project?

**11.10 IRR and MIRR** The estimated net cash flows of a project with an investment of ₹ 1000 million are as follows:

(Amounts in ₹ million)

Year	1	2	3	4	5
Net cash flow	120	400	480	380	300

- (a) What is the IRR of the project?  
 (b) What is the MIRR if the cost of capital is 10 percent?

**11.11 IRR** ICC Projects is considering a project in which an investment of ₹ 50 lakhs will be needed at the commencement and ₹ 200 lakhs after one year. The returns will start at the rate of ₹ 80 lakhs per year commencing from the end of the second year for 5 years. What is the IRR of the project?

**11.12 NPV and BCR** As part of its programme of supporting start-up ventures, Angel bank has provided the full initial investment cost of ₹ 200 lakhs to Suresh at a concessional interest rate of just 6 percent per annum. The estimated net cash flows of the project are as follows:

(₹ in lakhs)

Year	1	2	3	4	5
Net cash flow	40	60	100	70	60

Calculate the net present value and the net benefit cost ratio of the project.

**11.13 Multiple IRR** A project costs ₹ 1,000,000 today. It will have an inflow of ₹ 2,100,000 a year from now and an outflow of ₹ 1,04,000 two years from now. What are the IRRs of this project?

**11.14 NPV and IRR** US International Limited is evaluating a project in Estonia. The project's cash flows are estimated as follows:

Year	0	1	2	3	4
Cash Flow	-\$ 800,000	300,000	3,60,000	4,30,000	3,00,000

The Estonian government requires that cash flows generated by a foreign company are to be kept in Estonia and investment with the government for two years at a rate of 5 percent per year before repatriation. US International requires a return of 15 percent on this project. Calculate the NPV and IRR of the project.

## MINICASE

Aman Limited is a leading manufacturer of automotive components. It supplies to the original equipment manufacturers as well as the replacement market. Its projects typically have a short life as it introduces new models periodically.

You have recently joined Aman Limited as a financial analyst reporting to Ravi Sharma, the CFO of the company. He has provided you the following information about three projects, A, B, and C that are being considered by the Executive Committee of Aman Limited:

- Project A is an extension of an existing line. Its cash flow will decrease over time.
- Project B involves a new product. Building its market will take some time and hence its cash flow will increase over time.
- Project C is concerned with sponsoring a pavilion at a Trade Fair. It will entail a cost initially which will be followed by a huge benefit for one year. However, in the year following that some cost will be incurred to raze the pavilion.

The expected net cash flows of the three projects are as follows.

Year	Project A ₹)	Project B ₹)	Project C ₹)
0	(15,000)	(15,000)	(15,000)
1	11,000	3,500	42,000
2	7,000	8,000	(4,000)
3	4,800	13,000	—

Ravi Sharma believes that all the three projects have risk characteristics similar to the average risk of the firm and hence the firm's cost of capital, viz. 12 percent, will apply to them.

You have been asked to prepare a report for the executive committee, covering the following:

- (a) What is payback period and discounted payback period? Find the payback period and the discounted payback period of Projects A and B.
- (b) What is net present value (NPV)? What are the properties of NPV? Calculate the NPV of projects A, B, and C.
- (c) What is internal rate of return (IRR)? What are the problems with IRR? Calculate the IRR for Projects A, B, and C.
- (d) What is modified internal rate of return (MIRR)? What are the pros and cons of MIRR vis-à-vis IRR and NPV? Calculate the MIRR for Projects A, B, and C assuming that the intermediate cash flows can be reinvested at 12 percent rate of return.

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<sup>1</sup> The cost of capital must reflect the risk of the project. While the details of how the cost of capital is calculated are discussed in [Chapter 14](#), for the present we assume that the cost of capital figure is given and includes an appropriate premium for risk.

- <sup>2</sup> H.M. Weingartner, "Some Views on the Payback Period and Capital Budgeting Decisions," *Management Science*, Vol.15 (August 1969).

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter11/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter11/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Mini Cases
- Additional Solved Problems
- Excel on Solved Problems
- Answer Key



**12**  
**C H A P T E R**

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## **Estimation of Project Cash Flows**

### **Learning Objectives**

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After studying this chapter you should be able to:

- ✓ Define the elements of the cash flow stream.
- ✓ Discuss the basic principles of cash flow estimation.
- ✓ Explain the components of cash flows for replacement projects.
- ✓ Discuss the biases in cash flow estimation.

From the previous discussion it is clear that the cash flows are the key element in investment evaluation. So far we assumed that cash flows were given because we wanted to focus our discussion on investment criteria. Cash flows, however, are not available on a silver platter.

Estimating cash flows, the investment outlays and the cash inflows after the project is commissioned, is the most important, but also the most difficult step in capital budgeting. Forecasting errors can be quite large, particularly in gigantic, complex projects. For example, when several oil majors decided to construct the Alaska Pipeline, the initial cost estimate was about \$ 700 million. The final cost, however, was about \$ 7 billion. While this may be an extreme example, it highlights the pitfalls of forecasting.

Forecasting project cash flows involves numerous variables and many people participate in this exercise. Capital outlays are estimated by engineering and product development departments; revenue projections are provided by the marketing group; operating costs are estimated by production people, cost accountants, purchase managers, and HR executives; interest and tax burden are assessed by finance experts.

The role of the financial manager is to coordinate the efforts of various departments and obtain information from them, ensure that the forecasts are based on a set of consistent economic assumptions, keep the exercise

focussed on relevant variables, and minimise the biases inherent in cash flow forecasting.

This chapter discusses how to “spread the numbers” or develop the cash flow forecasts in conformity with certain basic principles.

## 12.1 ■ ELEMENTS OF THE CASH FLOW STREAM

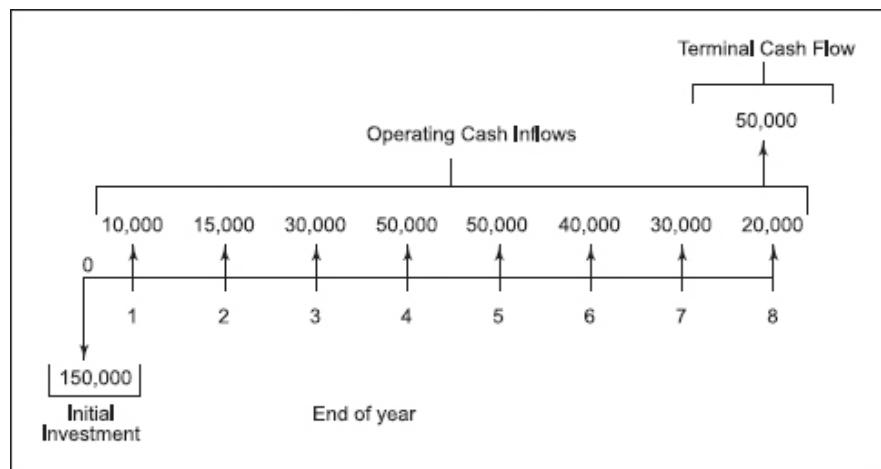
To evaluate a project, you must determine the relevant cash flows, which are the incremental after-tax cash flows associated with the project.

The cash flow stream of a conventional project – a project which involves cash outflows followed by cash inflows – comprises of three basic components: (i) initial investment, (ii) operating cash inflows, and (iii) terminal cash inflow.

The **initial investment** is the after-tax cash outlay on capital expenditure and net working capital when the project is set up. The **operating cash inflows** are the after-tax cash inflows resulting from the operations of the project during its economic life. The **terminal cash inflow** is the after-tax cash flow resulting from the liquidation of the project at the end of its economic life.

[Exhibit 12.1](#) depicts on a time line the cash flows for an illustrative project, with each of the cash flow components labelled.

**Exhibit 12.1** Cash Flow Components



## **Time Horizon for Analysis**

How is the time horizon for cash flow analysis usually established? The time horizon for cash flow analysis is usually the minimum of the following:

**Physical Life of the Plant** This refers to the period during which the plant remains in a physically usable condition, i.e., the number of years the plant would perform the function for which it had been acquired. This depends on the wear and tear which the plant is subject to. Suppliers of plant may provide information on the physical life under normal operating conditions. While the concept of physical life may be useful for determining the depreciation charge, it is not very useful for investment decision making purposes.

**Technological Life of the Plant** New technological developments tend to render existing plants obsolete. The technological life of a plant refers to the period of time for which the present plant would not be rendered obsolete by a new plant. It is very difficult to estimate the technological life because the pace of new developments is not governed by any law. While it is almost certain that a new development would occur when it would occur is anybody's guess. Yet an estimate of the technological life has to be made.

**Product Market Life of the Plant** A plant may be physically usable, its technology may not be obsolete, but the market for its products may disappear or shrink and hence its continuance may not be justified. The product market life of a plant refers to the period for which the product of the plant enjoys a reasonably satisfactory market.

**Investment Planning Horizon of the Firm** The time period for which a firm wishes to look ahead for purposes of investment analysis may be referred to as its investment planning horizon. It naturally tends to vary with the complexity and size of the investment. For small investments (say, installation of a lathe) it may be five years, for medium-size investments (say, expansion of plant capacity) it may be 10 years, and for large-size investments (say, setting up of a new division) it may be 15 years.

## **12.2 ■ BASIC PRINCIPLES OF CASH FLOW ESTIMATION**

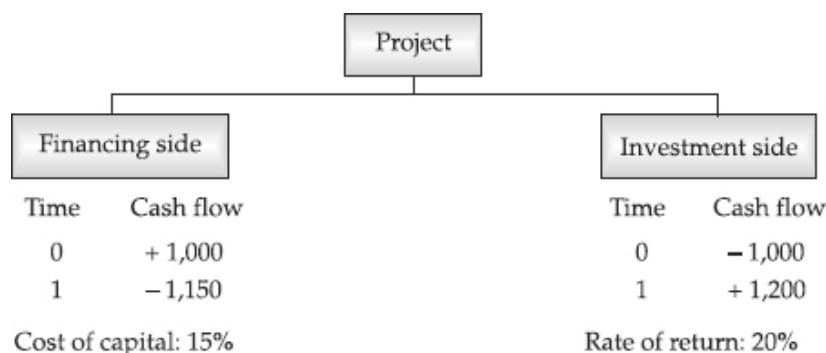
The following principles should be followed while estimating the cash flows of a project:

- Separation principle
- Incremental principle
- Post-tax principle
- Consistency principle

# Separation Principle

There are two sides of a project, viz., the investment (or asset) side and the financing side. The cash flows associated with these sides should be separated. A simple example may be given to illustrate how this is done.

Suppose a firm is considering a one-year project that requires an investment of ₹ 1,000 in fixed assets and working capital at time 0. The project is expected to generate a cash inflow of ₹ 1200 at the end of year 1 - this is the only cash inflow expected from the project. The project will be financed entirely by debt carrying an interest rate of 15 percent and maturing after 1 year. Assuming that there are no taxes, the cash flows associated with the investment side of the project, the rate of return on the investment side of the project, the cash flows associated with the financing side of the project, and the cost of capital on the financing side are as follows:



Note that the cash flows on the investment side of the project do not reflect financing costs (interest in our example). The financing costs are included in the cash flows on the financing side and reflected in the cost of capital figure (which is 15 percent in our example). The cost of capital is used as the hurdle rate against which the rate of return on the investment side (which is 20 percent in our case) is judged.

The important point to be emphasised is that while defining the cash flows on the investment side, financing costs should not be considered because they will be reflected in the cost of capital figure against which the rate of return figure will be evaluated.

Operationally, this means that interest on debt is ignored while computing profits and taxes thereon. Alternatively, if interest is deducted in the process of arriving at profit after tax, an amount equal to 'Interest (1 – tax rate)' should be added to 'Profit after tax'. Note that:

$$\begin{aligned}\text{Profit before interest and tax } & (1 - \text{tax rate}) \\&= (\text{Profit before tax} + \text{Interest}) (1 - \text{tax rate}) \\&= (\text{Profit before tax}) (1 - \text{tax rate}) + \text{Interest} (1 - \text{tax rate}) \\&= \text{Profit after tax} + \text{Interest} (1 - \text{tax rate})\end{aligned}$$

Thus, whether the tax rate is applied directly to the 'Profit before interest and tax' figure or whether the tax-adjusted interest, which is simply 'Interest  $(1 - \text{tax rate})$ ' is added to the profit after tax figure we get the same result.

## Incremental Principle

The cash flows of a project must be measured in incremental terms. To ascertain a project's incremental cash flows you have to look at what happens to the cash flows of the firm **with** the project and **without** the project. The difference between the two reflects the incremental cash flows attributable to the project. That is,

$$\text{Project cash flow for year } t = \text{Cash flow for the firm with the project for year } t - \text{Cash flow for the firm without the project for year } t$$

In estimating the incremental cash flows of a project, the following guidelines must be borne in mind:

**Consider All Incidental Effects** In addition to the direct cash flows of the project, all its incidental effects on the rest of the firm must be considered. The project may enhance the profitability of some of the existing activities of the firm because it has a complementary relationship with them; or it may detract from the profitability of some of the existing activities of the firm because it has a competitive relationship with them – all these effects must be taken into account.

How should **product cannibalisation** – the erosion in the sales of the firm's existing products on account of a new product introduction – be handled? One can argue that the loss of profit resulting from the reduction of sales of existing products may be treated as a negative incremental effect of the new product. This may, however, lead to the possibility of rejecting the new product. If this happens, it is very likely that a competitor may steal a march on the firm and introduce a product similar to what the firm had in mind, leading to an erosion in the sales of the existing products of the firm. This is indeed a highly unwelcome scenario because the firm loses sales to a competitor rather than to itself.

Thus how the loss of sales on account of product cannibalisation is treated will depend on whether or not a competitor is likely to introduce a close substitute to the new product that is being considered by the firm.

If the firm is operating in an extremely competitive business and is not protected by entry barriers, product cannibalisation will occur anyway. Hence the costs associated with it are not relevant in incremental analysis. On the other hand, if the firm is sheltered by entry barriers like patent protection or proprietary technology or brand loyalty, the costs of product cannibalisation should be incorporated in investment analysis.

**Ignore Sunk Costs** A sunk cost refers to an outlay already incurred in the past or already committed irrevocably. So it is not affected by the acceptance or rejection of the project under consideration. Suppose, for example, a company is debating whether it should invest in a project. The company has already spent ₹ 10 million for preliminary work meant to generate information useful for this decision. Is this ₹ 10 million a relevant cost for the proposed project? Clearly not. ₹ 10 million represents a sunk cost as it cannot be recovered irrespective of whether the project is accepted or not. Remember that bygones are bygones and are not relevant for decision making.

**Include Opportunity Costs** If a project uses resources already available with the firm, there is a potential for an opportunity cost – this is the cost created for the rest of the firm as a consequence of undertaking the project. The opportunity cost of a resource is the benefit that can be derived from it by putting it to its best alternative use. So, to analyse the opportunity cost, ask the question: “Is there any alternative use of the resource if the project is not undertaken?” For most resources, there will be an alternative use:

- The resource may be rented out. In this case the opportunity cost is the rental revenue foregone by undertaking the project. For example, if a project uses a vacant factory building owned by the firm, the revenue that can be derived from renting out this building represents the opportunity cost.
- The resource may be sold. In this case the opportunity cost is the value realised from the sale of the resource after paying taxes. For example, if a project uses an equipment which is currently idle, its opportunity cost is its sales price, net of any tax liability.
- The resource is required elsewhere in the firm. In this case, the cost of replacing there source represents its opportunity cost. For example, if a project requires the services of some experienced engineers from an existing division of the firm, the cost that is borne by that division to replace those engineers represents the opportunity cost.

What happens when a project uses a resource that has no current alternative use, but some potential alternative use? One example is excess capacity on some machine. Most firms find it impractical to sell or lease excess capacity, but realise that using it for a new product may exhaust capacity much earlier than otherwise. This may call for creating new

capacity earlier rather than later or reducing the output of some products in future. If new capacity has to be created earlier than later, the opportunity cost is: Present value of creating capacity earlier – Present value of creating capacity later. If the output of some products is likely to be reduced in future, the opportunity cost is the loss in cash flows that would have otherwise been generated by the sales of those products.

**Question the Allocation of Overhead Costs** Costs which are only indirectly related to a product (or service) are referred to as overhead costs. They include items like general administrative expenses, managerial salaries, legal expenses, rent, and so on. Accountants normally allocate overhead costs to various products on some basis like labour hours, or machine hours, or prime cost which appears reasonable. Hence, when a new project is proposed, a portion of the overhead costs of the firm is usually allocated to it. The overhead allocated to it, however, may hardly have any relationship with the incremental overhead costs, if any, associated with it. For purposes of investment analysis, what matters is the incremental overhead costs (along with other incremental costs) attributable to the project and not the allocated overhead costs.

**Estimate Working Capital Properly** Apart from fixed assets, a project requires working capital. Outlays on working capital have to be properly considered while forecasting the project cash flows. In this context, the following points must be remembered.

- Working capital (or more precisely, net working capital) is defined as: [Current assets, loans, and advances] - [Current liabilities and provisions]  
Note that current liabilities and provisions, also referred to as non-interest bearing current liabilities (NIBCLs), are deducted from current assets because they represent non-investor claims.
- The requirement of net working capital is likely to change over time. When the project is set up, there is an initial investment in net working capital. This tends to change over time as the output of the project changes.
- While fixed asset investments are made during the early years of the project and depreciated over time, net working capital is renewed periodically and hence is not subject to depreciation. Thus the net working capital at the end of the project life is assumed to have a salvage value equal to its book value.

## Post-tax Principle

Cash flows should be measured on an after-tax basis. Some firms may ignore tax payments and try to compensate this mistake by discounting the pre-tax cash flows at a rate that is higher than the cost of capital of the firm. Since there is no reliable way of adjusting the discount rate, you should always use after-tax cash flows along with after-tax discount rate. Cash flows should be measured after taxes. The important issues in assessing the impact of taxes are: What tax rate should be used to assess tax liability? How should losses be treated? What is the effect of noncash charges?

**Tax Rate** Let us examine the choices in terms of taxes. The average tax rate is the total tax burden as a proportion of the total income of the business. The marginal tax rate is the tax rate applicable to the income at margin – the next rupee of income. The marginal tax rate is typically higher than the average tax rate because tax rates are often progressive.

The income from a project typically is marginal. Put differently it is additional to the income generated by the assets of the firm already in place. Hence, the marginal tax rate of the firm is the relevant rate for estimating the tax liability of the project.

**Treatment of Losses** Because the firm as well as the project can incur losses which can produce tax savings, let us look at various possible combinations and the ways to deal with them. The different scenarios are summarised below:

Scenario	Project	Firm	Action
1	Incurs losses	Incurs losses	Defer tax savings
2	Incurs losses	Makes profits	Take tax savings in the year of loss
3	Makes profits	Incurs losses	Defer taxes until the firm makes profits
4	Makes profits	Makes profits	Consider taxes in the year of profit
Stand alone	Incurs losses	-	Defer tax saving until the project makes profits

**Effect of Noncash Charges** Noncash charges can have an impact on cash flows if they affect the tax liability. The most important of such noncash charges is depreciation. The tax benefit of depreciation is:

$$\text{Depreciation} * \text{Marginal tax rate}$$

The depreciation method allowed for tax purposes in India is the written down value method. Under this method the depreciation charge is calculated as follows:

$$\begin{aligned}
 \text{DEP}_1 &= \text{BV}_0 r \\
 \text{DEP}_2 &= \text{BV}_1 r = \text{BV}_0 (1 - r) r \\
 \vdots \\
 \text{DEP}_t &= \text{BV}_{t-1} r = \text{BV}_0 (1 - r)^{t-1} r
 \end{aligned} \tag{12.1}$$

where  $\text{DEP}$ ,  $\text{BV}$ , and  $r$  stand for depreciation charge, book value, and depreciation rate respectively.

For example, if the initial investment ( $\text{BV}_0$ ) is 100 and depreciation rate ( $r$ ) is 40 percent, the book value and depreciation charge will be as follows for the first three years:

Year	<i>Beginning book value</i>	<i>Depreciation charge</i>
1	100	$100 (0.40) = 40$
2	60	$100 (1-0.40) 0.40 = 24$
3	36	$100 (1-0.40)^2 0.40 = 14.4$

Apart from land which is not subject to depreciation, the depreciation rates for various categories of assets are prescribed under the Income Tax Act. The important rates are:

- Buildings : 5%
- Plant and machinery : 25% (general)
- Computers : 60%
- Vehicles on hire : 30%
- Pollution control equipment : 100%

## Consistency Principle

Cash flows and the discount rates applied to these cash flows must be consistent with respect to the **investor group** and **inflation**.

**Investor Group** The cash flows of a project may be estimated from the point of view of all investors (equity shareholders as well as lenders) or from the point of view of just equity shareholders.

The cash flows of a project from the point of view of all investors is the cash flows available to all investors after paying taxes and meeting investment needs of the project, if any. Also called **free cash flows**, they are defined as follows:

$$\begin{aligned}\text{Cash flows to all investors} = & \text{ PBIT (1 - tax rate)} \\ & + \text{Depreciation and noncash charges} \\ & - \text{Capital expenditure} \\ & - \text{Change in net working capital}\end{aligned}$$

The cash flows of a project from the point of view of equity shareholders are the cash flows available to equity shareholders after paying taxes, meeting investment needs, and fulfilling debt-related commitments. They are estimated as follows:

$$\begin{aligned}\text{Cash flows to equity shareholders} = & \text{Profit after tax} \\ & + \text{Depreciation and other noncash charges} \\ & - \text{Preference dividend} \\ & - \text{Capital expenditures} \\ & - \text{Change in net working capital} \\ & - \text{Repayment of debt} \\ & + \text{Proceeds from debt issues} \\ & - \text{Redemption of preference capital} \\ & + \text{Proceeds from preference issue}\end{aligned}$$

The discount rate must be consistent with the definition of cash flow:

<i>Cash flow</i>	<i>Discount rate</i>
Cash flows to all investors	Weighted average cost of capital
Cash flows to equity	Cost of equity

Generally, in capital budgeting we look at the cash flows to all investors and apply the weighted average cost of capital of the firm. We will also follow this convention.

**Inflation** In dealing with inflation, you have two choices. You can incorporate expected inflation in the estimates of future cash flows and apply a nominal discount rate to the same. Alternatively, you can estimate

the future cash flows in real terms and apply a real discount rate to the same.

Note that the following relationship holds between nominal and real values:

$$\begin{aligned}\text{Nominal cash flow}_t &= \text{Real cash flow}_t (1 + \text{Expected inflation rate})^t \\ \text{Nominal discount rate} &= (1 + \text{Real discount rate}) (1 + \text{Expected inflation rate}) - 1\end{aligned}$$

The consistency principle, in essence, suggests the following match up:

<i>Cash flow</i>	<i>Discount rate</i>
Nominal cash flow	Nominal discount rate
Real cash flow	Real discount rate

Generally, in capital budgeting analysis nominal cash flows are estimated and nominal discount rate is used. We will also follow this convention, unless mentioned to the contrary.

## **12.3 ■ CASH FLOW ILLUSTRATIONS**

To show how cash flows are determined, bearing in mind the principles discussed above, two illustrations are presented in this section.

## Illustration I

Naveen Enterprises is considering a capital project about which the following information is available:

- The investment outlay on the project will be ₹ 100 million. This consists of ₹ 80 million on plant and machinery and ₹ 20 million on net working capital. The entire outlay will be incurred at the beginning of the project.
- The project will be financed with ₹ 45 million of equity capital, ₹ 5 million of preference capital, and ₹ 50 million of debt capital. Preference capital will carry a dividend rate of 15 percent; debt capital will carry an interest rate of 15 percent.
- The life of the project is expected to be 5 years. At the end of 5 years, fixed assets will fetch a net salvage value of ₹ 30 million whereas net working capital will be liquidated at its book value.
- The project is expected to increase the revenues of the firm by ₹ 120 million per year. The increase in costs on account of the project is expected to be ₹ 80 million per year (This includes all items of cost other than depreciation, interest, and tax). The effective tax rate will be 30 percent.
- Plant and machinery will be depreciated at the rate of 25 percent per year as per the written down value method. Hence, the depreciation charges will be:

Year	1	2	3	4	5
Depreciation	₹ 20 mn	₹ 15 mn	₹ 11.25 mn	₹ 8.44 mn	₹ 6.33 mn

Given the above details, the project cash flows are shown in [Exhibit 12.2](#).

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## Exhibit 12.2 | Project Cash Flows

	₹ in million					
	0	1	2	3	4	5
1. Fixed assets	(80.00)					
2. Net working capital	(20.00)					
3. Revenues		120	120	120	120	120
4. Cost other than depreciation, interest and tax		80	80	80	80	80
5. Depreciation		20	15	11.25	8.44	6.33
6. Profit before tax		20	25	28.75	31.56	33.67
7. Tax		6	7.5	8.63	9.47	10.10
8. Profit after tax		14.0	17.5	20.12	22.09	23.57
9. Net salvage value of fixed assets						30.00
10. Recovery of net working capital						20.00
11. Initial outlay	(100.00)					
12. Operating cash flow (8+5)		34.0	32.5	31.37	30.53	29.90
13. Terminal cash flow (9 + 10)						50.0
14. Net cash flow (11+12+13)	(100.00)	34.0	32.5	31.37	30.53	79.90
Book value of Investment	100	80	65	53.75	45.31	

**Real World Complexities** In the Naveen Enterprises example, for the sake of simplicity, we assumed that revenues and operating costs would remain constant over the life of the project. In most real-life projects, however, revenues and costs are likely to vary over time. Typically, a new product has lower unit sales initially. As more customers become aware of the product, sales accelerate. After a while sales plateau, and eventually decline as competition intensifies or the product becomes obsolescent.

Likewise, the average selling price and production cost of the product tend to change over time. Prices and costs are likely to rise with the general level of inflation in the economy. For technology products, however, prices tend to fall over time with the development of newer technologies. In general, in most industries competition has a dampening effect on profit margins. All these factors must be considered when estimating a project's revenues and costs.

## Illustration II

India Pharma Ltd. is engaged in the manufacture of pharmaceuticals. The company was established in 2008 and has registered a steady growth in sales since then. Presently the company manufactures 16 products and has an annual turnover of ₹ 2200 million. The company is considering the manufacture of a new antibiotic preparation, K-cin, for which the following information has been gathered.

1. K-cin is expected to have a product life cycle of five years and thereafter it would be withdrawn from the market. The sales from this preparation are expected to be as follows:

Year	1	2	3	4	5
Sales (₹ in million)	100	150	200	150	100

2. The capital equipment required for manufacturing K-cin is ₹ 100 million and it will be depreciated at the rate of 25 percent per year as per the WDV method for tax purposes. The expected net salvage value after five years is ₹ 20 million.
3. The working capital requirement for the project is expected to be 20 percent of sales. At the end of 5 years, working capital is expected to be liquidated at par, barring an estimated loss of ₹ 5 million on account of bad debt. The bad debt loss will be a tax-deductible expense.
4. The accountant of the firm has provided the following cost estimates for K-cin:

Raw material cost	: 30 percent of sales
Variable labour cost	: 20 percent of sales
Fixed annual operating and maintenance cost	: ₹ 5 million
Overhead allocation (excluding depreciation, maintenance, and interest)	: 10 percent of sales

While the project is charged an overhead allocation, it is not likely to have any effect on overhead expenses as such.

5. The manufacture of K-cin would also require some of the common facilities of the firm. The use of these facilities would call for reduction in the production of other pharmaceutical preparations of the firm. This would entail a reduction of ₹ 15 million of contribution margin.

6. The tax rate applicable to the firm is 40 percent.

Based on the above information, the cash flows for the project have been worked out in [Exhibit 12.3](#). A few points about this exhibit are in order:

- The loss of contribution (item 7) is an opportunity cost.
- Overhead expenses allocated to the project have been ignored as they do not represent incremental overhead expenses for the firm as a whole.
- It is assumed that the level of networking capital is adjusted at the beginning of the year in relation to the expected sales for the year. For example, working capital at the beginning of year 1 (i.e. at the end of year 0) will be ₹ 20 million that is 20 percent of the expected revenues of ₹ 100 million for year 1. Likewise, the level of working capital at the end of year 1 (i.e. at the beginning of year 2) will be ₹ 30 million that is 20 percent of the expected revenues of ₹ 150 million for year 2.

## 12.4 CASH FLOW ILLUSTRATIONS

Developing cash flows for new projects or expansion projects is relatively straight forward. In such cases, the initial investment, operating cash inflows, and terminal cash flow are the after-tax cash flows associated with the proposed project. Estimating the relevant cash flows for a replacement project is somewhat complicated because you have to determine the incremental cash outflows and inflows in relation to the existing project. The three components of the cash flow stream of a replacement project are determined as follows:

Initial investment	=	Cost of the new assets + Net working capital required for the new asset	-	After tax salvage value realised from the old asset + Net working capital required for the old asset
Operating cash inflows	=	Operating cash inflows from the new asset	-	Operating cash inflows from the old asset, had it not been replaced
Terminal cash flow	=	After tax salvage value of the new asset + Recovery of net working capital associated with the new asset	-	After tax salvage value of the old asset, had it not been replaced + Recovery of net working capital associated with the old asset

A question often asked is: Once we have assumed that the old asset is replaced, why should we consider its operating cash inflows and terminal cash flow subsequently? The answer is: If you consider the advantage derived from liquidating the old asset, you should also consider the disadvantage suffered by not having the asset in the future. To illustrate this point, let us consider a very simple example. Suppose you own a plot of land that presently has a market value of ₹ 1 million. If you keep it for a year it is expected to fetch you ₹ 1.2 million. You come across another plot of land that will cost you ₹ 1.5 million now. If you buy this land you hope to sell it for ₹ 2.0 million a year hence. You are debating whether you should replace the existing plot of land with the new plot that costs ₹ 1.5 million. If you ignore taxes and assume that there is no operating cash inflow associated with both the plots of land, the cash flows of the replacement proposal are as follows:

Initial investment = Cost of the new plot – After-tax salvage value of the old plot  
= ₹ 1,500,000 – ₹ 1,000,000  
= ₹ 500,000

Operating cash inflow = Operating cash inflow from the new plot – Operating inflow from the old plot  
= ₹ 0 – ₹ 0  
= ₹ 0

Terminal flow = After tax salvage value from the new plot – After tax salvage of the old plot, had it been retained  
= ₹ 2,000,000 – ₹ 1,200,000  
= ₹ 800,000

### Exhibit 12.3 Cash Flows for the K-cin Project

	₹ in million					
	0	1	2	3	4	5
1. Capital equipment	(100)					
2. Level of networking capital (ending)	20	30	40	30	20	0
3. Revenues	100	150	200	150	100	
4. Raw material cost	30	45	60	45	30	
5. Labour cost	20	30	40	30	20	
6. Operating and maintenance cost	5	5	5	5	5	
7. Loss of contribution	15	15	15	15	15	
8. Depreciation	25	18.8	14.1	10.5	7.9	
9. Bad debt loss					5.0	
10. Profit before tax	5	36.2	65.9	44.5	17.1	
11. Tax	2	14.5	26.4	17.8	6.8	
12. Profit after tax	3	21.7	39.5	26.7	10.3	
13. Net salvage value of capital equipment					20	
14. Recovery of net working capital					15	
15. Initial investment	(100)					
16. Operating cash inflow (12+8+9)		28	40.5	53.6	37.2	23.2
17. Δ Net working capital	20	10	10	(10)	(10)	
18. Terminal cash flow (13 + 14)						35
19. Net cash flow (15 + 16 – 17 + 18)	(120)	18	30.5	63.6	47.2	58.2

Thus the relevant cash flow stream of this replacement proposal is:

Year	Cash Flow
0	- ₹ 500,000
1	₹ 800,000

If you don't subtract the salvage value of the existing plot a year from now, you get the following cash flow stream for the replacement proposal:

<i>Year</i>	<i>Cash Flow</i>
0	- ₹ 500,000
1	₹ 2000,000

Clearly this is erroneous and misleading because it considers the advantage from selling the plot today but overlooks the disadvantage expected a year from now.

## **Illustration**

Ojus Enterprises is determining the cash flow for a project involving replacement of an old machine by a new machine. The old machine bought a few years ago has a book value of ₹ 400,000 and it can be sold to realise a post tax salvage value of ₹ 500,000. It has a remaining life of five years after which its net salvage value is expected to be ₹ 160,000. It is being depreciated annually at a rate of 25 percent under the written down value method. The net working capital required for the old machine is ₹ 400,000.

The new machine costs ₹ 1,600,000. It is expected to fetch a net salvage of ₹ 800,000 after 5 years when it will no longer be required. The depreciation rate applicable to it is 25 percent under the written down value method. The net working capital required for the new machine is ₹ 500,000. The new machine is expected to bring a saving of ₹ 300,000 annually in manufacturing costs (other than depreciation). The tax rate applicable to the firm is 40 percent.

Given the above information, the incremental after-tax cash flows associated with the replacement project have been worked out in [Exhibit 12.4](#).

## **12.5 ■ BIASES IN CASH FLOW ESTIMATION**

As cash flows have to be forecast far into the future, errors in estimation are bound to occur. Yet, given the critical importance of cash flow forecasts in project evaluation, adequate care should be taken to guard against certain biases which may lead to over-statement or under-statement of true project profitability.

## **Over-statement of Profitability**

Knowledgeable observers of capital budgeting believe that profitability is often over-stated because the initial investment is under-estimated and the operating cash inflows are exaggerated. The principal reasons for such optimistic bias appear to be as follows:

- **Intentional overstatement** In a bid to present their projects in a favourable light, project sponsors may intentionally over-estimate the benefits and under-estimate the costs. Given the uncertainties characterising the future, project sponsors enjoy some latitude in twisting the figures the way they want.
- **Lack of experience** Inadequate experience on the part of project sponsors generally leads to over-optimistic estimates. Experience often induces conservatism that checks over-optimistic tendencies. Inexperience, on the other hand, may lead to wishful thinking.



## Exhibit 12.4 | Cash Flows for the Replacement Project

Year	₹ in '000)				
	0	1	2	3	4
<b>I. Investment Outlay</b>					
1. Cost of new asset		(1600)			
2. Salvage value of old asset		500			
3. Increase in net working capital		(100)			
4. Total net investment (1 – 2 + 3)		(1200)			
<b>II. Operating Inflows</b>					
Over the Project Life					
5. After-tax savings in manufacturing costs	180	180	180	180	180
6. Depreciation on new machine	400	300	225	168.8	126.6
7. Depreciation on old machine	100	75	56.3	42.2	31.6
8. Incremental depreciation (6–7)	300	225	168.7	126.6	95
9. Tax savings on Incremental depreciation ( $0.4 \times 8$ )	120	90	67.5	50.6	38
10. Net operating cash flow (5 + 9)	300	270	247.5	230.6	218
<b>III. Terminal Cash Flow</b>					
11. Net salvage value of new machine					800
12. Net salvage value of old machine					160
13. Recovery of incremental net working capital					100
14. Total terminal cash flow (11 – 12 + 13)					740
<b>IV. Net Cash Flow</b>	<b>(1200)</b>	<b>300</b>	<b>270</b>	<b>247.5</b>	<b>230.6</b>
<b>(4 + 10 + 14)</b>					<b>958</b>

- **Myopic euphoria** Individuals responsible for preparing forecasts may become too involved and lose their sense of proportion. The lack of objectivity in this case is neither intentional nor due to inexperience. It may simply be the effect of “mass psychology” as each person’s favourable opinion may be reinforced and magnified by others in the group. Referred to as “risky shift” or “group polarisation effect” in social psychology, this phenomenon is widely supported by empirical studies
- **Capital rationing** Companies typically operate under capital rationing, which may be externally determined or internally imposed. An awareness of such a constraint induces project sponsors to exaggerate the benefits of projects proposed by them. After all every sponsor is keen that his proposal finds a place in the limited capital budget when there is competition among various claimants.

## **Under-statement of Profitability**

In the foregoing discussion, we noted the problem of optimistic bias that may lead to an over-statement of project cash flows and profitability. There can be an opposite kind of bias relating to the terminal benefit which may depress a project's true profitability. To understand this bias let us look at how the terminal cash flow is estimated in practice. Typically it is defined as:

Net salvage value of fixed assets + Net recovery of working capital margin

Generally, the net salvage value of fixed assets is put equal to 5 percent of the original cost and the net recovery of working capital margin is set equal to its original book value (under the assumption that current assets do not depreciate).

The above approach almost invariably leads to under-estimation of the terminal benefit of the project, due to the following reasons:

**Salvage Values are Under-Estimated** To put the net salvage value of fixed assets equal to just 5 percent (which may more or less correspond to the book value after 8 to 10 years) of the original cost is to ignore the fact that in real life situations fixed assets, even after 8 to 10 years of use, generally command a substantial market value. This is because (a) the rate of physical wear and tear is usually much less than the rate of depreciation for tax or accounting purposes and (b) the secular rate of inflation in India has been around 8 percent.

**Intangible Benefits are Ignored** The terminal benefits from a project cannot be equated with just the salvage values of tangible assets left in the project. Apart from investment in tangible assets for which salvage values can be estimated more easily (taking into account the factors mentioned above), major projects are designed to establish a market position, hone research and engineering capability, develop a distribution network, and build brand loyalty. To assume that these benefits are worthless beyond an arbitrarily chosen time horizon is to overlook important business realities. These benefits should not be ignored just because it is difficult to quantify them.

**The Value of Future Options is Overlooked** More often than not, a project has a strategic payoff in the form of new investment opportunities that may possibly open up if the project is undertaken. To illustrate, consider the case of a firm which is evaluating a proposal to set up a project for

manufacturing scooters. The long term goal of a firm is to be a market leader in the field of two-wheelers, scooters as well as motorcycles. However, the firm considers entry into the motorcycles market to be infeasible currently as it lacks technical expertise or market image to challenge well-entrenched manufacturers in the field. Thus, the proposal to manufacture motorcycles hinges on the expertise developed and success achieved in the field of scooters. Put differently, it means that the project for manufacturing scooters has a potential payoff in terms of entry into a new field which may generate a large benefit. So, in assessing the scooter project the value of future options generated by it must be taken into account. Since analytical models for doing this are not well developed, judgmental estimation, though subjective in nature, may be done.

## **12.6 ■ ADJUSTMENT FOR INFLATION**

Inflation is a persistent fact of life in India and many other countries. So, it must be properly reflected in capital budgeting.

## Bias Caused by Inflation

If there is no inflation,  $r_r$ , the real rate, and  $r_{NOM}$ , the nominal rate would be the same. In addition, the expected real net cash flows ( $RCF_t$ ) and the expected nominal net cash flow ( $NCF_t$ ) would also be the same. Bear in mind that real rates and cash flows do not reflect inflation, whereas nominal rates and cash flows reflect inflation. In particular, all nominal market interest rates include inflation premium.

Let us assume that the expected rate of inflation is positive and all of the project's cash flows (including depreciation-related cash flows) are expected to rise at the rate  $i$ , the inflation rate. Also assume that the same rate of inflation,  $i$ , is included in the market cost of capital as inflation premium. Under these assumptions,

$$NCF_t = RCF_t(1 + i)^t \quad (12.2)$$

$$(1 + r_{NOM}) = (1 + r_r)(1 + i) \quad (12.3)$$

The  $NPV$ , considering the effect of inflation, would be calculated as follows:

$$NPV \text{ (with inflation)} = \sum_{t=0}^n \frac{NCF_t}{(1 + r_{NOM})^t} = \sum_{t=0}^n \frac{RCF_t(1 + i)^t}{(1 + r_r)^t(1 + i)^t} \quad (12.4)$$

If we cancel out the  $(1 + i)^t$  terms which appear both in the numerator and denominator, we are left with:

$$NPV = \sum_{t=0}^n \frac{RCF_t}{(1 + r_r)^t} \quad (12.5)$$

Thus, if nominal cash flows are expected to rise at the same inflation rate that is reflected in the nominal discount rate, then the inflation – adjusted  $NPV$  is the same regardless of whether nominal cash flows are discounted at a nominal rate or real cash flows are discounted at a real rate.

However, some analysts commit the mistake of discounting constant cash flows (cash flows which are not adjusted for inflation) with a market-determined cost of capital figure which typically includes an inflation premium. Put differently, the numerator does not reflect inflation, whereas the denominator does. As a result the  $NPV$  is biased downwards.

## Making Adjustment for Inflation

You can adjust for inflation in two ways. First, express all cash flows as real cash flows and discount them with a cost of capital that is adjusted to a real rate by abstracting away the inflation premium. This method produces an unbiased *NPV* when all project cash flows, including depreciation, are identically affected by inflation and the same is also reflected in the nominal cost of capital. Since these assumptions do not necessarily hold in practice, this method is not commonly used.

Second, express all cash flows in nominal terms and discount them at the nominal cost of capital. While building inflation into the cash flows, *use the best available information on how inflation will impact each element of the cash flow.*

Our discussion on inflation adjustment may be summed up as follows. First, inflation is a critical factor in capital budgeting decisions and it must be properly dealt with. Second, the most effective way of handling inflation is to reflect it explicitly in cash flows and discount rate. Third, since future inflation rates cannot be estimated precisely, inflation adds uncertainty and complexity to capital budgeting decisions.

## SUMMARY

- The cash flow stream of a conventional project comprises of three basic components: **initial investment**, **operating cash inflows**, and **terminal cash inflow**.
- The following principles should be followed while estimating the cash flows of a project. (i) **Separation principle**: separate the cash flows on the investment side from the cash flows on the financing side. (ii) **Incremental principle**: measure cash flows on an incremental basis. (iii) **Post-tax principle**: measure cash flows on a post-tax basis. (iv) **Consistency principle**: cash flows and the discount rates applied to the cash flows must be consistent with respect to the investor group and inflation.
- Estimating the relevant cash flows for a replacement project is somewhat complicated because you have to determine the incremental cash outflows and inflows in relation to the existing project.
- Given the critical importance of cash flow forecasts in project evaluation, adequate care must be taken to guard against certain biases which may lead to over-statement or under-statement of true project profitability.

## QUESTIONS

1. What are the three elements of the cash flow stream of a project?
2. How is the time horizon for cash flow analysis usually established?
3. What does the separation principle say?
4. Discuss the guidelines to be borne in mind while estimating the incremental cash flows of a project.
5. How will you estimate the tax impact of losses?
6. What is the formula for depreciation under the written down value method?
7. How would you define the cash flows to all investors and the cash flows to equity shareholders?
8. Discuss the two ways of dealing with inflation.
9. What are the three components of the cash flow stream of a replacement project?
10. Explain why there is often an optimistic bias with respect to estimates of initial investment and operating cash inflows.
11. Why is the terminal benefit of a project typically under-estimated?

## SOLVED PROBLEMS

12.1 Mr. Rao, Finance Director of Modern Synthetics Limited, called Mr. Diwan, Manager, Management Services Division of the company to explore ways and means of improving the management information system in the company. On the basis of their discussion it became obvious that the company needed a computer system for processing efficiently and accurately the growing volume of information generated in the business. It was felt that the computer system would also facilitate the timely preparation of control reports needed by the management.

Mr. Rao asked Mr. Diwan to find out which computer system would be suitable for the needs of the company and estimate the costs and benefits expected from it. Mr. Diwan talked to the representatives of a few computer manufacturing companies. On the basis of his discussion with them, he felt that the Alpha III system supplied by Computronics Limited was quite suitable for the needs of Modern Synthetics Limited. He estimated the costs and benefits associated with this system as follows:

- Cost of the computer along with ₹ 1.5 million accessories
- Operation and maintenance ₹ 0.25 million per annum
- Savings in clerical cost ₹ 0.6 million per annum

- Savings in space cost ₹ 0.1 million per annum

The computer would have an economic life of five years and it would be depreciated at the rate of 33 1/3 percent per year as per the written down value method. After five years, it would be disposed of for a value equal to its book value. The tax rate is 50 percent.

On examining the above information, Mr. Rao asked Mr. Diwan to prepare projected cash flows of the capital budgeting proposal for submission to the Executive Committee of the company.

**Solution** The net cash flow stream has been worked out in the following table:

	Cash flow for the computer installation					
	0	1	2	3	4	5
A. Cost of computer	(1,500,000)					
B. Savings		700,000	700,000	700,000	700,000	700,000
C. Operation and maintenance cost		250,000	250,000	250,000	250,000	250,000
D. Depreciation		500,000	333,333	222,222	148,148	98,675
E. Profit before tax		(50,000)*	116,667	227,778	301,852	357,235
F. Tax		(25,000)	58,334	113,889	150,926	175,618
G. Profit after tax		(25,000)	58,333	113,889	150,926	175,617
H. Net salvage value						197,531
I. Initial flow (A)	(1,500,000)					
J. Operating flow (G+D)		475,000	391,667	336,111	299,074	274,382
K. Terminal flow (H)						197,531
L. Net cash flow	(1,500,000)	475,000	391,667	336,111	299,074	471,913

\* A loss provides a tax shelter.

- 12.2 Metcalf Engineers is considering a proposal to replace one of its hammers. The following information is available.

  - (a) The existing hammer was bought 2 years ago for ₹ 1 million. It has been depreciated at the rate of 33 1/3 percent per annum. It can be presently sold at its book value. It has a remaining life of 5 years after which, on disposal, it would fetch a value equal to its then book value.
  - (b) The new hammer costs ₹ 1.6 million. It will be subject to a depreciation rate of 33 1/3 percent. After 5 years it is expected to fetch a value equal to its book value. The replacement of the old hammer would increase revenues by ₹ 0.2 million per year and reduce operating cost (excluding depreciation) by ₹ 150,000 per year. Compute the incremental post-tax cash flows associated with the replacement proposal, assuming a tax rate of 50 percent.

**Solution** The incremental post-tax cash flows are worked out as follows:

	Cash flow of the replacement project					
	0	1	2	3	4	5
A. Net investment in the new hammer	(1,155,556)					
B. Increase in revenues		200,000	200,000	200,000	200,000	200,000
C. Savings in operating costs		150,000	150,000	150,000	150,000	150,000
D. Depreciation on new hammer		533,333	355,555	237,037	158,025	105,350
E. Depreciation on old hammer		148,148	98,765	65,844	43,896	29,264
F. Incremental depreciation on new hammer (D-E)		385,185	256,790	171,193	114,129	79,086
G. Incremental taxable profit (B+C-F)		(31,185)	93,210	178,807	235,871	273,914
H. Incremental tax		(15,593)	46,605	89,404	117,936	136,957
I. Incremental profit after tax		(15,592)	46,605	89,403	117,935	136,957
J. Net incremental salvage value						152,172
K. Initial flow (A)	(1,155,556)					
L. Operating flow (I+F)		369,593	303,395	260,596	232,064	213,043
M. Terminal flow (J)						152,172
N. Net cash flow (K+L+M)	(1,155,556)	369,593	303,395	260,596	232,064	368,215

*Working Note:* The book value of the old hammer now is  $\text{₹ } 1,000,000 \times 2/3 \times 2/3 = 444,444$ . Since this is also the salvage value now, the replacement of the old hammer by the new hammer, which costs  $\text{₹ } 1.6$  million, entails a net investment of  $\text{₹ } 1,600,000 - 444,444 = \text{₹ } 1,115,556$ .

## PROBLEMS

### 12.1 Cash Flows and IRR

The following information is available on a project.

- The investment outlay on the project will be  $\text{₹ } 200$  million. This consists of  $\text{₹ } 150$  million on plant and machinery and  $\text{₹ } 50$  million on net working capital. The entire outlay will be incurred in the beginning.
- The life of project is expected to be 7 years. At the end of 7 years, fixed assets will fetch a net salvage value of  $\text{₹ } 48$  million whereas net working capital will be liquidated at its book value.
- The project is expected to increase the revenues of the firm by  $\text{₹ } 250$  million per year. The increase in costs on account of the project is expected to be  $\text{₹ } 100$  million per year (This includes all items of cost other than depreciation, interest, and tax). The tax rate is 30 percent.
- Plant and machinery will be depreciated at the rate of 25 percent per year as per the written down method.
  - (a) Estimate the post-tax cash flows of the project. (b) Calculate the IRR of the project.

**12.2 Cash Flows and NPV** Modern Pharma is considering the manufacture of a new drug, Floxin, for which the following information has been gathered:

- Floxin is expected to have a product life cycle of seven years and after that it would be withdrawn from the market. The sales from this drug are expected to be as follows:

Year	1	2	3	4	5	6	7
Sales (₹ in million)	80	120	160	200	160	120	80

- The capital equipment required for manufacturing Floxin is ₹ 120 million and it will be depreciated at the rate of 25 percent per year as per the WDV method for tax purposes. The expected net salvage value after seven years is ₹ 25 million.
- The working capital requirement for the project is expected to be 25 percent of sales. Working capital level is adjusted at the beginning of the year in relation to the projected sales for the year. At the end of 7 years, working capital is expected to be liquidated at par, barring an estimated loss of ₹ 4 million on account of bad debt which, of course, will be a tax-deductible expense.
- The accountant of the firm has provided the following estimates for the cost of Floxin:

Raw material cost	: 30 percent of sales
Variable manufacturing cost	: 10 percent of sales
Fixed annual operating and maintenance costs	: ₹ 10 million
Variable selling expenses	: 10 percent of sales
Overhead allocation (excluding depreciation, maintenance, and interest)	: 10 percent of sales

The incremental overhead attributable to the overhead are, however, expected to be only 5 percent of sales.

- The manufacture of Floxin will cut into the sales of an existing product thereby reducing its contribution margin by ₹ 10 million per year.
  - The tax rate for the firm is 30 percent.
- (a) Estimate the post-tax incremental cash flows for the project to manufacture Floxin.
- (b) What is the NPV of the project if the cost of capital is 15 percent?

**12.3 Replacement Project** Teja International is determining the cash flow for a project involving replacement of an old machine by a new machine. The old machine bought a few years ago has a book value of ₹ 800,000 and it can be sold to realise a post tax salvage value of ₹ 900,000. It has a remaining life of five years after which its net salvage value is expected to be ₹ 200,000. It is being depreciated annually at a rate of 25 percent as per the WDV method.

The new machine costs ₹ 3,000,000. It is expected to fetch a net salvage value of ₹ 1,500,000 after five years. The depreciation rate applicable to it is 25 percent under the WDV method. The new machine is expected to bring a saving of ₹ 650,000 annually in manufacturing costs (other than depreciation). The incremental net working capital associated with the new machine is ₹ 500,000. The tax rate applicable to the firm is 30 percent.

- Estimate the cash flow associated with the replacement project.
- What is the NPV of the replacement project if the cost of capital is 14 percent?

**12.4 Tax Savings** A machine costs ₹ 100,000 and is subject to a depreciation rate of 25 percent under the WDV method. What is the present value of the tax savings on account of depreciation for a period of 5 years if the tax rate is 40 percent and the discount rate is 15 percent?

**12.5 Replacement Project** Mahima Enterprises is considering replacing an old machine by a new machine. The old machine bought a few years ago has a book value of ₹ 90,000 and it can be sold for ₹ 90,000. It has a remaining life of five years after which its net salvage value is expected to be ₹ 10,000. It is being depreciated annually at the rate of 20 percent as per the WDV method. The new machine costs ₹ 400,000. It is expected to fetch a net salvage value of ₹ 25,000 after 5 years. It will be depreciated annually at the rate of 25 percent as per the WDV method. Investment in working capital will not change with the new machine. The tax rate for the firm is 35 percent. Estimate the cash flow associated with the replacement proposal, assuming that other costs remain unchanged.

## MINICASE - I

After seeing Snapple's success with fruit drinks, the board of directors of Modern Foods is seriously considering a proposal for a lemon juice project.

You have been recently hired as a financial analyst by Modern Foods and you report to Mahajan, the CEO of the company. You have been entrusted with the task of evaluating the project.

The lemon juice would be produced in an unused building adjacent to the main plant of Modern Foods. The building, owned by Modern Foods, is fully depreciated. However, it can be rented out for an annual rental of ₹ 1 million. The outlay on the project is expected to be ₹ 25 million – ₹ 15 million toward plant and machinery and ₹

10 million toward gross working capital. You can assume that the outlay will occur right in the beginning. This means that there is no interest during the construction period.

The proposed scheme of financing is as follows: ₹ 0 million of equity, ₹ 8 million of term loan, ₹ 5 million of working capital advance, and ₹ 2 million of trade credit.

The term loan is repayable in 8 equal semi-annual installments of ₹ 1 million each. The first installment will be due after 18 months. The interest on the term loan will be 15 percent.

The levels of working capital advance and trade credit will remain at ₹ 5 million and ₹ 2 million respectively, till they are paid back or retired at the end of 5 years, which is the expected life of the project. Working capital advance will carry an interest rate of 14 percent.

The lemon juice project is expected to generate a revenue of ₹ 30 million a year. The operating costs (excluding depreciation and interest) are expected to be ₹ 20 million a year.

For tax purposes, the depreciation rate on fixed assets will be 25 percent as per the written down value method. Assume that there is no other tax benefit.

The net salvage value of plant and machinery is expected to be ₹ 5 million at the end of the year 5. Recovery of working capital, at the end of year 5, is expected to be at book value.

The income tax rate is expected to be 30 percent.

Mahajan wants you to estimate the cash flows from two different points of view:

- (a) Cash flows from the point of all investors (which is also called the explicit cost funds point of view)
- (b) Cash flows from the point of equity investors.

## MINICASE - II

The introduction of GST has thrown open a huge opportunity for the tax consultancy business and Jacob Kurian is one of those professionals actively considering entering that field on his own. For that he will have to resign the current job of working as a product manager in a well-known online marketing company drawing an annual salary of ₹ 15 lakhs with normal annual increment of 8 percent. What is emboldening him to take the plunge is the fact that his wife is firmly employed as a project manager in an MNC drawing a high salary (*more than him!*) and the couple is yet to raise a family.

His plan is to start a proprietary firm styled Taxperts. Though he owns an office space in an old commercial complex, the lease on it would be expiring only in two years. However, as a similar sizedspace adjacent to it is currently vacant, he plans to take that on rent to start with and eventually shift to own place once that becomes vacant. The fixed assets for the project would consist of computers and accessories costing ₹ 20 lakhs and furniture and fixtures costing ₹ 30 lakhs. A one-time non-refundable Government subsidy at 20 percent of the cost of fixed assets would be available at the beginning of the project. Besides, the government would also arrange

a term loan of ₹ 40 lakhs from a bank for the project, at an interest rate of 9 percent, repayable in four equal annual installments after an initial holiday period of 1 year.

On shifting to own office space, while no additional fixed assets would be needed, a one-time relocation expense of ₹ 2 lakhs would have to be incurred. At the commencement of business, the firm would have to make some advance payments and keep deposits with various agencies totaling to ₹ 2 lakhs, which would all be refunded in full at the end of 5 years. An amount of ₹ 10 lakhs would have to be held ready at the start of the project in the firm's checking account to meet employee payments as it would take a couple of months for the revenue stream to set in. Various stationery and other consumables totaling to ₹ 1 lakh would have to be held on an ongoing basis which might fetch a net salvage value of only 0.25 lakh after 5 years. An amount of ₹ 1.5 lakhs would be needed towards the cost of electricity and water, ₹ 3 lakhs towards transportation expenses and ₹ 1 lakh towards miscellaneous expenses each year. For the rented premises, an interest free refundable security deposit of ₹ 2 lakhs would have to be kept with the landlord and an annual rent of ₹ 5 lakhs would have to be paid to him at the beginning of each year. There would in all be 10 employees under him and their annual salary would total to ₹ 50 lakhs with an average annual increment of 8 percent. The revenues during the project life are estimated to be as follows:

₹ in lakhs				
Year 1	Year 2	Year 3	Year 4	Year 5
80	100	120	110	80

The depreciation rate on computer and accessories would be 60 percent and on furniture and fixtures 10 percent under the WDV method. The rented office space is fully depreciated. Jacob has other means of income and his effective marginal tax rate is 33 percent. At the end of 5 years the computers and accessories and furniture and fittings would together fetch a net salvage value of ₹ 25 lakhs. What is the IRR of the project? Is it financially worthwhile for Jacob?

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter12/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter12/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Mini Cases
- Additional Solved Problems
- Excel on Solved Problems
- Answer Key



## **Risk Analysis in Capital Budgeting**

### **Learning Objectives**

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After studying this chapter you should be able to:

- ✓ Describe the sources, measures, and perspectives on risk.
- ✓ Explain the techniques of sensitivity analysis, scenario analysis, and break-even analysis.
- ✓ Discuss the steps involved in simulation analysis.
- ✓ Show how decision tree analysis may be used for analysing sequential decision making in face of risk.
- ✓ Describe the strategies employed for managing risk.
- ✓ Discuss how risk is analysed and assessed in practice.

Risk is inherent in almost every business decision. More so in capital budgeting decisions as they involve costs and benefits extending over a long period of time during which many things can change in unanticipated ways.

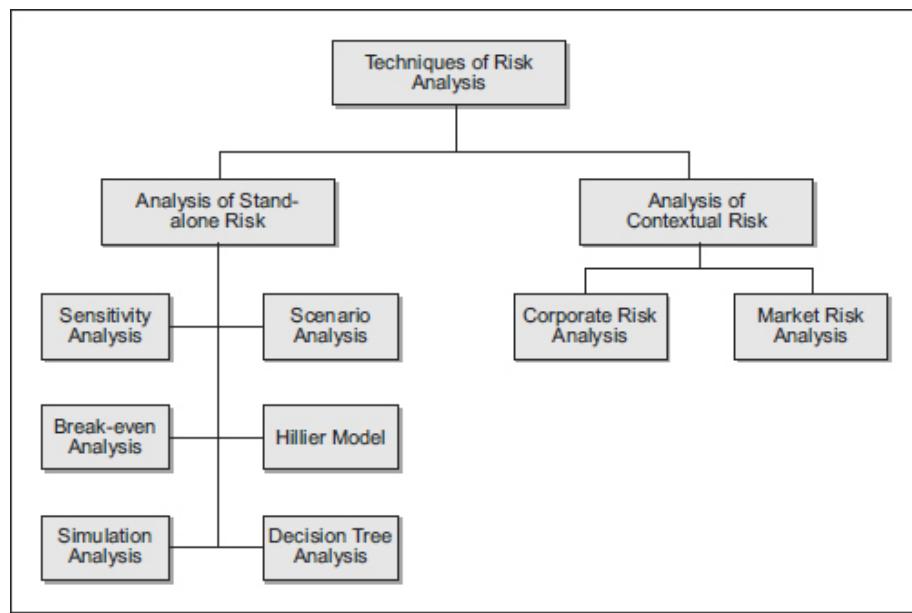
For the sake of expository convenience, we assumed so far that all investments being considered for inclusion in the capital budget had the same risk as those of the existing investments of the firm. Hence the average cost of capital was used for evaluating every project. Investment proposals, however, differ in risk. A research and development project may be more risky than an expansion project and the latter tends to be more risky than a replacement project. In view of such differences, variations in risk need to be evaluated explicitly in capital investment appraisal.

Risk analysis is one of the most complex and slippery aspects of capital budgeting. Many different techniques have been suggested and no single technique can be deemed as best in all situations. The variety of techniques suggested to handle risk in capital budgeting fall into two broad categories: (i) Approaches that consider the stand-alone risk of a project. (ii) Approaches that consider the risk of a project in the context of the firm or in

the context of the market. [Exhibit 13.1](#) classifies various techniques into these two broad categories.

This chapter discusses different techniques of risk analysis (except market risk analysis which is covered in the chapter on Cost of Capital), explores various approaches to project selection under risk, and describes risk analysis in practice.

### **Exhibit 13.1 Techniques for Risk Analysis**



## 13.1 ■ SOURCES AND PERSPECTIVES ON RISK

### Sources of Risk

There are several sources of risk in a project. The important ones are project-specific risk, competitive risk, industry-specific risk, market risk, and international risk.

**Project-specific risk** The earnings and cash flows of the project may be lower than expected because of estimation error or some factors specific to the project like the quality of management.

**Competitive risk** The earnings and cash flows of the project may be affected by unanticipated actions of competitors.

**Industry-specific risk** Unexpected technological developments and regulatory changes, that are specific to the industry to which the project belongs, will have an impact on the earnings and cash flows of the project as well.

**Market risk** Unanticipated changes in macroeconomic factors like the GDP growth rate, interest rate, and inflation have an impact on all projects, albeit in varying degrees.

**International risk** In the case of a foreign project, the earnings and cash flows may be different than expected due to exchange rate risk or political risk.

## Perspectives on Risk

You can view a project from at least three different perspectives:

**Stand-alone risk** This represents the risk of a project when it is viewed in isolation.

**Firm risk** Also called corporate risk, this represents the contribution of a project to the risk of the firm.

**Market risk** This represents the risk of a project from the point of view of a diversified investor. It is also called systematic risk.

Since the primary goal of the firm is to maximise shareholder value, what matters finally is the risk that a project imposes on shareholders. If shareholders are well diversified, market risk is the most appropriate measure of risk.

In practice, however, the project's stand-alone risk as well as its corporate risk are also considered important. Why? The project's stand-alone risk is considered important for the following reasons:

- Measuring a project's stand-alone risk is easier than measuring its corporate risk and far easier than measuring its market risk.
- In most of the cases, stand-alone risk, corporate risk, and market risk are highly correlated. If the overall economy does well, the firm too would do well. Further, if the firm does well, most of its projects would do well. Thanks to this high correlation, stand-alone risk may be used as a rough proxy for corporate risk and market risk.
- The proponent of a capital investment is likely to be judged on the performance of that investment. Hence he will naturally be concerned about its stand-alone risk and not about its contribution to the risk of the firm or the risk of a diversified investor.
- In most firms, the capital budgeting committee considers investment proposals one at a time. The committee often does not have the time or information or expertise to fully consider the interactions of the investments with the other investments of the firm or its shareholders.

Corporate risk is considered important for the following reasons:

- Undiversified shareholders are more concerned about corporate risk than market risk. Promoters who generally have a substantial equity stake tend to be undiversified or poorly diversified shareholders.

- Empirical studies suggest that both market risk and corporate risk have a bearing on required returns. Perhaps even diversified investors consider corporate risk in addition to market risk when they specify required returns.
- The stability of over-all corporate cash flows and earnings is valued by managers, workers, suppliers, creditors, customers, and the community in which the firm operates. If the cash flows and earnings of the firm are perceived to be highly volatile and risky, the firm will have difficulty in attracting talented employees, loyal customers, reliable suppliers, and dependable lenders. This will impair its performance and destroy shareholder wealth.

Recognising the importance of stand-alone risk, firm risk, and market risk, we will discuss risk from all the three perspectives

## 13.2 ■ SENSITIVITY ANALYSIS

Since the future is uncertain, you may like to know what will happen to the viability of the project when some variable like sales or investment deviates from its expected value. In other words, you may want to do “what if” analysis or sensitivity analysis.

To understand the nature of sensitivity analysis, let us consider an example. Suppose you are the financial manager of Naveen Flour Mills. Naveen is considering setting up a new flour mill near Bangalore. Based on Naveen’s previous experience, the project staff of Naveen has developed the figures shown in [Exhibit 13.2](#) (Note that the salvage value has been assumed to be nil and the straight line method of depreciation is used). The discount rate is 12%.

### Exhibit 13.2 Cash Flow Forecast for Naveen’s Flour Mill Project

	₹ in '000)	
	Year 0	Years 1- 10
1. Investment	(20,000)	
2. Sales		18,000
3. Variable costs (66 $\frac{2}{3}$ % of sales)		12,000
4. Fixed costs		1,000
5. Depreciation		2,000
6. Pre-tax profit		3,000
7. Taxes (33.33%)		1,000
8. Profit after taxes		2,000
9. Cash flow from operation		4,000
10. Net cash flow	(20,000)	4,000

Since the cash flow from operations is an annuity, the NPV of the flour mill project is:

$$\begin{aligned} & -20,000,000 + 4,000,000 \times PVIFA(r = 12\%, n = 10) \\ & -20,000,000 + 4,000,000 (5.650) \\ & = ₹ 2,600,000 \end{aligned}$$

The NPV based on the expected values of the underlying variables looks positive. You are, however, aware that the underlying variables can vary widely and hence you would like to explore the effect of such variations on the NPV. So you define the optimistic and pessimistic estimates for the

underlying variables. These are shown in the left hand columns of [Exhibit 13.3](#). With this information, you can calculate the NPV for the optimistic and pessimistic values of each of the underlying variables.

**Exhibit 13.3 Sensitivity of NPV to Variations in the Value of Key Variables**

Key Variable	Range			NPV		
	Pessimistic	Expected	Optimistic	Pessimistic	Expected	Optimistic
Investment ₹ in million)	24	20	18	- 0.65	2.60	4.22
Sales ₹ in million)	15	18	21	- 1.17	2.60	6.40
Variable costs as a percent of sales	70	66.67	65	0.34	2.60	3.73
Fixed costs	1.3	1.0	0.8	1.47	2.60	3.33

To do this, vary one variable at a time. For example, to study the effect of an adverse variation in sales (from the expected ₹ 18 million to the pessimistic ₹ 15 million), you maintain the values of the other underlying variables at their expected levels. (This means that the investment is held at ₹ 20 million, variable costs as a proportion of sales are held at  $66\frac{2}{3}$  percent, fixed costs are held at ₹ 1 million, so on and so forth).

The NPV when the sales are at their pessimistic level and other variables at their expected level is shown on the right side of [Exhibit 13.3](#). Likewise you can calculate the effect of variations in the values of the other underlying variables. The NPVs for the pessimistic, expected, and optimistic forecasts are shown on the right side of [Exhibit 13.3](#).

## Evaluation

A very popular method for assessing risk, sensitivity analysis has certain merits:

- It shows how robust or vulnerable a project is to changes in values of the underlying variables.
- It indicates where further work may be done. If the net present value is highly sensitive to changes in some factor, it may be worthwhile to explore how the variability of that critical factor may be contained.
- It is intuitively very appealing as it articulates the concerns that project evaluators normally have.

Notwithstanding its appeal and popularity, sensitivity analysis suffers from several shortcomings:

- It merely shows what happens to NPV when there is a change in some variable, without providing any idea of how likely that change will be.
- Typically, in sensitivity analysis only one variable is changed at a time. In the real world, however, variables tend to move together.
- It is inherently a very subjective analysis. The same sensitivity analysis may lead one decision maker to accept the project while another may reject it.

### 13.3 ■ SCENARIO ANALYSIS

In sensitivity analysis, typically one variable is varied at a time. In scenario analysis, several variables are varied simultaneously. Most commonly, three scenarios are considered: expected (or normal) scenario, pessimistic scenario, and optimistic scenario. In the normal scenario, all variables assume their expected (or normal values); in the pessimistic scenario, all variables assume their pessimistic values; and in the optimistic scenario all variables assume their optimistic values.

The NPV of the project of Naveen Flour Mills under three scenarios is calculated in [Exhibit 13.4](#).

**Exhibit 13.4 Pessimistic, Normal and Optimistic Scenario**

	(₹ in million)		
	Pessimistic Scenario	Expected Scenario	Optimistic Scenario
1. Investment	24	20	18
2. Sales	15	18	21
3. Variable costs	10.5 (70%)	12 (66.67%)	13.65 (65%)
4. Fixed costs	1.3	1.0	0.8
5. Depreciation	2.4	2.0	1.8
6. Pre-tax profit	0.8	3.0	4.75
7. Tax	0.27	1.0	1.58
8. Profit after tax	0.53	2.0	3.17
9. Annual cash flow from operations	2.93	4.0	4.97
10. Net present value (9) × PVIFA (12%, 10 yrs) – (1)	(7.45)	2.60	10.08

## Scenario Analysis Using a Spreadsheet

First, set up the Excel spreadsheet as shown in [Exhibit 13.5](#). The NPV calculation is in C16. Enter the pessimistic values of the key variables, namely, investments, sales, variable costs as a percentage of sales, and fixed costs in B19 to B22. Likewise enter the expected values of the key variables in C19 to C22 and the optimistic values of the key variables in D19 to D22.

Then click on Tools and from the drop-down menu select Scenarios. A dialogue box named Scenario Manager appears in which click on the button Add. A new dialogue box appears in which against Scenario name, type Pessimistic and against Changing cells give references of the cells whose values change for the various scenarios, viz. C4, C7, C5, C9 and click on the button OK.

Another box named Scenario Values appears in which fill in the respective values against the changing cells, in this case (24,000), 15,000, 70% and 1,300 respectively. Click on the button OK and the Scenario Manager reappears. Click on the button Add and in the Scenario Name box against name type Expected. The changing cells references remain unchanged but in the next dialogue box the cell values are to be changed to the expected values viz. (20,000), 18,000, 66.67% and 1,000 respectively.

Click on the button OK and this time use the Scenario Manager to get the Optimistic scenario by giving the related input values. When the Scenario Manager reappears, click on the button Summary. In the resultant dialogue box, check in the box Scenario summary and in the Result cells give the reference of the cell whose value is needed—in this case—C16. Now when you click OK a Scenario Summary appears. In the Result Cell of this summary, you can see the desired result viz. net present value for each of the scenarios, in a neat table, whose labels can be suitably edited if necessary.

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## Exhibit 13.5 | Scenario Analysis

	A	B	C	D
1.	Discount rate	Project life	Tax rate	
2.	12%	10	33.33%	
3.	Expected values (₹ in '000)			
4.	Investment in year 0		(20,000)	
5.	Variable costs as a percentage of sales		66.67%	
6.	For years 1 to 10			
7.	Sales		18,000	
8.	Variable costs	= C7*C5	12,001	
9.	Fixed costs		1,000	
10.	Depreciation	= -C4/B2	2,000	
11.	Pre-tax profit	= C7-C8-C9-C10	2,999	
12.	Taxes	= C11*C2	1,000	
13.	Profit after taxes	= C11-C12	2,000	
14.	Cash flow from operation	= C13 + C10	4,000	
15.	Present value of the cash flow stream	= PV(A2,B2,-C14)	22,599	
16.	Net present value of the project	= C15 + C4	2,599	
17.				
18.	Key variables	Pessimistic	Expected	Optimistic
19.	Investment	-24,000	-20,000	-18,000
20.	Sales	15,000	18,000	21,000
21.	Variable costs as a percent of sales	70	66.67	65
22.	Fixed costs	1,300	1,000	800

## Exhibit 13.6 | Scenario Summary

	A	B	C	D	E	F	G
1.							
2.							
3.			Scenario Summary				
4.				Current Values:	Pessimistic	Expected	Optimistic
5.			Changing Cells:				
6.			\$C\$4	(20,000)	(24,000)	(20,000)	(18,000)
7.			\$C\$7	18,000	15,000	18,000	21,000
8.			\$C\$5	66.67%	70.00%	66.67%	65.00%
9.			\$C\$9	1,000	1,300	1,000	800
10.			Result Cells:				
11.			\$C\$16	2,599	-7,426	2,599	10,064
12.			Notes: Current Values column represents values of changing cells at time Scenario Sumary Report was created. Changing cells for each scenario are highlighted in gray.				
13.							
14.							

## Evaluation

Scenario analysis may be regarded as an improvement over sensitivity analysis because it considers variations in several variables together.

However, scenario analysis has its own limitations:

- It is based on the assumption that there are a few well-delineated scenarios. This may not be true in many cases. For example, the economy does not necessarily lie in three discrete states, viz., recession, stability, and boom. It can in fact be anywhere on the continuum between the extremes. When a continuum is converted into three discrete states some information is lost.
- Scenario analysis expands the concept of estimating the expected values. Thus, in a case where there are 10 inputs the analyst has to estimate 30 expected values ( $3 \times 10$ ) to do the scenario analysis.

## 13.4 ■ BREAK-EVEN ANALYSIS

In sensitivity analysis we ask what will happen to the project if sales decline or costs increase or something else happens. As a financial manager, you will also be interested in knowing how much should be produced and sold at a minimum to ensure that the project does not 'lose money'. Such an exercise is called **break-even analysis** and the minimum quantity at which loss is avoided is called the break-even point. The break-even point may be defined in accounting terms or financial terms.

## Accounting Break-even Analysis

Suppose you are the financial manager of Naveen Flour Mills. Naveen is considering setting up a new flour mill near Bangalore. Based on Naveen's previous experience, the project staff of Naveen has developed the figures shown in [Exhibit 13.7](#).

Note that the ratio of variable costs to sales is 0.667 (12/18). This means that every rupee of sales makes a contribution of ₹ 0.333. Put differently, the contribution margin ratio is 0.333. Hence the break-even level of sales will be:

$$\frac{\text{Fixed costs} + \text{Depreciation}}{\text{Contribution margin ratio}} = \frac{(1+2) \text{ million}}{0.333} = ₹ 9 \text{ million}$$

### Exhibit 13.7 Cash Flow Forecast for Naveen's Flour Mill Project

	('000)	
	Year 0	Years 1 - 10
1. Investment	(20,000)	
2. Sales	18,000	
3. Variable costs ( $66\frac{2}{3}\%$ of sales)	12,000	
1. Fixed costs	1,000	
2. Depreciation	2,000	
3. Pre-tax profit	3,000	
4. Taxes	1,000	
5. Profit after taxes	2,000	
6. Cash flow from operation	4,000	
7. Net cash flow	(20,000)	4,000

By way of confirmation, you can verify that the break-even level of sales is indeed ₹ 9 million.

	₹ in million
Sales	9
Variable costs	6
Fixed costs	1
Depreciation	2
Profit before tax	0
Tax	0
Profit after tax	0

A variant of the **accounting break-even point** is the **cash break-even point** which is defined as the level of sales at which the firm neither makes a cash profit nor incurs a cash loss. The cash break even sales is defined as:

$$\frac{\text{Fixed costs}}{\text{Contribution margin ratio}}$$

The cash break-even level of sales for the flour mill project is:

$$1 \text{ million}/0.333 = ₹ 3 \text{ million}$$

A project that breaks even in accounting terms is like a stock that gives you a return of zero percent. In both the cases you recover your investment, but don't get any return.

## Financial Break-even Analysis

The focus of financial break-even analysis is on NPV and not accounting profit. At what level of sales will the project have a zero NPV?

To illustrate how the financial break-even level of sales is calculated, let us go back to the flour mill project. The annual cash flow of the project depends on sales as follows:

1. Variable costs : 66.67 percent of sales
2. Contribution : 33.33 percent of sales
3. Fixed costs : ₹ 1 million
4. Depreciation : ₹ 2 million
5. Pre-tax profit :  $(0.333 \times \text{Sales}) - ₹ 3 \text{ million}$
6. Tax (at 33.33%) :  $0.333(0.333 \times \text{Sales} - ₹ 3 \text{ million})$
7. Profit after tax :  $0.667(0.333 \times \text{Sales} - ₹ 3 \text{ million})$
8. Cash flow (4+7) :  $₹ 2 \text{ million} + 0.667(0.333 \times \text{Sales} - ₹ 3 \text{ million})$   
= 0.222 Sales

Since the cash flow lasts for 10 years, its present value at a discount rate of 12 percent is:

$$\begin{aligned}\text{PV(cash flows)} &= 0.222 \text{ Sales} \times \text{PVIFA (10 years, 12\%)} \\ &= 0.222 \text{ Sales} \times 5.650 \\ &= 1.254 \text{ Sales}\end{aligned}$$

The project breaks even in NPV terms when the present value of these cash flows equals the initial investment of ₹ 20 million. Hence, the financial break-even occurs when

$$\begin{aligned}\text{PV (cash flows)} &= \text{Investment} \\ 1.254 \text{ Sales} &= ₹ 20 \text{ million} \\ \text{Sales} &= ₹ 15.95 \text{ million}\end{aligned}$$

Thus, the sales for the flour mill must be ₹ 15.95 million per year for the investment to have a zero NPV. Note that this is significantly higher than ₹ 9 million which represents the accounting break-even sales.

## 13.5 ■ HILLIER MODEL

Under certain circumstances, the expected net present value and the standard deviation of net present value may be obtained through analytical derivation as suggested by F.S. Hillier. Two cases of such analysis are discussed here: (i) no correlation among cash flows and (ii) perfect correlation among cash flows. When the cash flows of different years are uncorrelated the cash flow for year  $t$  is independent of cash flow for year  $t-m$ . If cash flows for different years are perfectly correlated, the behaviour of cash flows in all periods is alike. The  $\overline{NPV}$  and  $\sigma$  (NPV) under these two cases are as follows:

*Uncorrelated Cash Flows*

$$\overline{NPV} = \sum_{t=1}^n \frac{\bar{C}_t}{(1+i)^t} - I$$

$$\sigma(NPV) = \sum_{t=1}^n \left( \frac{\sigma_t^2}{(1+i)^{2t}} \right)^{1/2}$$

*Perfectly Correlated Cash Flows*

$$\overline{NPV} = \sum_{t=1}^n \frac{\bar{C}_t}{(1+i)^t} - I$$

$$\sigma(NPV) = \sum_{t=1}^n \frac{\sigma_t}{(1+i)^t}$$

where  $\bar{C}_t$  is the expected cash flow for year  $t$ ,  $\sigma_t$  is the standard deviation of cash flow for year  $t$ ,  $i$  is the risk free rate, and  $I$  is the initial investment.

## **13.6 ■ SIMULATION ANALYSIS**

Sensitivity analysis indicates the sensitivity of the criterion of merit (NPV, IRR, or any other) to variations in basic factors. Such information, though useful, may not be adequate for decision making. The decision maker would also like to know the likelihood of such occurrences. Simulation analysis is a tool for doing that.

## Procedure

The steps involved in simulation analysis are as follows:

1. Model the project. The model of the project shows how the net present value is related to the parameters and the exogenous variables. Parameters are input variables specified by the decision maker and held constant over all simulation runs. Exogenous variables are input variables which are stochastic in nature and outside the control of the decision maker.
2. Specify the values of parameters and the probability distributions of the exogenous variables.
3. Select a value, at random, from the probability distributions of each of the exogenous variables.
4. Determine the net present value corresponding to the randomly generated values of exogenous variables and pre-specified parameter values.
5. Repeat steps (3) and (4) a number of times to get a large number of simulated net present values.
6. Plot the frequency distribution of the net present value.

**Illustration** In real life situations, simulation is done only on the computer because of the computational tedium involved. However, to give you a flavour of what goes on in simulation, we will work with a simple example where simulation has been done manually.

Zenith Chemicals is evaluating an investment project whose net present value has been modelled as follows:

$$NPV = \sum_{t=1}^n \frac{\text{Annual Cash Flow}}{(1 + \text{Risk-free Rate})^t} - \text{Initial Investment} \quad (13.1)$$

In the NPV model embodied in Eq.(13.1), the risk-free rate and the initial investment are parameters with the following values: risk-free rate = 10 percent and initial investment = ₹ 13,000. The annual cash flow and the project life ( $n$ ) are stochastic exogenous variables with the following distributions:

Annual Cash Flow		Project Life	
Value	Probability	Value	Probability
₹ 1,000	0.02	3 years	0.05
1,500	0.03	4	0.10
2,000	0.15	5	0.30
2,500	0.15	6	0.25
3,000	0.30	7	0.15
3,500	0.20	8	0.10
4,000	0.15	9	0.03
		10	0.02

The firm wants to perform 10 manual simulation runs for this project. To perform the simulation runs, we have to generate values, at random, for the two exogenous variables: annual cash flow and project life. For this purpose, we have to (i) set up the correspondence between the values of exogenous variables and random numbers, and (ii) choose some random number generating device. [Exhibit 13.8](#) shows the correspondence between various variables and two digit random numbers. [Exhibit 13.9](#) presents a table of random digits that will be used for obtaining two digit random numbers<sup>1</sup>.

Now we are ready for simulation. In order to obtain random numbers from [Exhibit 13.9](#) we may begin anywhere at random in the table and read any pair of adjacent columns (since we are interested in a two-digit random number) and read column-wise or row-wise.

For our example, let us use the first two columns of [Exhibit 13.9](#). Starting from the top, we will read down the column. For the first simulation run we need two-digit random numbers, one for the annual cash flow and the other for the project life. These numbers are 53 and 97 and the corresponding values for annual cash flow and project life are ₹ 3,000 and 9 years respectively. We go further in this manner. [Exhibit 13.10](#) shows the random numbers so obtained and the results of simulation.

**Exhibit 13.8 | Correspondence Between Values of Exogenous Variables and Two Digit Random Numbers**

Annual Cash Flow				Project Life			
Value	Probability	Cumulative Probability	Two Digit Random Numbers	Value	Probability	Cumulative Probability	Two Digit Random Numbers
₹				Years			
1,000	.02	.02	00 to 01	3	.05	.05	00 to 04
1,500	.03	.05	02 to 04	4	.10	.15	05 to 14
2,000	.15	.20	05 to 19	5	.30	.45	15 to 44
2,500	.15	.35	20 to 34	6	.25	.70	45 to 69
3,000	.30	.65	35 to 64	7	.15	.85	70 to 84
3,500	.20	.85	65 to 84	8	.10	.95	85 to 94
4,000	.15	1.00	86 to 99	9	.03	.98	95 to 97
				10	.02	1.00	98 to 99

**Exhibit 13.9 | Random Numbers**

53479	81115	98036	12217	59526
97344	70328	58116	91964	26240
66023	38277	74523	71118	84892
99776	75723	03172	43112	83086
30176	48979	92153	38416	42436
81874	83339	14988	99937	13213
19839	90630	71863	95053	55532
09337	33435	53869	52769	18801
31151	58925	40823	41330	21093
67619	52515	03037	81699	17106

## Exhibit 13.10 | Simulation Results

Run	Annual Cash Flow		Project Life		
	Random Number	Corresponding Value of Annual Flow	Random Number	Corresponding Value of Project Life	Net Present Value
1	53	3,000	97	9	4277
2	66	3,500	99	10	8506
3	30	2,500	81	7	(829)
4	19	2,000	09	4	(7660)
5	31	2,500	67	6	(2112)
6	81	3,500	70	7	4039
7	38	3,000	75	7	1605
8	48	3,000	83	7	1605
9	90	4,000	33	5	2163
10	58	3,000	52	6	66

### World Bank's Experience

It may be instructive here to review the experience of World Bank. The following are its summary remarks on simulation.

- Simulation is a powerful technique which permits use of a great deal of information which would otherwise be lost.
- It is a highly efficient medium of communication.
- It is not a technique which replaces skilled judgment. On the contrary, it often requires the use of far more judgment than the traditional analysis.
- Despite the method's value, the treatment of correlations between variables remains a major problem. It is clear that results can be completely misleading if correlations are not handled properly.

## Evaluation

An increasingly popular tool of risk analysis, simulation offers certain advantages:

- Its principal strength lies in its versatility. It can handle problems characterised by (a) numerous exogenous variables following any kind of distribution, and (b) complex interrelationships among parameters, exogenous variables, and endogenous variables. Such problems often defy the capabilities of analytical methods.
- It compels the decision maker to explicitly consider the interdependencies and uncertainties characterising the project.

Simulation, however, is a controversial tool which suffers from several shortcomings.

- It is difficult to model the project and specify the probability distributions of exogenous variables.
- Simulation is inherently imprecise. It provides a rough approximation of the probability distribution of net present value (or any other criterion of merit). Due to its imprecision, the simulated probability distribution may be misleading when a tail of the distribution is critical.
- A realistic simulation model, likely to be complex, would most probably be constructed by a management scientist, not the decision maker. The decision maker, lacking understanding of the model, may not use it.
- To determine the net present value in a simulation run the risk-free discount rate is used. This is done to avoid prejudging risk which is supposed to be reflected in the dispersion of the distribution of net present value. Thus the measure of net present value takes a meaning, very different from its usual one, that is difficult to interpret.

## 13.7 ■ DECISION TREE ANALYSIS

The scientists at Vigyanik have come up with an electric moped. The firm is ready for pilot production and test marketing. This will cost ₹ 20 million and take six months. Management believes that there is a 70 percent chance that the pilot production and test marketing will be successful. In case of success, Vigyanik can build a plant costing ₹ 150 million. The plant will generate an annual cash inflow of ₹ 30 million for 20 years if the demand is high or an annual cash inflow of ₹ 20 million if the demand is moderate. High demand has a probability of 0.6; moderate demand has a probability of 0.4. The discount rate is 12%. To analyse such situations where sequential decision making is involved decision tree analysis is helpful.

## Steps in Decision Tree Analysis

The key steps in decision tree analysis are as follows:

- Delineate the decision tree
- Evaluate the alternatives

**Delineate the Decision Tree** Exhibiting the anatomy of the decision situation, the decision tree shows:

- The decision points (typically represented by squares), the alternative options available for experimentation and action at these points, and the investment outlays associated with these options.
- The chance points (typically represented by circles) where outcomes are dependent on the chance process, the likely outcomes at these points along with the probabilities thereof, and the monetary values associated with them.

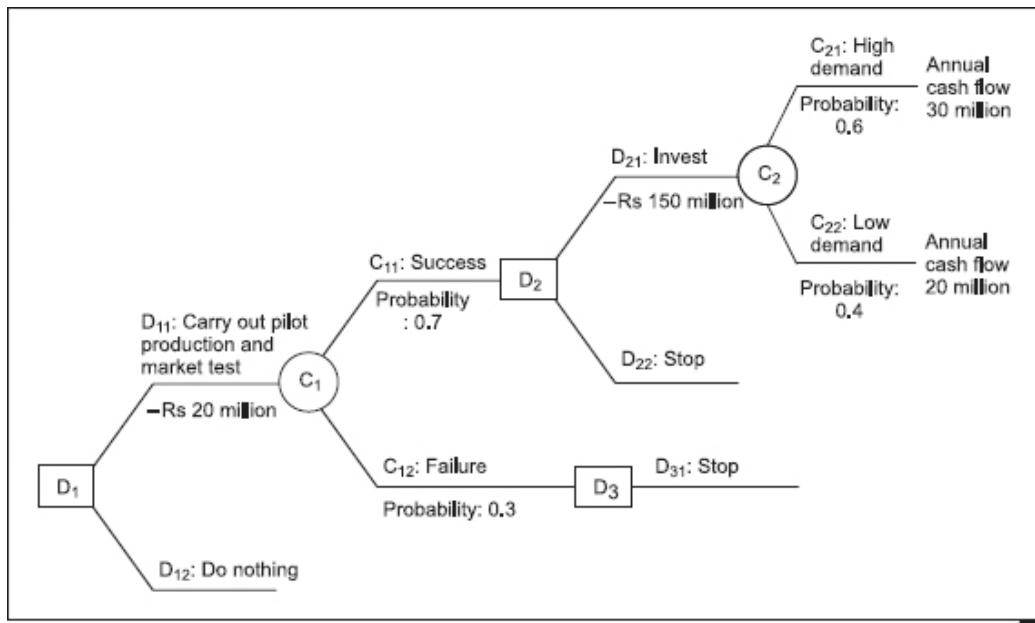
**Evaluate the Alternatives** Once the decision tree is delineated and data about outcomes and probabilities gathered, decision alternatives may be evaluated as follows:

1. Start at the right-hand end of the tree and calculate the NPV at various chance points that come first as you proceed leftward.
2. Given the NPVs of chance points in step 1, evaluate the alternatives at the final stage decision points in terms of their NPVs.
3. At each final stage decision point, select the alternative which has the highest NPV and truncate the other alternatives. Each decision point is assigned a value equal to the NPV of the alternative selected at that decision point.
4. Proceed backward (leftward) in the same manner, calculating the NPV at chance points, selecting the decision alternative which has the highest NPV at various decision points, truncating inferior decision alternatives, and assigning NPVs to decision points, till the first decision point is reached.

The decision tree for the electric moped project of Vigyanik is shown in [Exhibit 13.11](#).

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## Exhibit 13.11 | Decision Tree



The alternatives in the decision tree shown in Exhibit 13.11 are evaluated as follows:

1. Start at the right-hand end of the tree and calculate the NPV at chance point C<sub>2</sub> that comes first as we proceed leftward.

$$\begin{aligned} \text{NPV}(C_2) &= 0.6 [30 \times \text{PVIFA}(20, 12\%)] + 0.4 [20 \times \text{PVIFA}(20, 12\%)] \\ &= ₹ 194.2 \text{ million} \end{aligned}$$

2. Evaluate the NPV of the decision alternatives at D<sub>2</sub> the last stage decision point:

Alternative	NPV
D <sub>21</sub> (Invest ₹ 150 million)	₹ 44.2 million
D <sub>22</sub> (Stop)	0

3. Select D<sub>21</sub> and truncate D<sub>22</sub> as  $\text{NPV}(D_{21}) > \text{NPV}(D_{22})$ .
4. Calculate the NPV at chance point C<sub>1</sub> that comes next as we roll backwards.

$$\text{NPV}(C_1) = 0.7 [44.2] + 0.3 [0] = ₹ 30.9 \text{ million}$$

5. Evaluate the NPV of the decision alternatives at D<sub>1</sub> the first stage decision point:

Alternative	NPV
D <sub>11</sub> (Carry out pilot production and market test, -Rs 20 million)	₹ 30.9 million
D <sub>12</sub> (Do nothing)	0

D <sub>11</sub> (Carry out pilot production and market test at a cost of ₹ 20 million)	₹ 10.9 million
D <sub>12</sub> (Do nothing)	0

Based on the above evaluation, we find that the optimal decision strategy is as follows: Choose D<sub>11</sub> (carry out pilot production and market test) at the decision point D<sub>1</sub> and wait for the outcome at the chance point C<sub>1</sub>. If the outcome at C<sub>1</sub> is C<sub>11</sub> (success), invest ₹ 150 million; if the outcome at C<sub>1</sub> is C<sub>12</sub> (failure) stop.

## **Value of Real Options**

Airways Limited has been set up to run an air taxi service in western India. The company is debating whether it should buy a turboprop aircraft or a piston engine aircraft. The turboprop aircraft costs 4000 and has a larger capacity. It will serve if the demand turns out to be high. The piston engine aircraft costs 1800 and has a smaller capacity. It will serve if the demand is low, but it will not suffice if the demand is high.

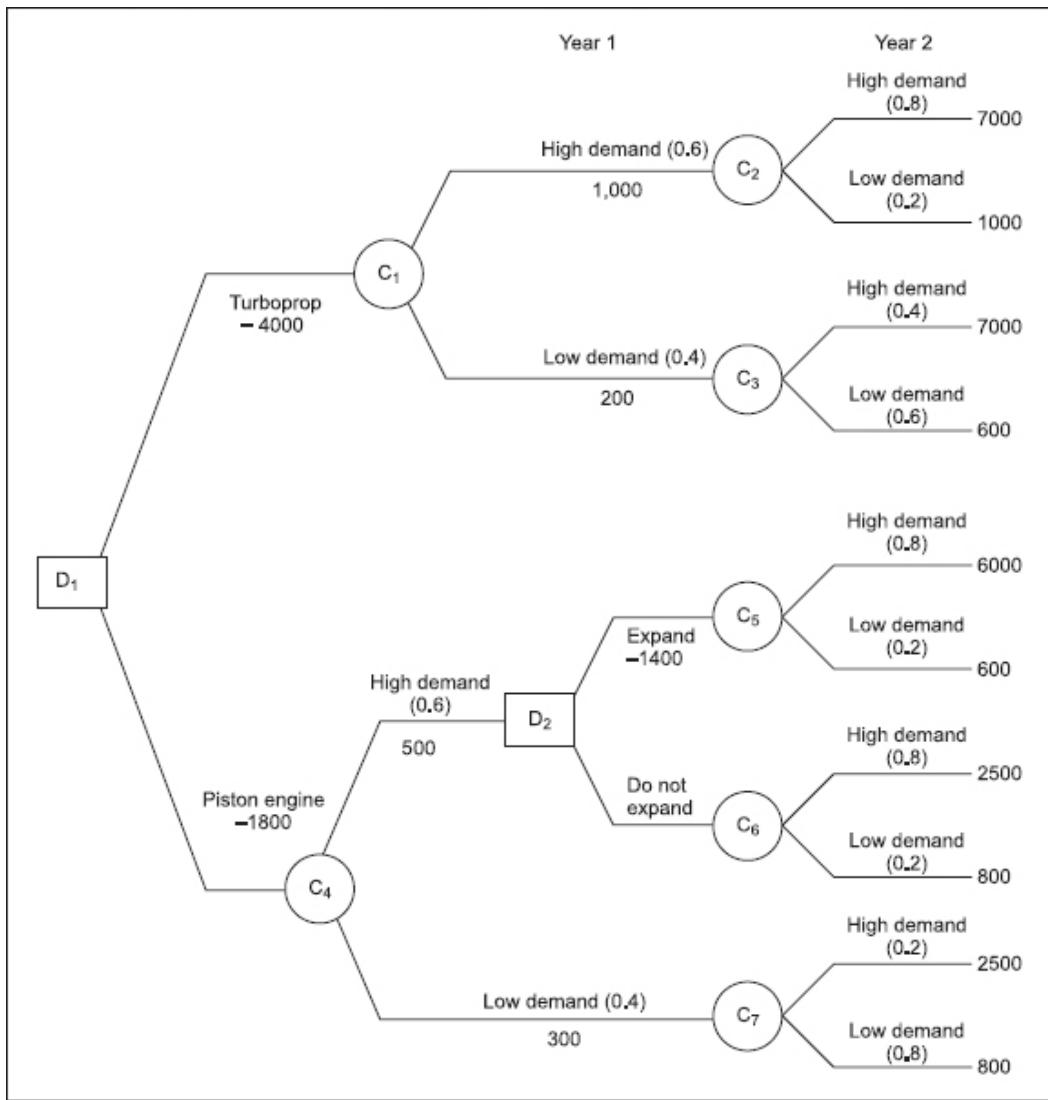
The company believes that the chances of demand being high and low in year 1 are 0.6 and 0.4. If the demand is high in year 1, there is an 80 percent chance that it will be high in subsequent years (year 2 onward) and a 20 percent chance that it will be low in subsequent years.

The technical director of Airways Limited thinks that if the company buys a piston engine aircraft now and the demand turns out to be high the company can buy a second-hand piston engine aircraft for 1400 at the end of year 1. This would double its capacity and enable it to cope reasonably well with high demand from year 2 onwards.

The payoffs associated with high and low demand for various decision alternatives are shown in [Exhibit 13.12](#). The payoffs shown for year 1 are the payoffs occurring at the end of year 1 and the payoffs shown for year 2 are the payoffs for year 2 and the subsequent years, evaluated as of year 2, using a discount rate of 12 percent which is the weighted average cost of capital for Airways Limited.

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## Exhibit 13.12 | Decision Tree



If Airways Limited buys the turboprop aircraft, there are no further decisions to be made. So, the NPV of the turboprop aircraft can be calculated by simply discounting the expected cash flows:

$$\begin{aligned}
 \text{NPV} &= -4000 + \frac{0.6(1000) + 0.4(200)}{(1.12)} \\
 &\quad + \frac{0.6[0.8(7000) + 0.2(1000)] + 0.4[0.4(7000) + 0.6(600)]}{(1.12)^2} \\
 &= 389
 \end{aligned}$$

If Airways Limited buys the piston engine aircraft and the demand in year 1 turns out to be high, a further decision has to be made with respect

to capacity expansion. To evaluate the piston engine aircraft, proceed as follows:

First, calculate the NPV of the two options viz., ‘expand’ and ‘do no expand’ at decision point D<sub>2</sub>:

$$\text{Expand: NPV} = \frac{0.8(6000) + 0.2(600)}{1.12} - 1400 = 2993$$

$$\text{Do not expand: NPV} = \frac{0.8(2500) + 0.2(800)}{1.12} = 1929$$

Second, truncate the ‘do not expand’ option as it is inferior to the ‘expand’ option. This means that the NPV at decision point D<sub>2</sub> will be 2993.

Third, calculate the NPV of the piston engine aircraft option.

$$\text{NPV} = -1800 + \frac{0.6(500 + 2993) + 0.4(300)}{(1.12)} + \frac{0.4[0.2(2500) + 0.8(800)]}{(1.12)^2}$$

$$= 542$$

Since the NPV of the piston engine aircraft (542) is greater than the NPV of the turboprop aircraft (389), the former is a better bet. So the recommended strategy for Airways Limited is to invest in the piston engine aircraft at decision point D<sub>1</sub> and, if the demand in year 1 turns out to be high, expand capacity by buying another piston engine aircraft.

**Option to Expand** Note that if Airways Limited does not have the option of expanding capacity at the end of year 1, the NPV of the piston engine aircraft option would be:

$$\text{NPV} = -1800 + \frac{0.6(500) + 0.4(300)}{(1.12)}$$

$$+ \frac{0.6[0.8(2500) + 0.2(800)] + 0.4[0.2(2500) + 0.8(800)]}{(1.12)^2}$$

$$= -28$$

Thus, the **option to expand** has a value of: 542 – (– 28) = 570.

**Option to Abandon** So far we assumed that Airways Limited will continue operations irrespective of the state of demand. Let us now introduce the possibility of abandoning the operation and disposing off the aircraft at the end of year 1, should it be profitable to do so. Suppose after 1 year of use the turboprop aircraft can be sold for 3600 and the piston-engine aircraft for 1400.

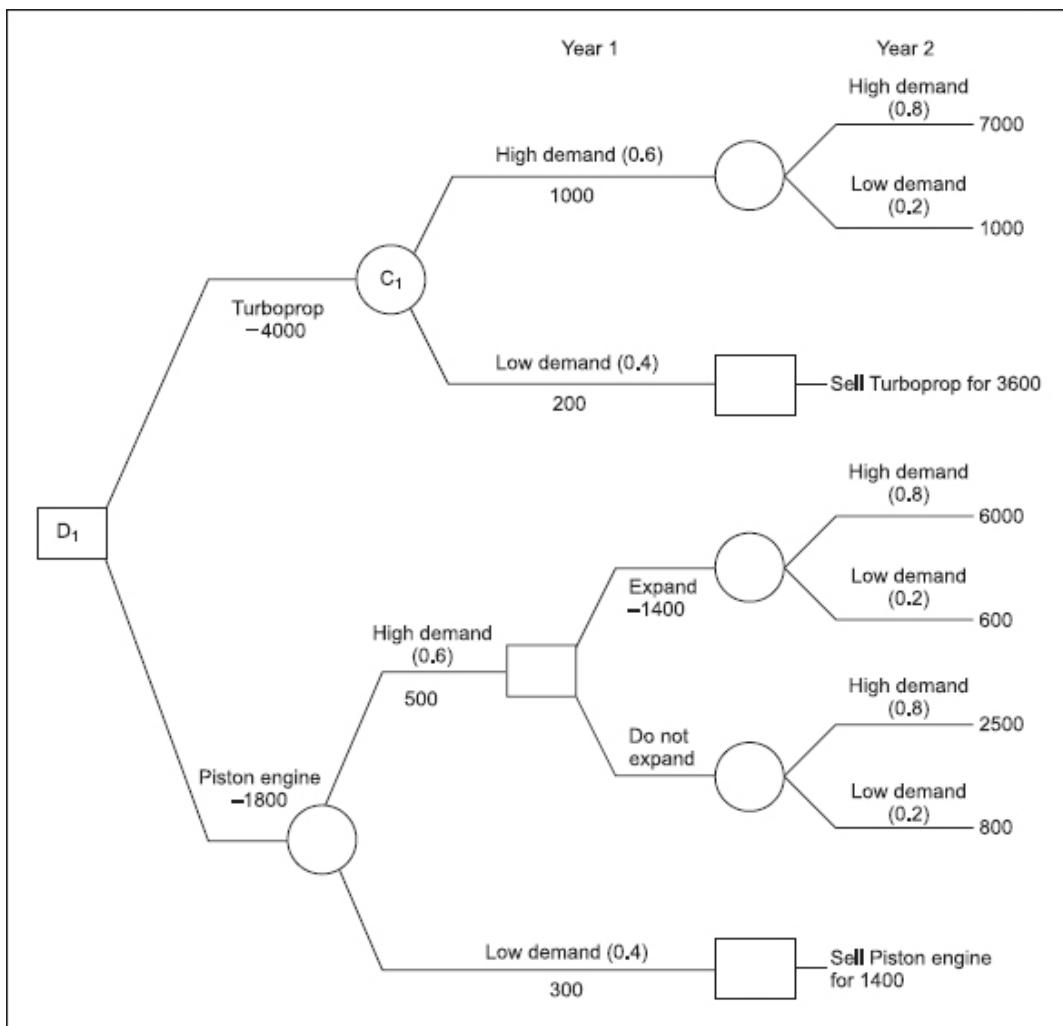
If the demand in year 1 turns out to be low, the payoffs for ‘continuation’ and ‘abandonment’ as of year 1 are as follows.

<i>Turboprop Aircraft</i>	<i>Piston Engine Aircraft</i>
Continuation: $[0.4(7000) + 0.6(600)]/(1.12)$ = 2821	Continuation: $[0.2(2500) + 0.8(800)]/(1.12)$ = 1018
Abandonment: 3600	Abandonment: 1400

Thus in both the cases it makes sense to sell off the aircraft after year 1, if the demand in year 1 turns out to be low.

The revised decision tree, taking into account the abandonment options, is shown in [Exhibit 13.13](#).

### Exhibit 13.13 Decision Tree



Given the decision tree with abandonment possibilities, let us calculate the NPV of the turboprop aircraft and the piston engine aircraft.

$$\text{NPV (Turboprop)} = -4000 + \frac{0.6[1000 + \{0.8(7000) + 0.2(1000) / (1.12)\}] + 0.4(200 + 3600)}{(1.12)}$$

$$= 667$$

$$\text{NPV (Piston engine)} = -1800 + \frac{0.6(500 + 2993) + 0.4(300 + 1400)}{(1.12)}$$

$$= 678$$

Note that the possibility of abandonment increases the NPV of the Turboprop aircraft from 389 to 667. This means that the value of the option to abandon is:

$$= \text{NPV with abandonment} - \text{NPV without abandonment}$$

$$\text{Value of abandonment option} = 667 - 389 = 278$$

For the piston engine aircraft the possibility of abandonment increases the NPV from 542 to 678. Hence the value of the **abandonment option** is 136.

## Evaluation

Decision trees are useful for analysing a project that has the following characteristics:

- Decisions on continuing the project are made in well-defined stages.
- The outcomes at each stage fall into a few broad classes.
- The probabilities and the cash flows associated with various outcomes can be specified at the beginning of the project. This means that the firm has experience of doing similar projects in the past.

Obviously, decision tree analysis requires enormous information before it can be applied. It may be difficult to apply decision tree analysis to a project where the product or service is new and the firm has very little information on how the market will respond to it. Decision trees are also not easy to apply when investments are gradually made over a period of time rather than in a few well-defined stages.

## 13.8 ■ CORPORATE RISK ANALYSIS

A project's corporate risk is its contribution to the overall risk of the firm. Put differently, it reflects the impact of the project on the risk profile of the firm's total cash flows.

In a [previous chapter](#) we learnt that the contribution of a security to portfolio risk depends on (i) the standard deviation of its returns and (ii) the correlation of its returns with the returns on the other securities included in the portfolio. Just the same way, the corporate risk of a project depends on (i) the standard deviation of its returns and (ii) the correlation of its returns with the returns on the other projects of the firm.

On a stand-alone basis a project may be very risky but if its returns are not highly correlated – or, even better, negatively correlated – with the returns on the other projects of the firm, its corporate risk tends to be low.

Aware of the benefits of portfolio diversification, many firms consciously pursue a strategy of diversification. Hindustan Unilever Limited, for example, has a diversified portfolio comprising, in the main, of the following businesses: soaps and detergents, personal care products, edible oil, and tea.

The proponents of diversification argue that it helps in reducing the firm's overall risk exposure. As most businesses are characterised by cyclicalities, it seems desirable that there are at least two to three different lines of business in a firm's portfolio. As someone put it vividly: "If you have three legs to your firm, you enjoy a reasonable degree of stability." This is simply another way of saying that don't put all your eggs in the same basket.

The logic of corporate diversification for reducing risk, however, has been questioned. Why should a firm diversify when shareholders can reduce risk through personal diversification. All that they have to do is to hold a diversified portfolio of securities or participate in a mutual fund scheme. Indeed, they can do it more efficiently.

There does not seem to be an easy answer. Although shareholders can reduce risk through personal diversification there are some other benefits from corporate diversification. Stable earnings and cash flows enable a firm to attract talent, to secure greater commitment from various stakeholders, to exploit tax shelters fully, and to check adverse managerial incentives. Hence, most firms do look at the impact of investment proposals, particularly the major ones, on the overall risk profile of the firm.

## 13.9 ■ MANAGING RISK

Managers are not merely content with measuring risk. They want to explore ways and means of mitigating risk. Some of the ways of doing this are discussed below. These risk reduction strategies have a cost associated with them, and whether they are profitable in a given situation will depend on circumstances.

**Fixed and Variable Costs** A common way to modify the risk of an investment is to change the proportions of fixed and variable costs. For example, in the early 1980s Ford Motor Company restructured its operations. Essentially, it decided to buy most of its components from outside suppliers instead of manufacturing them in-house. This decreased its fixed costs and increased its variable costs. The net effect was that its break-even level declined.

**Pricing Strategy** Pricing strategy is used by many firms to manage risk. A lower price increases potential demand, but also raises the break-even level. This is the reason why publishers first bring out a hard-cover edition at a higher price and then introduce a soft-cover edition at a lower price.

**Sequential Investment** If you are not sure about the market response to your product or service, you may start small and later expand as the market grows. This strategy may entail higher capital cost per unit because capacity is created in stages. However, it reduces risk exposure. You can employ decision tree analysis to hammer out the optimal sequence of investment in face of risk.

**Improving Information** An African proverb says “Don’t test the depth of a river with both feet”. You may like to gather more information about the market and technology before taking the plunge. Additional study often improves the quality of forecasts but involves direct costs (the cost of the study) as well as opportunity costs of delayed action. You have to weigh the costs and benefits of further study and decide how much of additional information should be gathered.

**Financial Leverage** We discussed how reducing the proportion of fixed operating costs lowers risk. Likewise reducing the dependence on debt lowers risk. Remember that debt entails a definite contractual

commitment whereas equity carries no fixed burden. Hence if the operating risk of the project is high, it makes sense to go for a low level of financial leverage.

**Insurance** You can get an insurance cover against a variety of risks like physical damage, theft, loss of key person, and so on. Insurance is a pure antidote for such risks. Of course, to protect yourself against such risks you have to pay insurance premium.

**Long-term Arrangements** One way to mitigate risk is to enter into long-term arrangements with suppliers, employees, lenders, and customers. A long-term contract with suppliers ensures availability of inputs at a predictable price; a long-term wage contract with employees removes uncertainty about employee cost; a long term debt contract reduces risk about interest rate; finally, a long-term sales contract with customers eliminates revenue risk.

Often long-term contracts are indexed. This means that the prices are periodically adjusted in line with the movement of some index which essentially reflects inflation. For example, a supply contract may have an escalator clause that links the supply price to some price index like the Wholesale Price Index. Price indexing protects both the buyer and seller against inflation risk because indexing ensures that the real price (price in terms of purchasing power) is constant.

**Strategic Alliance** When the resources required for a project or the risks inherent in a project are beyond the capacity of a single company, strategic alliance may be the way out. A strategic alliance, also referred to as a joint venture, represents a partnership between two or more independent companies which join hands to achieve a common purpose. It is usually organised as a newly created company, though the partners may choose any other form of organisation. Typically, the partners partake in the equity of the common enterprise, contribute resources (technology, facilities, distribution networks, brands, key manpower, and so on), and share management and control. The massive resource requirements and huge risks in modern enterprises have compelled many traditional rivals to work together. Competitors are beginning to cooperate leading to a phenomenon called 'co-optition'.

**Derivatives** Derivative instruments like options and futures can be used for managing risk. An option gives its owner the right to buy or sell an underlying asset on or before a given date at a predetermined price. An

option to buy is a call option – it gives flexibility which is very valuable in volatile markets. For example, a call option embedded in a debt instrument gives the issuing firm the right to prematurely redeem (buy back) the debt instrument at a certain price. Such an option is very valuable when the interest rate falls.

A futures contract is an agreement between two parties to exchange an asset for cash at a predetermined future date for a price that is specified today. Futures contracts eliminate price risk. For example, a refinery may buy an oil futures contract for its oil requirement. Doing so entitles the refinery to get delivery of oil at a specified future date at a price that is fixed today.

**Shorter Time to Market** One way to reduce uncertainty is to cut the time to market. Researchers at Harvard Business School found in the early 1990s that Japanese automakers were designing and launching new car models in about two years when their American counterparts took about four years. This gave Japanese automakers two advantages. First, they received revenues from their investments in new models much earlier. Second, they faced less risk as they had to anticipate customer needs and preferences only two years, and not four years, in advance.

**Contingency Planning** Apart from taking steps to reduce risk to the extent it is practical and feasible, well managed companies prepare for the worst. This means listing the things that could go wrong with a decision and then identifying the actions that would be taken to cope with those adverse developments. Put differently, a contingency plan is prepared that will help the firm to recover from bad outcomes.

## 13.10 ■ PROJECT SELECTION UNDER RISK

Once information about expected return (measured as net present value, or internal rate of return or some other criterion of merit) and variability of return (measured in terms of range or standard deviation or some other risk index) has been gathered, the next question is: Should the project be accepted or rejected? There are several ways of incorporating risk in the decision process: judgmental evaluation, payback period requirement, risk-adjusted discount rate, and certainty equivalent.

**Judgmental Evaluation** Often managers look at the risk and return characteristics of a project and decide judgmentally whether the project should be accepted or rejected, without using any formal method for incorporating risk in the decision making process. The decision may be based on the collective view of some group like the capital budgeting committee, or the executive committee, or the board of directors. If judgmental decision making appears highly subjective or haphazard, consider how most of us make important decisions in our personal life. We rarely use formal selection methods or quantitative techniques for choosing a career or a spouse or an employer. Instead, we rely on our judgment.

**Payback Period Requirement** In many situations companies use NPV or IRR as the principal selection criterion, but apply a payback period requirement to control for risk. Typically, if an investment is considered more risky, a shorter payback period is required even if the NPV is positive or IRR exceeds the hurdle rate. This approach assumes that risk is a function of time.

Ordinarily it is true that the farther a benefit lies in future the more uncertain it is likely to be because economic and competitive conditions tend to change over time. However, risk is influenced by things other than the mere passage of time. Hence the payback period requirement may not be an adequate method for risk adjustment or control.

**Risk Adjusted Discount Rate** The risk adjusted discount rate method calls for adjusting the discount rate to reflect project risk. If the risk of the project is equal to the risk of the existing investments of the firm, the discount rate used is the average cost of capital of the firm; if the risk of the project is greater than the risk of the existing investments of the firm, the discount rate used is higher than the average cost of capital of the firm; if

the risk of the project is less than the risk of the existing investments of the firm the discount rate used is less than the average cost of capital of the firm. The risk adjusted discount rate is:

$$r_k = i + n + d_k \quad (13.2)$$

where  $r_k$  is the risk-adjusted discount rate for project  $k$ ,  $i$  is the risk-free rate of interest,  $n$  is the adjustment for the firm's normal risk, and  $d_k$  is the adjustment for the differential risk of project  $k$ .

It may be noted that  $(i + n)$  measures the firm's cost of capital.  $d_k$  may be positive or negative depending on how the risk of the project under consideration compares with the existing risk of the firm.

The adjustment for the differential risk of project  $k$ , quite understandably, depends on management's perception of the project risk and management's attitude towards risk (risk-return preference). A large pharmaceutical concern, for example, uses the following risk-adjusted discount rates for various types of investments.

<i>Investment Category</i>	<i>Risk-adjusted Discount Rate</i>
Replacement investments	Cost of capital
Expansion investments	Cost of capital + 2%
Investments in related lines	Cost of capital + 3%
Investments in new lines	Cost of capital + 5%

Once the project's risk-adjusted discount rate ( $r_k$ ) is specified, the project is accepted if its net present value, calculated using the risk-adjusted discount rate is positive.

The risk-adjusted discount rate is commonly employed in practice. Firms use different discount rates, presumably related to the risk factor, for different types of investment projects. The discount rate is generally low for routine replacement investments, moderate for expansion investments, and high for new investments.

Despite its popularity, the risk-adjusted discount rate method suffers from two serious limitations: (i) It is difficult to estimate  $d_k$  consistently - often it is determined in an extremely *ad hoc* and arbitrary manner. (ii) This method assumes that risk increases with time at a constant rate. This assumption may not be very valid.

**Certainty Equivalent Method** Before describing the certainty equivalent method let us understand the concept of certainty equivalent coefficient. Suppose someone presents you with a lottery the outcome of which has the following probability distribution.

<i>Outcome</i>	<i>Probability</i>
₹ 1,000	0.3
₹ 5,000	0.7

You are further asked: How much of a certain amount would you accept in lieu of this lottery? Let us say that your reply is: ₹ 3,000. This amount - ₹ 3,000 - represents the certainty equivalent of the above lottery which has an expected value of ₹ 3,800 ( $\text{₹ } 1,000 \times 0.3 + \text{₹ } 5,000 \times 0.7$ ) and a given distribution. The factor  $3,000/3,800 (=0.79)$  is called the certainty equivalent coefficient. It reflects primarily two things: variability of outcomes and your attitude towards risk. Certainty equivalent coefficients transform expected values of uncertain flows into their certainty equivalents.

Under the certainty equivalent method, the net present value is calculated as follows:

$$\text{NPV} = \sum_{t=1}^n \frac{\alpha_t \bar{C}_t}{(1+i)^t} - I \quad (13.3)$$

where NPV is the net present value,  $\bar{C}_t$  is the expected cash flow for year  $t$ ,  $\alpha_t$  is the certainty equivalent coefficient for the cash flow of year  $t$ ,  $i$  is the risk free interest rate, and  $I$  is the initial investment (about which it is assumed that there is no uncertainty).

The certainty equivalent method is conceptually superior to the risk-adjusted discount rate method because it does not assume that risk increases with time at a constant rate. Each year's certainty equivalent coefficient is based on the level of risk characterising its cash flow. Despite its conceptual soundness it is not as popular as the risk-adjusted discount rate method. This is perhaps because it is inconvenient and difficult to specify a series of certainty equivalent coefficients but seemingly simple to adjust the discount rate. Notwithstanding this practical difficulty, the merits of the certainty equivalent method must not be ignored.

## 13.11 ■ RISK ANALYSIS IN PRACTICE<sup>2</sup>

Several methods to incorporate the risk factor into capital expenditure analysis are used in practice. The most common ones are discussed here.

**Conservative Estimation of Revenues** In many cases the revenues expected from a project are conservatively estimated to ensure that the viability of the projects is not easily threatened by unfavourable circumstances. The capital budgeting systems often have built-in devices for conservative estimation. This is indicated by the following remarks made by two executives:

“We ask the project sponsor to estimate revenues conservatively. This checks the optimism common among project sponsors.”

“The capital budgeting committee requires justification for revenue figures given by those who propose capital expenditures. This has a sobering effect on them.”

**Safety Margin in Cost Figures** A margin of safety is generally included in estimating cost figures. This varies between 10 percent and 30 percent of what is deemed as normal cost. The size of the margin depends on what management feels about the likely variation in cost. The following observation suggests this:

“In estimating the cost of raw material we add about 20 to 25 percent to the current prices as the raw material price is not stable and often we pay a high price to get it. For labour cost we add about 10 to 12 percent as this is the annual increase.”

**Flexible Investment Yardsticks** The cut-off point on an investment varies according to the judgement of management about the riskiness of the project. In one company replacement investments are okayed if the expected post-tax return exceeds 15 percent but new investments are undertaken only if the expected post-tax return is greater than 20 percent. Another company employs a short payback period of three years for new investments. Its decision rule was stated by its financial controller as follows:

“Our policy is to accept a new project only if it has a payback period of three years. We have never, as far as I know, deviated from this. The use of a short payback period automatically weeds out risky projects.”

**Sensitivity Analysis** It is a common practice to judge how robust or vulnerable a project is to adverse variations in the values of the underlying

variables like selling price, raw material cost, and quantity sold. As one manager put it:

"We examine the impact of 5 percent and 10 percent adverse variation in selling price, raw material cost, and quantity sold on NPV and IRR."

**Scenario Analysis** Companies often look at a few scenarios and the top management or the board of directors decides on the basis of such information. Two examples are given below:

In a pharmaceutical company sponsors are required to give three estimates of rate of return: most pessimistic, most likely and most optimistic.

In a shipping company three estimates, labelled high, medium, and low are developed for proposed investments.

### **Relative Importance of Various Methods of Assessing Project Risk**

A survey of corporate finance practices in India found the relative importance of various methods of assessing project risk to be as follows:

	<i>% of companies rating it as very important or important</i>
■ Sensitivity analysis	90.10
■ Scenario analysis	61.60
■ Risk-adjusted discount rate	31.70
■ Decision tree analysis	12.20
■ Monte Carlo simulation	8.20

Source: Manoj Anand 'Corporate Finance Practices in India: A Survey', *Vikalpa*, October – December 2002.

## **SUMMARY**

- A number of techniques are used to handle risk in capital budgeting.
- **Sensitivity analysis** and **scenario analysis** involve "what if" analysis. In the former, one variable is changed at a time; in the latter, several variables are changed simultaneously.
- **Simulation analysis** is used for developing the probability profile of a criterion of merit by randomly combining values of variables that bear on the chosen criterion.

- **Break-even analysis** determines the minimum output at which the project does not 'lose money'. It can be defined in **accounting terms** or **financial terms**.
- Under certain circumstances, the expected NPV and the standard deviation of NPV may be obtained through analytical derivation.
- **Decision tree analysis** is a useful tool for analysing sequential decisions in the face of risk.
- A project's **corporate risk** is its contribution to the overall risk of the firm.
- Aware of the benefits of **portfolio diversification**, many firms consciously pursue a strategy of diversification.
- The commonly used strategies for managing risk are to increase the proportion of variable costs, make sequential investments, get insurance cover, enter into long-term contracts, seek strategic alliances, and use derivatives.
- There are several ways of incorporating risk in the decision process; **judgmental evaluation**, **payback period** requirement, **risk-adjusted discount rate** method, and **certainty equivalent** method.

## QUESTIONS

1. List the techniques of risk analysis.
2. Discuss the steps involved in sensitivity analysis.
3. What are the pros and cons of sensitivity analysis?
4. Discuss the steps involved in scenario analysis.
5. What is the best and worst case analysis?
6. What are the pros and cons of scenario analysis?
7. How is accounting break-even analysis done? What is the cash break-even point?
8. How is financial break-even analysis done?
9. If cash flows of different years are perfectly uncorrelated, how is the standard deviation of NPV defined by the Hillier model?
10. If cash flows of different years are perfectly correlated, how is the standard deviation of NPV defined by the Hillier model?
11. Discuss the procedure for simulation analysis.
12. What are the pros and cons of simulation?
13. Discuss the steps involved in decision tree analysis.
14. What are the pros and cons of decision tree analysis?
15. What is the corporate risk of a project?
16. Discuss the ways and means used in practice to manage risk.
17. Discuss the following ways of incorporating risk in the investment decision making process: judgmental evaluation and payback period requirement.
18. Discuss the risk-adjusted discount method.
19. Explain the certainty equivalent method.
20. Critically comment on the methods of risk analysis commonly used in practice.

## SOLVED PROBLEMS

- 13.1 Ajeet Corporation is considering the risk characteristics of a certain project. The firm has identified that the following factors, with their respective expected values, have a bearing on the NPV of this project.

Initial investment	₹ 30,000
Cost of capital	10%
Quantity manufactured and sold annually	1,400
Price per unit	₹ 30
Variable cost per unit	₹ 20
Fixed costs	₹ 3,000
Depreciation	₹ 2,000
Tax rate	50%
Life of the project	5 years
Net salvage value	Nil

Assume that the following underlying variables can take the values as shown below:

<i>Underlying Variable</i>	<i>Pessimistic</i>	<i>Optimistic</i>
Quantity manufactured and sold	800	1800
Price per unit	₹ 20	₹ 50
Variable cost per unit	₹ 40	₹ 15

Calculate the sensitivity of net present value to variations in the quantity manufactured.

*Solution* The sensitivity of net present value to variations in quantity manufactured and is calculated below:

Particulars	Range		
	Pessimistic	Expected	Optimistic
Investment	₹ 30,000	₹ 30,000	₹ 30,000
Sales quantity	800	1,400	1,800
Price per unit	₹ 30	₹ 30	₹ 30
Sales	₹ 24,000	₹ 42,000	₹ 54,000
Variable cost per unit	₹ 20	₹ 20	₹ 20
Variable costs	₹ 16,000	₹ 28,000	₹ 36,000
Fixed costs	₹ 3,000	₹ 3,000	₹ 3,000
Depreciation	₹ 2,000	₹ 2,000	₹ 2,000
Pre tax profit	₹ 3,000	₹ 9,000	₹ 13,000
Taxes	₹ 1,500	₹ 4,500	₹ 6,500
Profit after taxes	₹ 1,500	₹ 4,500	₹ 6,500
Cash flow from operations	₹ 3,000	₹ 6,500	₹ 8,500
Salvage value	₹ 0	₹ 0	₹ 0
Net present value *	-₹ 16,732	-₹ 5,360	₹ 2,222

\* NPV = - Investment + Cash flow from operations (PVIFA<sub>10%,5</sub>)

- 13.2 Calculate the accounting break-even point and financial break-even point of the above project.

(a) The accounting break-even point is calculated as follows:

Sales	₹ 42,000
Variable costs	28,000
Fixed costs	3,000
Depreciation	2,000

The accounting break-even point is:

$$\frac{\text{Fixed costs} + \text{Depreciation}}{\text{Contribution margin ratio}} = \frac{3,000 + 2,000}{0.333} = ₹ 15,000$$

where the contribution margin ratio is

$$1 - \frac{\text{Variable costs}}{\text{Sales}} = 1 - \frac{28,000}{42,000} = 0.333$$

(b) The financial break-even point is calculated as follows:

1. Variable costs : 0.667 sales
2. Contribution : 0.333 sales
3. Fixed costs : 3,000
4. Depreciation : 2,000
5. Pre tax profits : 0.333 sales - 5,000
6. Tax (@50 percent) : 0.5 (0.333 sales - 5,000)
7. Profit after tax : 0.5 (0.333 sales - 5,000)
8. Cash flow (4 + 7) : 2,000 + 0.5 (0.333 sales - 5,000)

$$= (0.1665 \text{ sales} - 500)$$

Since the cash flow lasts for 5 years, its present value at a discount rate of 10 percent is:

$$\begin{aligned}\text{PV (Cash flows)} &= (0.1665 \text{ sales} - 500) \times \text{PVIFA}_{10\%, 5} \\ &= (0.1665 \text{ sales} - 500) \times 3.791\end{aligned}$$

The project breaks even in NPV terms when the present value of these cash flows equals the initial investment of ₹ 30,000. Hence the financial break-even occurs when

$$(0.1665 \text{ sales} - 500) \times 3.791 = 30,000$$

$$0.631 \text{ sales} - 1895.5 = 30,000$$

$$0.631 \text{ sales} = 30,000 + 1895.5 = 31,895.5$$

$$\text{Sales} = 31,895.5 / 0.631 = ₹ 50,548$$

- 13.3 A project involves an outlay of ₹ 100,000. Its expected cash inflow at the end of year 1 is ₹ 40,000. Thereafter it decreases every year by ₹ 2,000. It has an economic life of 6 years. The certainty equivalent factor is  $a_t = 1 - .05t$ . Calculate the net present value of the project if the risk free rate of return is 10 percent.

**Solution** The net present value is calculated as follows:

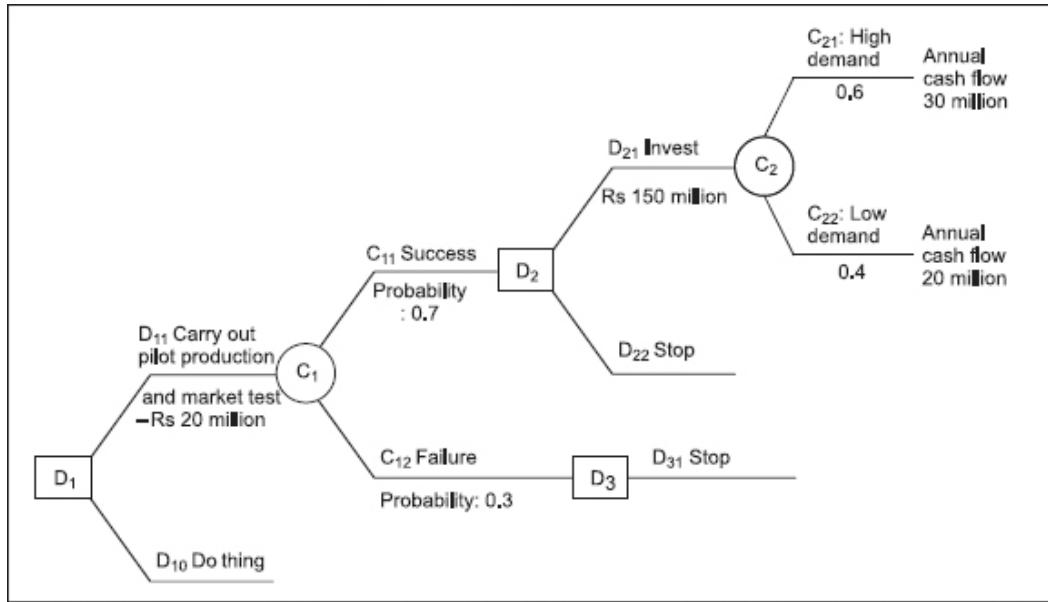
Year	Expected cash flow	Certainty equivalent factor	Certainty equivalent value	Discount factor @ 10 percent	Present value
0	-100,000	1.00	-100,000	1.000	-100,000
1	40,000	0.95	38,000	0.909	34,542
2	38,000	0.90	34,200	0.826	28,249
3	36,000	0.85	30,600	0.751	22,981
4	34,000	0.80	27,200	0.683	18,578
5	32,000	0.75	24,000	0.621	14,904
6	30,000	0.70	21,000	0.564	11,844
Net present value					₹ 31,098

- 13.4 The scientist at Spectrum have come up with an electric moped. The firm is ready for pilot production and test marketing. This will cost ₹ 20 million and take six months. Management believes that there is a 70 percent chance that the pilot production and test marketing will be successful. In case of success, Spectrum can build a plant costing ₹ 150 million. The plant will generate an annual cash inflow of ₹ 30 million for 20 years if the demand is high or an annual cash inflow of ₹ 250 million if the demand is low. High demand has a probability of 0.6; low demand has a probability of 0.4.

Suggest the optimal course of action using decision tree analysis.

**Solution**

The decision tree for the electric moped project of Spectrum is shown below:



The alternatives are evaluated as follows:

1. Start at the right-hand end of the tree and calculate the expected monetary value (EMV) at chance point  $C_2$  that comes first as we proceed leftward.  

$$\text{EMV}(C_2) = 0.6 [30 \times \text{PVIFA}(20, 12\%)] + 0.4 [20 \times \text{PVIFA}(20, 12\%)]$$
  

$$= ₹ 194.2 \text{ million}$$
2. Evaluate the EMV of the decision alternatives at  $D_2$  the last stage decision point.

Alternative	EMV
$D_{21}$ (Invest ₹ 150 million)	₹ 44.2 million
$D_{22}$ (Stop)	0

3. Select  $D_{21}$  and truncate  $D_{22}$  as  $\text{EMV}(D_{21}) > \text{EMV}(D_{22})$
4. Calculate the EMV at chance point  $C_1$  that comes next as we roll backwards.

$$\begin{aligned}\text{EMV}(C_1) &= 0.7 [44.2] + 0.3 [0] \\ &= ₹ 30.9 \text{ million}\end{aligned}$$

5. Evaluate the EMV of the decision alternatives at  $D_1$  the first stage decision point

Alternative	EMV
$D_{11}$ (Carryout pilot production and market test at a cost of ₹ 20 million)	₹ 10.9 million
$D_{12}$ (Do nothing)	0

Based on the above evaluation, we find that the optimal decision strategy is as follows: Choose  $D_{11}$  (carry out pilot production and market test) at the decision point  $D_1$  and wait for the outcome at the chance point  $C_1$ . If the

outcome at  $C_1$  is  $C_{11}$  (success), invest ₹ 150 million, if the outcome at  $C_1$  is  $C_{12}$  (failure) stop.

## PROBLEMS

**13.1 Break-even Points** You are the financial manager of Hindustan Extrusion Products Limited (HEPL). HEPL is planning to set up an extrusion plant at Indore. Your project staff has developed the following cash flow forecast for the extrusion plant project.

*Cash Flow Forecast for HEPL's Extrusion Plant*

	<i>₹ in million</i>	
	Year 0	Years 1 – 10
Investment	(250)	
Sales		200
Variable costs (60% of sales)		120
Fixed costs		20
Depreciation (10% of investment)	(10% of investment)	25
Pre-tax profit		35
Taxes		10
Profit after taxes		25
Cash flow from operations		50
Net cash flow		50

What is the NPV of the extraction plant project? Assume that the cost of capital is 13 percent. The range of values that the underlying variables can take is shown below:

<i>Underlying Variable</i>	<i>Pessimistic</i>	<i>Expected</i>	<i>Optimistic</i>
Investment (₹ in million)	300	250	200
Sales (₹ in million)	150	200	275
Variable cost as a percent of sales	65	60	56
Fixed costs (₹ in million)	30	20	15
Cost of capital (%)	14	13	12

- (a) Calculate the effect of variations in the values of the underlying variables on NPV.

- (b) Calculate the accounting break-even point and the financial break-even point for the extrusion plant.

**13.2 Sensitivity Analysis and Break-even Points** Ajeet Corporation is considering the risk characteristics of a certain project. The firm has identified that the following factors, with their respective expected values, have a bearing on the NPV of this project.

Initial investment	₹ 30,000
Cost of capital	10%
Quantity manufactured and sold annually	1,400
Price per unit	₹ 30
Variable cost per unit	₹ 20
Fixed costs	₹ 3,000
Depreciation	₹ 2,000
Tax rate	50%
Life of the project	5 years
Net salvage value	₹ Nil

Assume that the following underlying variables can take the values as shown below:

<i>Underlying variable</i>	<i>Pessimistic</i>	<i>Optimistic</i>
Quantity manufactured and sold	800	1800
Price per unit	₹ 20	₹ 50
Variable cost per unit	₹ 40	₹ 15

- (a) Calculate the sensitivity of net present value to variations in (i) quantity manufactured and sold, (ii) price per unit, and (iii) variable cost per unit.  
 (b) Calculate the accounting break-even point and the financial break-even point.

**13.3 Expected NPV and Standard Deviation** A project involving an outlay of ₹ 10 million has the following benefits associated with it.

<i>Year 1</i>		<i>Year 2</i>		<i>Year 3</i>	
<i>Cash flow</i> <i>(₹ in mln)</i>	<i>Prob.</i>	<i>Cash flow</i> <i>(₹ in mln)</i>	<i>Prob.</i>	<i>Cash flow</i> <i>(₹ in mln)</i>	<i>Prob.</i>
4	0.4	5	0.4	3	0.3
5	0.5	6	0.4	4	0.5
6	0.1	7	0.2	5	0.2

Assume that the cash flows are independent. Calculate the expected net present value and the standard deviation of net present value assuming that  $i = 10$  percent.

**13.4 Standard Deviation of NPV** Janakiram is considering an investment which requires a current outlay of ₹ 25,000. The expected value and standard

deviation of cash flows are:

<i>Year</i>	<i>Expected Value</i>	<i>Standard Deviation</i>
1	₹ 12,000	₹ 5,000
2	10,000	6,000
3	9,000	5,000
4	8,000	6,000

The cash flows are perfectly correlated. Calculate the expected net present value and standard deviation of net present value of this investment, if the risk-free interest rate is 8 percent.

**13.5 Probability Distribution** Ujwal Lamps Company is considering an investment project which has a life of four years. The cost of project is 10,000 and the possible cash flows are given below:

<i>Year 1</i>		<i>Year 2</i>		<i>Year 3</i>		<i>Year 4</i>	
<i>Cash flow</i>	<i>Prob.</i>						
2,000	0.2	3,000	0.4	4,000	0.3	2,000	0.2
3,000	0.5	4,000	0.3	5,000	0.5	3,000	0.4
4,000	0.3	5,000	0.3	6,000	0.2	4,000	0.2

The cash flows of various years are independent and the risk-free discount rate (post-tax) is 6 percent.

- (a) What is the expected NPV?
- (b) If the NPV is approximately normally distributed, what is the probability that the NPV will be zero or less?
- (c) What is the probability that the profitability index will be greater than 1.2?

## MINICASE - I

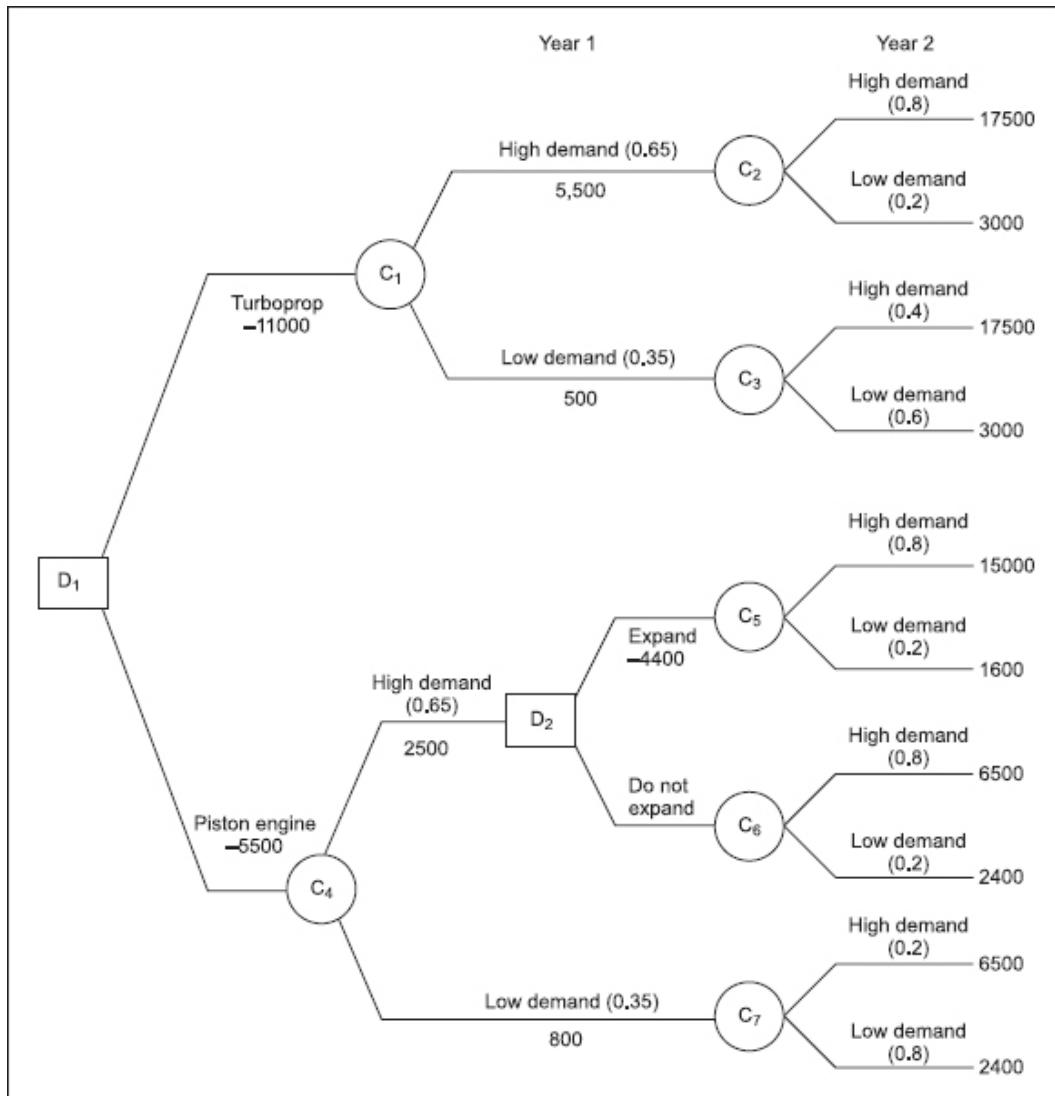
Southern Airways has been set up to run an air taxi service in southern India. The company is debating whether it should buy a turboprop aircraft or a piston engine aircraft. The turboprop aircraft cost 11000 and has larger capacity. It will serve if the demand turns out to be high. The piston aircraft costs 5500 and has a smaller capacity. It will serve if the demand is low, but it will not suffice if the demand is high.

The company believes that the chances of demand being high and low in year 1 are 0.65 and 0.35 respectively. If the demand is high in the year 1, there is an 80 percent chance that it will be high in subsequent years (year 2 onward) and 20 percent chance that it will be low in subsequent years.

The CEO of Southern Airways thinks that if the company buys a piston engine aircraft and the demand turns out to be high, the company can buy a second-hand piston engine aircraft for 4400 at the end of year 1. This would double its capacity and enable it to cope reasonably well with high demand for year 2 onwards.

The payoffs associated with high and low demand for various decision alternatives are shown in the accompanying decision tree. The payoffs shown for year 1 are the payoffs occurring at the end of year 1 and payoffs shown for year 2 are the payoffs for year 2 and the subsequent years, evaluated as of year 2, using a discount rate of 12 percent which is the weighted average cost of capital.

### Decision Tree



1. What is the expected NPV of the turboprop aircraft?
2. What is the expected NPV of the piston engine aircraft?
3. What is the value of the *option to expand* in the case of the piston engine aircraft?
4. If the turboprop aircraft can be sold for 8000 at the end of year 1, what is the value of the *option to abandon*?
5. If the piston engine aircraft can be sold for 4400 at the end of year 1 what is the value of the *option to abandon*?

## **MINICASE - II**

With the machinery installed and personnel hired, Chinmay Joshi is all set to commence his pet project of manufacture and distribution of wholesome ready to eat packaged food within Mumbai. It had taken all his wits and powers of persuasion to make his wealthy businessman father cough up money for such a startup venture. What finally clinched the deal for him was his assurance that the annualised effective return from the project would not be less than twenty five percent which his father's existing business earned. So, today morning when he heard that a well-known cab aggregator was also actively mulling the idea of entering food distribution business in the city, he was naturally taken aback. His quick enquiries with knowledgeable friends however told him that the damage to his project would be limited to just some ten percent of sales. However, fearing the worst, he has arranged an urgent meeting with you, a financial consultant near his office, to assess the implications of this competition and advise him on the following:

- (a) By what percentage the net present value could fall in the event of a ten percent loss in annual sales?
- (b) By what percentage the annual sales could go down before the internal return falls below 25 percent?

On a perusal of the project report you note the following assumptions and estimates: The initial investment is ₹ 400 lakhs and the annual sales is ₹ 500 lakhs for the next 10 years, 60 percent of which are variable costs. Annual fixed costs is ₹ 20 lakhs and the effective tax rate is 33 percent. The depreciation is ₹ 40 lakhs per annum. The cost of capital is 12 percent. How will you work out and answer his queries?

- 
- <sup>1</sup> Extracted from Rand Corporation, *A Million Random Digits with 100,000 Normal Deviates*, Glencoe, Illinois: The Free Press.
  - <sup>2</sup> The discussion in this section is based on a survey conducted by the author which covered 20 firms.

### **Online Resources**

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter13/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter13/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## 14 CHAPTER

# The Cost of Capital

## Learning Objectives

After studying this chapter you should be able to:

- ✓ Distinguish between company cost of capital and project cost of capital.
- ✓ Show how the cost of debt and the cost of preference is calculated.
- ✓ Discuss various methods for estimating the cost of equity.
- ✓ Explain the rationale for using the target capital structure weights in market value terms.
- ✓ Determine the weighted marginal cost of capital schedule.
- ✓ Show how floatation costs should be handled in computing the cost of capital.
- ✓ Describe the factors affecting the cost of capital.
- ✓ Understand the misconceptions surrounding cost of capital.

In a [previous chapter](#) we learnt that the cash flows of a capital investment may be viewed from the explicit cost funds point of view or the equity point of view and the discount rate applied to the cash flows must be consistent with the point of view adopted. We also mentioned that the standard practice in capital budgeting is to look at the cash flows from the point of view of explicit cost funds (referred to also as investor claims) and apply the weighted average cost of capital of the firm as the discount rate.

The items on the financing side of the balance sheet are called capital components. The major capital components are equity, preference, and debt. Capital, like any other factor of production, has a cost. Any use of capital imposes an opportunity cost on investors as investors have access to a host of financial market alternatives. So, the use of capital by a company must be benchmarked against the alternatives in the financial market. The cost of capital provides this benchmark. A company's cost of capital is the average cost of the various capital components (or securities)

employed by it. Put differently, it is the average rate of return required by the investors who provide capital to the company.

The cost of capital is a central concept in financial management. It is used for evaluating investment projects, for determining the capital structure, for assessing leasing proposals, for setting the rates that regulated organisations like electric utilities can charge to their customers, so on and so forth.

## 14.1 ■ SOME PRELIMINARIES

### Concept of Average Cost of Capital

A company's cost of capital is the weighted average cost of various sources of finance used by it, viz., equity, preference, and debt.

Suppose that a company uses equity, preference, and debt in the following proportions: 50, 10, and 40. If the component costs of equity, preference, and debt are 16 percent, 12 percent, and 8 percent respectively, the weighted average cost of capital (WACC) will be:

$$\begin{aligned} \text{WACC} &= (\text{Proportion of equity}) (\text{Cost of equity}) + \\ &\quad (\text{Proportion of preference}) (\text{Cost of preference}) + \\ &\quad (\text{Proportion of debt}) (\text{Cost of debt}) \\ &= (0.5)(16) + (0.10)(12) + (0.4)(8) = 12.4 \text{ percent} \end{aligned}$$

Bear in mind the following in applying the above formula:

- For the sake of simplicity, we have considered only three types of capital (equity; nonconvertible, noncallable preference; and nonconvertible, noncallable debt). We have ignored other forms of capital like convertible or callable preference, convertible or callable debt, bonds with payments linked to stock market index, bonds that are puttable or extendable, warrants, so on and so forth. Calculating the cost of these forms of capital is somewhat complicated. Fortunately, more often than not, they are a minor source of capital. Hence, excluding them may not make a material difference.
- Debt includes long-term debt as well as short-term debt (such as working capital loans and commercial paper). Some companies leave out the cost of short-term debt while calculating the weighted average cost of capital. In principle, this is not correct. Investors who provide short-term debt also have a claim on the earnings of the firm. If a company ignores this claim, it will misstate the rate of return required on its investments.
- Since the above equation does not include items such as accounts payable and deferred taxes, you might think that something is missing. After all, accounts payable represented a short-term "loan" from the suppliers and, as some argue, deferred taxes may be viewed as a "loan" from the tax department. You are right in the sense that these items should not be ignored. But remember that they affect the cash flows and not the WACC. Hence, in deriving the cash flows they are duly concerned.

## Rationale

The rationale for using the WACC as the hurdle rate in capital budgeting is fairly straightforward. If a firm's rate of return on its investment exceeds its cost of capital, equity shareholders benefit. To illustrate this point, consider a firm which employs equity and debt in equal proportions and whose cost of equity and debt are 14 percent and 6 percent respectively. The cost of capital, which is the weighted average cost of capital, works out to 10 percent ( $0.5 \times 14 + 0.5 \times 6$ ). If the firm invests ₹ 100 million, say, on a project which earns a rate of return of 12 percent, the return on equity funds employed in the project will be:

$$\frac{\text{Total return on the project} - \text{Interest on debt}}{\text{Equity funds}} = \frac{100(0.12) - 50(0.06)}{50} = 18 \text{ percent}$$

Since 18 percent exceeds the cost of equity (14 percent), equity shareholders benefit. More generally, when a firm earns a rate of return in excess of its cost of capital, it creates economic profit or value for its investors.

## **Company Cost of Capital and Project Cost of Capital**

At the outset we must distinguish between the company cost of capital and the project cost of capital.

The **company cost of capital** is the rate of return expected by the existing capital providers. It reflects the business risk of existing assets and the capital structure currently employed.

The **project cost of capital** is the rate of return expected by capital providers for a new project or investment the company proposes to undertake. Obviously, it will depend on the business risk and the debt capacity of the new project.

If a firm wants to use its company cost of capital, popularly called the weighted average cost of capital (WACC), for evaluating a new investment, two conditions should be satisfied:

- The business risk of the new investment is the same as the average business risk of existing investments. In other words, the new investment will not change the risk complexion of the firm.
- The capital structure of the firm will not be affected by the new investment. Put differently, the firm will continue to follow the same financing policy.

Thus, strictly speaking the WACC is the right discount rate for an investment which is a carbon copy of the existing firm. This chapter generally assumes that the new investment will be similar to existing investments in terms of business risk and debt capacity.

## **14.2 ■ COST OF DEBT AND PREFERENCE**

Since debt and preference stock entail more or less fixed payments, estimating the cost of debt and preference is relatively easy.

## Cost of Debt

Conceptually, the cost of a debt instrument is the yield to maturity of that instrument. Let us apply this concept to different types of debt instruments such as debentures, bank loans, and commercial paper.

The *cost of a debenture* is the value of  $r_D$  in the following equation.

$$P_0 = \sum_{t=1}^n \frac{I}{(1+r_D)^t} + \frac{F}{(1+r_D)^n} \quad (14.1)$$

where  $P_0$  is the current market price of the debenture,  $I$  is the annual interest payment,  $n$  is the number of years left to maturity, and  $F$  is the maturity value of the debenture.

Computation of  $r_D$  requires a trial-and-error procedure which was discussed in a [previous chapter](#). If you are not inclined to follow the trial and error procedure, you can employ the following formula which gives a very close approximation to the correct value.

$$r_D = \frac{I + (F - P_0) / n}{0.6P_0 + 0.4F} \quad (14.2)$$

To illustrate this formula, consider the following debenture of Multiplex Limited.

Face value	: ₹ 1,000
Coupon rate	: 12 percent
Remaining period to maturity	: 4 years
Current market price	: ₹ 1040

The approximate yield to maturity of this debenture is:

$$r_D = \frac{120 + (1000 - 1040) / 4}{0.6 \times 1040 + 0.4 \times 1000} = 10.7 \text{ percent}$$

Unlike a debenture, a bank loan is not traded in the secondary market. The *cost of a bank loan* is simply the current interest the bank would charge if the firm were to raise a similar loan now. Suppose that Multiplex Limited has a ₹ 300 million outstanding bank loan on which it is paying an interest of 13 percent. However, if Multiplex Limited were to raise a similar loan now the bank would charge 12 percent. This then represents the cost of the bank loan.

A commercial paper is a short-term debt instrument which is issued at a discount and redeemed at par. Hence the *cost of commercial paper* is simply its implicit interest rate. Suppose, Multiplex Limited has outstanding

commercial paper that has a balance maturity of 6 months. The face value of one instrument is ₹ 1,000,000 and it is traded in the market at ₹ 965,000. The implicit interest rate for 6 months is:

$$\frac{1,000,000}{965,000} - 1 = 0.0363 \text{ or } 3.63 \text{ percent}$$

The effective annual interest rate works out to:

$$(1.0363)^2 - 1 = 0.0739 \text{ or } 7.39 \text{ percent}$$

When a firm uses different instruments of debt, the overall weighted average cost of debt has to be calculated. To illustrate this calculation, let us look at the following data on the debt employed by Multiplex Limited.

<i>Debt instrument</i>	<i>Face value</i>	<i>Market value</i>	<i>Coupon rate</i>	<i>YTM or Current rate</i>
Non-convertible debentures	₹ 100 million	₹ 104 million	12%	10.7%
Bank loan	₹ 200 million	₹ 200 million@ ₹ 48.25 million	13%	12.0%
Commercial paper	₹ 50 million	₹ 352.25 million	N.A.	7.39%
④ Since the bank loan does not have a secondary market we have, for the sake of simplicity, equated market value with face value.				

The overall weighted average cost of debt is calculated using the market value proportions and yields (current rates) of various debt instruments.

The overall weighted average cost of debt for Multiplex Limited works out to:

$$10.7\% [104/352.25] + 12.0\% [200/352.25] + 7.39\% [48.25/352.25] = 10.98\%$$

Note that we use the yields to maturity or the current rates as they reflect the rates at which the firm can raise new debt. Put differently, we are interested in calculating the marginal cost of debt. Hence, coupon rates that reflect the historical or embedded interest rates at the time the debt was originally raised are not relevant for our purposes.

What we have calculated so far is the overall weighted average pre-tax cost of debt. Since interest on debt is a tax-deductible expense, the pre-tax cost of debt has to be adjusted for the tax factor to arrive at the post-tax cost of debt.

$$\text{Post-tax cost of debt} = \text{Pre-tax cost of debt} (1 - \text{Tax rate})$$

The tax rate to be used in this calculation is the marginal tax rate applicable to the company. If we assume that the marginal tax rate for Multiplex Limited is 35 percent, the post-tax cost of debt for Multiplex Limited is:

Post-tax cost of debt = 10.98 percent  $(1 - 0.35)$  = 7.14 percent

## Cost of Preference

Preference capital carries a fixed rate of dividend and is redeemable in nature. Even though the obligations of a company towards its preference shareholders are not as firm as those towards its debenture holders, we will assume that preference dividend will be paid regularly and preference capital will be redeemed as per the original intent.

Thus, preference stock will be considered much like a bond with fixed commitments. However, preference dividend, unlike debt interest, is not a tax-deductible expense and hence does not produce any tax saving<sup>1</sup>.

Given the fixed nature of preference dividend and principal repayment commitment and the absence of tax deductibility, the cost of preference is simply equal to its yield. To illustrate, consider the preference stock of Multiplex Limited for which the following data is available:

Face value	: ₹ 100
Dividend rate	: 11 percent
Maturity period	: 5 years
Market price	: ₹ 95

The yield on this preference stock, if we apply the approximate yield formula, works out to:

$$\frac{11 + (100 - 95)/5}{0.4 \times 100 + 0.6 \times 95} = 12.37 \text{ percent}$$

If a company has more than one issue of preference stock outstanding, the average yield on all preference issues may be calculated, just the way it was done for debt issues.

## 14.3 ■ COST OF EQUITY

Equity finance may be obtained in two ways: (i) retention of earnings, and (ii) issue of additional equity. The cost of equity or the return required by equity shareholders is the same in both the cases. Remember that when a firm decides to retain earnings, an opportunity cost is involved. Shareholders could have received the earnings as dividends and invested the same in alternative investments of comparable risk to earn a return. So, irrespective of whether a firm raises equity finance by retaining earnings or issuing additional equity shares, the cost of equity is the same. The only difference is in floatation costs. There is no floatation cost for retained earnings whereas there is a floatation cost of 2 to 10 percent or even more for additional equity. This difference is considered separately as explained in Section 14.9. So, in our present discussion, cost of equity refers to the cost of retained earnings as well as the cost of external equity.

While the cost of debt and preference can be determined fairly easily, the cost of equity is rather difficult to estimate. This difficulty stems from the fact that there is no definite commitment on the part of the firm to pay dividends. However, we can come up with reasonably good estimates of the cost of equity by employing some basic principles.

## The CAPM Approach

A popular approach to estimating the cost of equity is the capital asset pricing model (CAPM) relationship discussed at length in [Chapter 9](#). According to the CAPM, the required return on a company's equity is:

$$r_E = R_f + \beta_E (E(R_M) - R_f) \quad (14.3)$$

where  $r_E$  is the required return on the equity of company,  $R_f$  is the risk-free rate,  $\beta_E$  is the beta of the equity of company<sup>2</sup>, and  $E(R_M)$  is the expected return on the market portfolio.

To illustrate the CAPM approach, let us assume that  $R_f = 10$  percent and  $E(R_M) = 18$  percent. The required return on equity stocks of companies with different betas is given as follows:

Beta	<i>Required return</i> = $R_f + \beta_E (E(R_M) - R_f)$
------	---

0.5	$10 + 0.5 (18 - 10) = 14\%$
-----	-----------------------------

1.0	$10 + 1.0 (18 - 10) = 18\%$
-----	-----------------------------

1.5	$10 + 1.5 (18 - 10) = 22\%$
-----	-----------------------------

To use the CAPM, the following inputs are required:  $R_f$ , the risk-free rate;  $(E(R_M) - R_f)$ , the market risk premium (also called the equity risk premium); and  $\beta_E$ , the beta of the stock.

While there is disagreement among finance practitioners as to how these inputs have to be estimated, for our purposes the following will suffice:

- The risk-free rate may be estimated as the yield on a long-term government bond that has maturity of 10 years or more.
- The market risk premium may be estimated as the difference between the average return on the market portfolio and the average risk free rate over the past 10 to 15 years – the longer the period, the better it is.
- The beta of the stock may be calculated by regressing the monthly returns on the stock over the monthly returns on the market index over the past 60 months or more.

The CAPM is regarded by many as a fairly rigorous and objective approach to determining the required return on equity. This approach,

however, is based on the assumption that investors eliminate unsystematic risk by efficient diversification and hence require compensation only for systematic risk which is reflected in beta. Market imperfections may impede efficient diversification by investors, exposing them to unsystematic risk. When this occurs, investors will require compensation for unsystematic risk as well, a factor which is not found in the security market line relationship. Another shortcoming of the CAPM relates to the instability of the betas of individual securities. Studies have shown that individual securities have unstable betas. This makes the use of a historical beta as a proxy for the future beta somewhat questionable. Notwithstanding these shortcomings, the CAPM approach is a useful approach for estimating the required rate of return of equity stocks. More than 80 percent of the leading companies in the world use it for estimating the cost of equity, though there is no agreement as to how the inputs of CAPM – risk free rate, market risk premium, and beta – are to be computed.

### **Equity Risk Premium in India**

Using the data for the period 1981-2006, J.R. Varma and S.K. Barua estimated that the equity risk premium is about 8.75 percent on a geometric mean basis and about 12.5 percent on an arithmetic mean basis. They found very little difference between the pre reform and post reform period.

Source: J.R. Varma and S.K. Barua, "A First Cut Estimate of the Equity Risk Premium in India," *IIMA Working Paper*, June 2006.

## **Bond Yield Plus Risk Premium Approach**

Analysts who do not have faith in the CAPM approach often resort to a subjective procedure to estimate the cost of equity. They add a judgmental risk premium to the observed yield on the long-term bonds of the firm to get the cost of equity:

$$\text{Cost of equity} = \text{Yield on long-term bonds} + \text{Risk premium}$$

The logic of this approach is fairly simple. Firms that have risky and consequently high cost debt will also have risky and consequently high cost equity. So it makes sense to base the cost of equity on a readily observable cost of debt.

The problem with this approach is how to determine the risk premium. Should it be 2 percent, 4 percent, or  $n$  percent? There seems to be no objective way of determining it. Most analysts look at the operating and financial risks of the business and arrive at a subjectively determined risk premium that normally ranges between 2 percent and 6 percent. While this approach may not produce a precise cost of equity, it will give a reasonable ballpark estimate.

## Dividend Growth Model Approach

The price of an equity stock depends ultimately on the dividends expected from it:

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \dots = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t} \quad (14.4)$$

where  $P_0$  is the current price of the stock,  $D_t$  is the dividend expected to be paid at the end of year  $t$ , and  $r$  is the equity shareholders' required rate of return.

If dividends are expected to grow at a constant rate of  $g$  percent per year, then Eq.(14.4) becomes:

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_1(1+g)}{(1+r)^2} + \frac{D_1(1+g)^2}{(1+r)^3} + \dots \infty$$

This simplifies to:

$$P_0 = \frac{D_1}{r-g}$$

This is called the Gordon model, after Myron J. Gordon who first proposed it. Solving the above equation for  $r$ , we get:

$$r = \frac{D_1}{P_0} + g = \frac{D_0(1+g)}{P_0} + g \quad (14.5)$$

Thus, the expected return of shareholders, which in equilibrium is also the required return, is equal to the dividend yield plus the expected growth rate.

For a publicly traded company, it is fairly easy to determine the dividend yield. However, estimating the expected growth rate,  $g$ , is difficult. You can estimate  $g$  by using the following methods:

1. You can get a handle over  $g$  by relying on analysts' forecasts for the future growth rates. Analysts' forecasts may be available from a variety of sources. Since different sources are likely to give different estimates, a simple approach may be to obtain multiple estimates and then average them.
2. You can look at dividends for the preceding 5-10 years, calculate the annual growth rates, and average them. Suppose you observe the following dividends for some stock.

<i>Year</i>	<i>Dividend</i>	<i>Rupee change</i>	<i>Growth</i>
1	₹ 3.00	—	—
2	₹ 3.50	₹ 0.50	16.7
3	₹ 4.00	₹ 0.50	14.3
4	₹ 4.25	₹ 0.25	6.3
5	₹ 4.75	₹ 0.50	11.8

If you average the four growth rates, the result is 12.3 percent, so you can use this as an estimate of the expected growth rate,  $g$ .

- 3. You can use the retention growth rate method. Here, you first forecast the firm's average retention rate (this is simply 1 minus the dividend payout rate) and then multiply it by the firm's expected future return on equity (ROE).

$$g = (\text{Retention rate}) (\text{Return on equity})$$

For example, if the forecasted retention rate and return on equity are 0.60 and 15 percent, the expected growth rate is:  $g = (0.6) (15\%) = 9$  percent.

The dividend growth model is simple. It is easy to understand and easy to apply. However, there are some problems associated with it.

- First, it cannot be applied to companies that do not pay dividends or to companies that are not listed on the stock market. Even for companies that pay dividends, the assumption that dividends will grow at a constant rate may not be valid.
- Second, it does not explicitly consider risk. There is no direct adjustment for the risk associated with the estimated growth. Of course, there is an implicit adjustment for risk as the current stock price is used.

### How Companies Estimate the Cost of Equity

A survey of corporate finance practices in India revealed that the following methods (in the order of decreasing importance) are followed by companies in India to estimate the cost of equity:

	<i>% companies considering as very important or important</i>
■ Capital asset pricing model	54.3
■ Gordon's dividend discount model	52.1
■ Earnings – yield (Earnings per share/Market price per share)	34.2
■ Dividend-yield	26.2

■ Multifactor model

7.0

Source: Manoj Anand, "Corporate Finance Practices in India: A Survey," *Vikalpa*, October-December 2002, pp 29-56

## Earnings-Price Ratio Approach

According to this approach, the cost of equity is equal to:

$$\frac{E_1}{P_0} \quad (14.6)$$

where  $E_1$  is the expected earnings per share for the next year, and  $P_0$  is the current market price per share.

$E_1$  may be estimated as: (Current earnings per share)  $\times$  (1 + growth rate of earnings per share).

This approach provides an accurate measure of the rate of return required by equity investors in the following two cases:

- When the earnings per share are expected to remain constant and the dividend payout ratio is 100 percent.
- When retained earnings are expected to earn a rate of return equal to the rate of return required by equity investors.

The first case is rarely encountered in real life and the second case is also somewhat unrealistic. Hence, the earnings-price ratio should not be used indiscriminately as the measure of the cost of equity capital.

## 14.4 ■ DETERMINING THE PROPORTIONS

For calculating the WACC we need information on the cost of various sources of capital and the proportions (or weights) applicable to them. So far we discussed how to calculate the cost of specific sources of capital. We now look at how the weights should be established.

The appropriate weights are the *target capital structure weights stated in market value terms*. What is the rationale for using the target capital structure? What is the logic for using market values?

The primary reason for using the target capital structure is that the current capital structure may not reflect the capital structure that is expected to prevail in future or the capital structure the firm plans to have in future. While it is conceptually appealing to rely on the target capital structure, there may be some difficulties in using the target capital structure. A company may not have a well-defined target capital structure. Perhaps the changing complexion of its business or the changing conditions in the capital market may make it difficult for the company to articulate its target capital structure. Further, if the target capital structure is significantly different from the current capital structure, it may be difficult to estimate what the component capital costs would be. Notwithstanding these difficulties, finance experts generally recommend that the weights must be based on the target capital structure.

In calculating the weights for the target capital structure, should one use book (balance sheet) values or market values? It is tempting to use the book value weights because they are easy to calculate, they are available for every company (whether it is traded or not), and they are fairly stable.

Finance scholars, however, believe that market values are superior to book values because the component costs used in WACC calculation represent the opportunity costs reflecting the current market conditions. In order to justify its valuation the firm must earn competitive returns for shareholders and debtholders on the current value (market value) of their investments. An example may be given to illustrate this point. Suppose shareholders invested ₹ 100 million on initial capital in a company 10 years ago. Over the 10-year period, the book value grew to ₹ 250 million but the market value increased ₹ 450 million. A reasonable return in the present market conditions is 15 percent. Rational investors would expect a return of 15 percent on the current market value of ₹ 450 million, not the current book

value of ₹ 250 million. Hence, we recommend the use of market value weights unless market values are not available or highly unreliable.

### **Weights Used by Companies to Compute the Weighted Average Cost of Capital**

The frequency with which various weights are used in practice, as found in a survey done by Manoj Anand, reported in the October –December 2002 issue of *Vikalpa* is shown below:

	% of Use*
■ Book value weights	41.8
■ Market value weights	22.8
■ Target capital structure weights	39.2

\* A few respondents use more than one basis of weighting.

## 14.5 ■ WEIGHTED AVERAGE COST OF CAPITAL

Given the cost of specific sources of financing and the scheme of weighting, the weighted average cost of capital (WACC) can be readily calculated by multiplying the specific cost of each source of financing by its proportion in the capital structure and adding the weighted values. In symbols, the weighted average cost of capital may be expressed as follows:

$$\text{WACC} = w_E r_E + w_p r_P + w_D r_D (1 - t_c) \quad (14.7)$$

where WACC is the weighted average cost of capital,  $w_E$  is the proportion of equity,  $r_E$  is the cost of equity,  $w_p$  is the proportion of preference,  $r_P$  is the cost of preference,  $w_D$  is the proportion of debt,  $r_D$  is the cost of debt, and  $t_c$  is the corporate tax rate.

Let us look at an example. The cost of specific sources of capital for Bharat Nigam Limited are:  $r_E = 16.0$  percent,  $r_P = 14.0$  percent,  $r_D = 12.0$  percent.

The market value proportions of equity, preference, and debt are:  $w_E = 0.60$ ,  $w_p = 0.05$ ,  $w_D = 0.35$ .

The tax rate for Bharat Nigam Limited is 30 percent. So, the post tax cost of debt is:  $12.0 (1 - 0.3) = 8.4$  percent.

The WACC for Bharat Nigam Limited is calculated in [Exhibit 14.1](#).

### Exhibit 14.1 Calculation of the WACC for Bharat Nigam Limited

Source of Capital	Proportion (1)	Cost (2)	Weighted Cost [(1) × (2)]
Equity	0.60	16.0%	9.60%
Preference	0.05	14.0%	0.70%
Debt	0.35	8.4%	2.94%
WACC = 13.24 %			

**A Caution** Since debt is cheaper than equity, you may think that the WACC can be lowered by raising the proportion of debt in the financing mix. However, this doesn't work. As the debt ratio increases, the remaining equity becomes more risky so its cost goes up, nullifying the advantage of more cheap debt. Of course, debt has a tax advantage as interest is a tax-deductible expense.

### **Best Global Practices in Estimating the Cost of Capital**

- WACC is the dominant discount rate used in DCF analyses.
- Weights are based on market, not book, value mixes of debt and equity.
- The after-tax cost of debt is predominantly based on marginal pretax cost, and marginal or statutory tax rates.
- The CAPM is the dominant model for estimating the cost of equity.

## 14.6 ■ WEIGHTED MARGINAL COST OF CAPITAL

At the outset we assumed, *inter alia*, that the adoption of new investment proposals will not change either the risk complexion or the capital structure of the firm. Does it mean that the weighted average cost of capital will remain the same irrespective of the magnitude of financing? Apparently not. Generally, the weighted average cost of capital tends to rise as the firm seeks more and more capital. This may happen because the supply schedule of capital is typically upward sloping – as suppliers provide more capital, the rate of return required by them tends to increase. A schedule or graph showing the relationship between additional financing and the weighted average cost of capital is called the **weighted marginal cost of capital** schedule.

## Determining the Weighted Marginal Cost of Capital Schedule

The procedure for determining the weighted marginal cost of capital involves the following steps:

1. Estimate the **cost of each source of financing for various levels of its use** through an analysis of current market conditions and an assessment of the expectations of investors and lenders.
2. Identify the levels of total new financing at which the cost of the new components would change, given the capital structure policy of the firm. These levels, called **breaking points**, can be established using the following relationship.

$$BP_j = \frac{TF_j}{w_j} \quad (14.8)$$

where  $BP_j$  is the breaking point on account of financing source  $j$ ,  $TF_j$  is the total new financing from source  $j$  at the breaking point, and  $w_j$  is the proportion of financing source  $j$  in the capital structure.

3. Calculate the WACC for various ranges of total financing between the breaking points.
4. Prepare the weighted marginal cost of capital schedule which reflects the WACC for each level of total new financing.

**Illustration** To illustrate how the weighted marginal cost of capital schedule is prepared, let us consider an example. Shiva Electronics plans to use equity and debt in the following proportions:

Equity : 40  
Debt : 60

**Cost of Each Source of Finance for Various Levels of Use** Based on its discussions with its merchant bankers and lenders Shiva Electronics estimates the cost of its sources of finance for various levels of usage as follows:

<i>Source of Finance</i>	<i>Range of New Financing</i> <i>(₹ in million)</i>	<i>Cost</i> <i>(%)</i>
Equity	0 – 30	18
	More than 30	20
Debt	0 – 50	10

**Breaking Points** Given the target capital structure proportions and the financing ranges for each source of finance, the breaking point for each source of finance and corresponding ranges of total new financing are given in columns 3 and 4 of [Exhibit 14.2](#).

**Weighted Average Cost of Capital for Various Ranges of Total Financing** Column 4 of [Exhibit 14.2](#) shows that the firm's weighted average cost of capital will change at ₹ 75 million and ₹ 83.3. million of total new financing. [Exhibit 14.3](#) shows the calculation of the weighted average cost of capital over these ranges.

**Exhibit 14.2**
**Determination of Breaking Point and the Resulting Range of Total New Financing for Shiva Electronics**

Source of Capital	Cost	Range of New Financing ₹ in Million)	Breaking Point ₹ in Million)	Range of Total New Financing ₹ in Million)
	(1)	(2)	(3)	(4)
Equity	18%	0 – 30	$\frac{30}{0.4} = 75$	0 – 75
	20%	Above 30		Above 75
Debt	10%	0 – 50	$\frac{50}{0.6} = 83.3$	0 – 83.3
	11%	Above 50	–	Above 83.3

**Exhibit 14.3 | Weighted Average Cost of Capital for Various Ranges of Total Financing for Shiva Electronics**

<i>Range of Total New Financing ₹ in Million)</i>	<i>Source of Capital</i>	<i>Proportion</i>	<i>Cost %</i>	<i>Weighted Cost % [(2) × (3)]</i>
	(1)	(2)	(3)	(4)
0 – 75	Equity	0.4	18	7.2
	Debt	0.6	10	6.0
	Weighted average cost of capital			13.2
75 – 83.3	Equity	0.4	20	8.0
	Debt	0.6	10	6.0
	Weighted average cost of capital			14.0
Above 83.3	Equity	0.4	20	8.0
	Debt	0.6	11	6.6
	Weighted average cost of capital			14.6

*Weighted Marginal Cost of Capital* The weighted marginal cost of capital is shown below:

**Exhibit 14.4 | The Weighted Marginal Cost of Capital**

<i>Range of Total Financing ₹ in Million)</i>	<i>Weighted Marginal Cost of Capital (%)</i>
0 – 75	13.2
75 – 83.3	14.0
Above 83.3	14.6

## 14.7 ■ DETERMINING THE OPTIMAL CAPITAL BUDGET

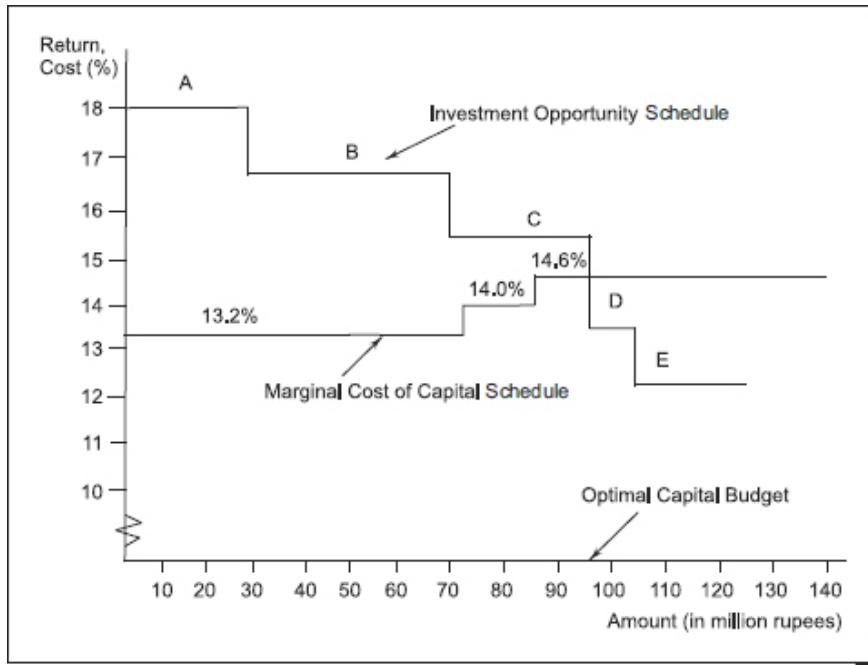
To determine the optimal capital budget, you have to compare the expected return on proposed capital expenditure projects with the marginal cost of capital schedule.

To illustrate, suppose Shiva Electronics is developing its capital budget for the forthcoming year. The company's schedule of proposed capital expenditure projects for the coming year is as follows.

<i>Project</i>	<i>Amount (Rupees in million)</i>	<i>Internal Rate of Return</i>
A	30	18.0%
B	40	16.5%
C	25	15.3%
D	10	13.4%
E	20	12.0%

The IRRs from the proposed capital expenditures are plotted against the cumulative funds required and shown as the **investment opportunity schedule** in [Exhibit 14.5](#). In addition, this exhibit shows the **marginal cost of capital schedule** for Shiva Electronics. The optimal capital budget is reflected by the point at which the investment opportunity schedule and the marginal cost of capital schedule intersect.

## Exhibit 14.5 | Determining the Optimal Capital Budget



Thus, the optimal capital budget for Shiva Electronics totals ₹ 95 million and includes Projects A, B, and C. Projects D and E are excluded as their IRRs are lower than the marginal cost of capital.

The logic of this procedure is that the objective of capital budgeting is to maximise the excess of *returns over costs*, or the area that lies between the marginal cost of capital schedule and the investment opportunity schedule.

## **14.8 ■ DIVISIONAL AND PROJECT COST OF CAPITAL**

The WACC can be used as the discount rate when the proposed investment is similar to the existing investments of the firm. This condition may not be as restrictive as it sounds because often new investments are similar to existing investments. A cement manufacturer may set up another cement plant or a software exporter may invest in another software development facility. In such cases we can use WACC as the discount rate.

However, there may be situations in which new investments tend to have a risk profile different from that of the existing investments of the firm. How should this be handled?

## The CAPM and the WACC

Using WACC for evaluating investments whose risks are different from those of the overall firm leads to poor decisions. [Exhibit 14.6](#) shows why.

[Exhibit 14.6](#) plots the CAPM relation corresponding to a risk free rate of 10 percent and a market risk premium of 8 percent. Consider an all-equity firm that has a beta of 1. Since it has no debt, its cost of equity as well as its WACC is 18 percent.

Suppose this firm has two investment opportunities, project *A* and project *B*. Project *A* has a beta,  $\beta_A$ , of 0.5 and an expected return of 16 percent and project *B* has a beta,  $\beta_B$ , of 1.5 and an expected return of 20 percent.

According to the CAPM, the required return on project *A* is 14 percent:

$$\text{Required return on } A = 10 \text{ percent} + 0.5 \times 8 \text{ percent} = 14 \text{ percent}$$

Since the expected return on *A* is 16 percent which is higher than its required return of 14 percent, it is a worthwhile project.

According to the CAPM, the required return on project *B* is 22 percent.

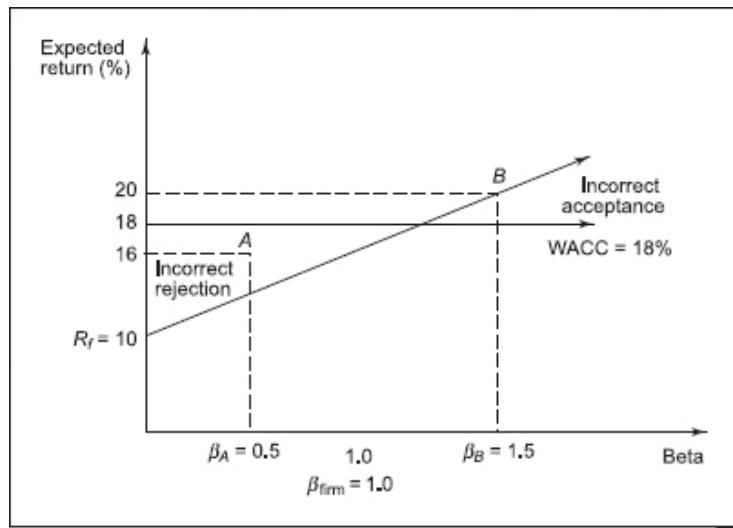
$$\text{Required return on } B = 10 \text{ percent} + 1.5 \times 8 \text{ percent} = 22 \text{ percent}$$

Since the expected return on project *B* is 20 percent, which is lower than its required return of 22 percent, it is not a worthwhile project.

However, if we apply the WACC of 18 percent to both *A* and *B*, *A* which is a worthwhile project will be rejected and *B* which is not a worthwhile project will be accepted. Thus, when projects have risks that are substantially different from those of the overall firm, applying WACC can potentially lead to poor decisions. In such cases, the expected return must be compared with the risk-adjusted required return, as calculated by the CAPM.

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## Exhibit 14.6 | The CAPM and the WACC



## **Divisional Cost of Capital**

When a firm is engaged in more than one line of business, we have a similar problem if the WACC is applied across-the-board.

Suppose a firm, Powerplus Limited, has two divisions, a regulated electric utility and a power plant manufacturing unit. The regulated utility has a relatively low risk whereas the power plant manufacturing unit has a relatively high risk.

Powerplus's overall cost of capital is really a mixture of two different costs of capital, a lower cost of capital for the electric utility and a higher cost of capital for the power plant manufacturing unit.

If a single WACC is used as a cutoff, Powerplus will over-invest in the power plant manufacturing unit which is a very risky business and under-invest in the electric utility unit which is a very safe business. Multi-divisional firms, which are aware of this problem, often calculate separate divisional costs of capital. Two approaches are commonly employed for this purpose: the pure play approach and the subjective approach.

**The Pure Play Approach** Suppose we want to come up with a discount rate for the electric utility unit of Powerplus. Perhaps the best way to do this is to identify electric utility companies that have publicly traded securities. We may find that a typical electric utility company has an equity beta of 0.7, a debt-equity ratio of 1:1, and a debt rating of AAA. Based on this information, we can compute the WACC for a typical electric utility company and use it as the discount rate for the projects of the electric utility unit of Powerplus. In stock market parlance, we are looking at a pure play, a company that is engaged in a single line of business (electric utility business, in our example). Hence this approach is called the pure play approach.

We can use the pure play approach, provided we can find suitable pure plays. In case we don't find suitable pure plays, determining a discount rate objectively is a difficult thing.

**The Subjective Approach** Since it may be difficult to objectively establish the discount rates for individual projects in many cases, firms often make subjective adjustments to the overall WACC.

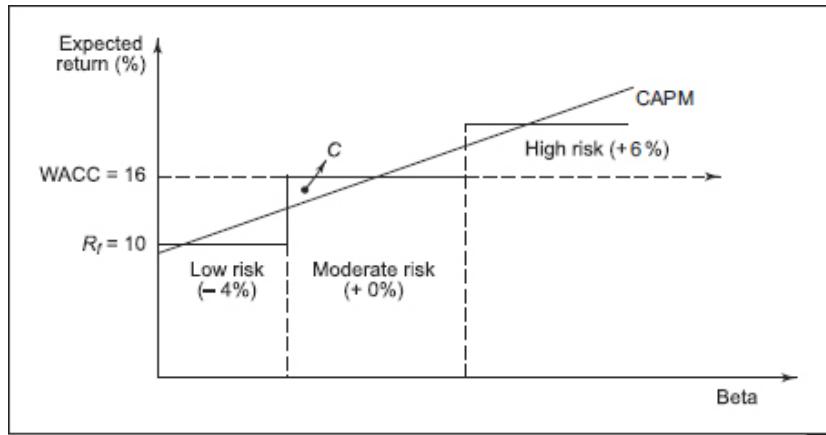
To illustrate, suppose the overall WACC of a firm is 16 percent. It may place its projects into one of several risk classes and adjust the overall WACC, as shown below:

Category	Example	Adjustment factor	Adjusted discount rate
Mandatory	Pollution control equipment	n.a.	n.a.
Low risk	Replacement equipment	- 4 %	12%
Moderate risk	Capacity expansion	0	16%
High risk	New product investment	+ 4 %	20%

The partitioning of projects into various risk classes is useful. Of course, within each risk class, some projects may be more risky than others and the potential for making wrong decisions still exists. For example, in [Exhibit 14.7](#), Project C is rejected by the subjective approach even though it lies above the CAPM line making it worthwhile. However, looking at [Exhibit 14.6](#) and [14.7](#), we find that the magnitude of potential error is much less with the subjective approach compared to the uniform WACC approach. Thus, some adjustment for risk, albeit subjective, is better than no adjustment.

Ideally, the required return on each project should be determined objectively. In practice, however, this is often not possible because the relevant information may not be available or the cost and effort involved may not be worth their while. Hence, subjective adjustment may be the only practical choice.

### Exhibit 14.7 | The CAPM Approach and the Subjective Approach



## 14.9 ■ FLOATATION COST AND THE COST OF CAPITAL

So far we have ignored the floatation costs. When a firm raises finance by issuing equity and debt, it almost invariably incurs floatation or issue costs, comprising of items like underwriting costs, brokerage expenses, fees of merchant bankers, advertising expenses, under-pricing cost, so on and so forth. For example, the floatation costs associated with equity issues may be 6 to 10 percent.

How should the floatation costs be handled in computing the cost of capital? One approach is to adjust the WACC to reflect the floatation costs. For example, if the WACC is 12 percent and the average floatation costs are 6 percent, the WACC may be revised as follows:

$$\text{Revised WACC} = \frac{\text{WACC}}{1 - \text{Floatation cost}} = \frac{12}{1 - .06} = 12.77 \text{ percent}$$

This is not correct because floatation costs are not an annual cost but a one-time cost. So a better approach is to leave the WACC unchanged but to consider floatation costs as part of the project cost. A simple example may be given to illustrate this approach.

The cost of equity for Prakash Limited, an all equity firm, is 18 percent. Since the firm is financed wholly by equity, its WACC too is 18 percent. Prakash Limited is considering a ₹ 200 million expansion project which will be funded by selling additional equity. Based on the advice of its merchant banker, Prakash Limited believes that its floatation costs will be 8 percent of the amount issued. This means that the net proceeds will only be 92 percent of the amount of equity raised. What is the cost of expansion, considering the floatation costs?

Prakash Limited has to sell enough equity so that it has ₹ 200 million after meeting the floatation costs. In other words,

$$\begin{aligned}\text{₹ 200 million} &= (1 - .08) \times \text{Amount raised} \\ \text{Amount raised} &= \frac{\text{₹ 200 million}}{(1 - 0.08)} = ₹ 217.39 \text{ million}\end{aligned}$$

Prakash Limited's floatation costs are ₹ 17.39 million and hence the true cost of the expansion project is ₹ 217.39 million.

In the previous example, we assumed that a firm raised money only through external equity issue. What happens if the firm relies, as is very common, on a mixture of retained earnings, external equity issue,

preference issue, and debt issue. In this case you have to calculate the weighted average floatation cost which is defined as follows:

$$f_A = w_R f_R + w_E f_E + w_P f_P + w_D f_D \quad (14.9)$$

where  $f_A$  is the weighted average floatation cost,  $w_R$ ,  $w_E$ ,  $w_P$ , and  $w_D$  are the proportions of retained earnings, external equity, preference capital, and debt capital in the capital structure of the firm, and  $f_R$ ,  $f_E$ ,  $f_P$ , and  $f_D$  are the floatation costs associated with retained earnings, external equity, preference capital, and debt capital.

To illustrate, consider the case of Phoenix Limited which employs retained earnings, external equity, preference capital, and debt capital in the following proportions:

$w_R = 0.2$ ,  $w_E = 0.3$ ,  $w_P = 0.1$ , and  $w_D = 0.4$ . The floatation costs are as follows:  $f_R = 0\%$ ,  $f_E = 10\%$ ,  $f_P = 5\%$ , and  $f_D = 4\%$ . The weighted average floatation cost is:

$$f_A = 0.2(0) + 0.3(10) + 0.1(5) + 0.4(4) = 5.1\%$$

This means that for every rupee of financing needed by the firm for its investments, the firm must raise:

$$\frac{1}{1 - .051} = ₹ 1.054$$

While calculating the weighted average floatation costs, use the weights in the existing capital structure (or target capital structure), even though the specific investment under consideration is financed entirely by debt or equity. The fact that a particular project can be financed with debt or equity is not relevant. If a firm has a debt-equity ratio of 3:2, for example, but chooses to finance a given project entirely with debt, it will have to raise additional equity subsequently to maintain its target debt-equity ratio. Taking this into consideration, you should always use weights in the capital structure.

## Floatation Costs and NPV

To illustrate how floatation costs are incorporated in an NPV analysis, let us consider an example. Ramesh Engineering is currently at its target debt-equity ratio of 4:5. It is evaluating a proposal to expand capacity which is expected to cost ₹ 4.5 million and generate after-tax cash flows of ₹ 1 million per year for the next 10 years. The tax rate for the company is 25 percent. Two financing options are being looked at:

- Issue of equity stock. The required return on the company's new equity is 18 percent. The issuance cost will be 10 percent.
- Issue of debentures carrying a yield of 12 percent. The issuance cost will be 2 percent.

What is the NPV of the expansion project? Since the expansion is in the existing business of the firm, we will use the company's WACC to value it:

$$\begin{aligned} \text{WACC} &= \frac{E}{V} r_E + \frac{D}{V} r_D (1 - T_c) \\ &= \frac{5}{9} \times 18\% + \frac{4}{9} \times 12\% (1 - 0.25) \\ &= 10\% + 4\% = 14\% \end{aligned}$$

The NPV of the project ignoring the floatation costs is:

$$\begin{aligned} \text{NPV} &= \text{Present value of benefits} - \text{Investment} \\ &= ₹ 1,000,000 \times \text{PVIFA (14%, 10 years)} - ₹ 4,500,000 \\ &= ₹ 1,000,000 \times 5.216 - ₹ 4,500,000 \\ &= ₹ 716,000 \end{aligned}$$

What will be the effect of floatation costs? Since the floatation costs of equity and debt are 10 percent and 2 percent respectively and the target debt-equity ratio is 4:5, the weighted average floatation cost,  $f_A$ , is:

$$\begin{aligned} f_A &= \frac{E}{V} \times f_E + \frac{D}{V} \times f_d \\ &= \frac{5}{9} \times 10\% + \frac{4}{9} \times 2\% \\ &= 6.44 \text{ percent} \end{aligned}$$

Note that the fact that Ramesh Engineering can finance the project entirely with equity or debt is irrelevant. What matters is the target capital structure of the firm.

Given that the expansion project needs ₹ 4,500,000, the true cost, including floatation costs, is ₹ 4,500,000 / (1 -  $f_A$ ) = ₹ 4,500,000 / 0.9356 = ₹ 4,809,748. Since the present value of cash inflows is ₹ 5,216,000, the

expansion project, after considering the floatation costs, has an NPV of: ₹ 5,216,000 – ₹ 4,809,748 = ₹ 406,252. The project is still worthwhile.

## **14.10 ■ FACTORS AFFECTING THE WEIGHED AVERAGE COST OF CAPITAL**

The cost of capital is affected by several factors, some beyond the control of the firm and others dependent on the investment and financing policies of the firm.

## **Factors Outside a Firm's Control**

The three most important factors, outside a firm's direct control, that have a bearing on the cost of capital are the level of interest rates, the market risk premium, and the tax rate.

**The Level of Interest Rates** If interest rates in the economy rise, the cost of debt to firms increases and vice versa. Interest rates also have a similar bearing on the cost of preference and cost of equity. Remember that the risk-free rate of interest is an important component of the CAPM, a model widely used for estimating the cost of equity.

**Market Risk Premium** The market risk premium reflects the perceived riskiness of equity stocks and investor aversion to risk. A factor beyond the control of individual firms, the market risk premium affects the cost of equity directly and the cost of debt indirectly (through a substitution effect).

**Tax Rates** The tax policy of the government has a bearing on cost of capital. The corporate tax rate has a direct impact on the cost of debt as used in the weighted average cost of capital. The capital gains tax rate relative to the rate on ordinary income has an indirect effect on the cost of equity relative to the cost of debt.

## **Factors Within a Firm's Control**

The cost of capital of a firm is affected by its investment policy, capital structure policy, and dividend policy.

**Investment Policy** To estimate the cost of capital, we start with the rates of return required on the outstanding equity and debt of the firm. These rates reflect how risky the firm's existing assets are. If a firm plans to invest in assets similar to those currently used, then its marginal cost of capital would be more or less the same as its current cost of capital. On the other hand, if the riskiness of its proposed investments is likely to be very different from the riskiness of its existing investments, its marginal cost of capital should reflect the riskiness of the proposed investments.

**Capital Structure Policy** To calculate the WACC we assumed a given target capital structure. Of course, a firm can change its capital structure and such a change is likely to affect the cost of capital because the post-tax cost of debt is lower than the cost of equity and equity beta, an input for calculating the cost of equity is a function of financial leverage.

**Dividend Policy** The dividend policy of a firm may affect its cost of equity.

## 14.11 MISCONCEPTIONS SURROUNDING COST OF CAPITAL

The cost of capital is a central concept in financial management linking the investment and financing decisions. Hence, it should be calculated correctly and used properly in investment evaluation. Despite this injunction, we find that several errors characterise the application of this concept. The more common misconceptions, along with suggestions to overcome them, are discussed below.

### 1. The concept of cost of capital is too academic or impractical

Some companies do not calculate the cost of capital because they regard it as 'academic' or 'impractical' or 'irrelevant' or 'imprecise.' These misgiving about cost of capital appear to be unjustified. Such reservation can be dispelled by emphasising the following points:

- The cost of capital is an essential ingredient of discounted cash flow analysis. Since discounted cash flow analysis is now widely used, cost of capital can scarcely be considered 'academic' or 'impractical'.
- Out of the various inputs required for discounted cash flow analysis, viz., project life, project cash flows (consisting of initial investment, operating cash flows, and terminal cash flow) and cost of capital, the last one, viz., the cost of capital can be calculated most reliably and accurately. So a concern about its imprecision seems to be misplaced.

### 2. Current liabilities (accounts payable and provisions) are considered as capital components

Sometimes it is argued that accounts payable and accruals are sources of funding to be considered in the calculation of the WACC. This view is not correct because what is not provided by investors is not capital.

### 3. The coupon rate on the firm's existing debt is used as the pre-tax cost of debt

The coupon rate on the firm's existing debt reflects a historical cost. What really matters in investment decision making is the interest rate the firm would pay if it issues debt today. Hence use the current cost of debt, not the historical cost of debt.

### 4. When estimating the market risk premium in the CAPM method, the historical average rate of return is used along with the current risk-free rate.

Consider the following information:

- Historical average return on common stocks = 19 percent
- Historical return on long-term Treasury bonds = 10 percent
- Current expected return on common stocks = 14 percent
- Current return on long-term Treasury bonds = 7 percent

Sometimes the market risk premium is calculated as the difference between the historical average return on common stocks and the current return on long-term Treasury bonds. This is not correct.

To calculate the market risk premium, you can use the historical risk premium (19 percent – 10 percent) or the current risk premium (14 percent - 7 percent), but not the difference between the historical average return on common stocks and the current return on long-term Treasury bonds (19 percent – 7 percent).

5. **The cost of equity is equal to the dividend rate or return on equity** It appears that the cost of equity is sometimes measured incorrectly. It is measured as the current dividend rate (dividend per share as a percentage of face value per share) or as return on equity. Only by accident do these measures represent the cost of equity correctly.

It should be clearly understood that the cost of equity is the rate of return required by equity investors given the risk they are exposed to. It has nothing to do with the current dividend rate or return on equity, which are mere historical numbers.

6. **Retained earnings are either cost free or cost significantly less than external equity** Sometimes firms impute a negligible or low cost to retained earnings under the influence of wrong notions like “retained earnings have no cost because shareholders are satisfied with dividends” or “retained earnings are already with the firm and hence some nominal returns on them may suffice.”

The error in such reasoning stems from ignoring the opportunity cost associated with retained earnings. When a firm retains a portion of its earnings, equity shareholders are denied dividends to that extent. If the same were distributed as dividends, equity shareholders could invest it elsewhere to earn a rate of return comparable to the cost of equity. Hence the opportunity cost of retained earnings is more or less equal to the cost of equity funds.

7. **Depreciation has no cost** Similar to the misconception that retained earnings are more or less cost-free is the notion that depreciation-generated funds are also virtually cost free. In a conversation with the author, a manager commented: “Depreciation is capital already in the

company. Since it does not have to be raised, even in an indirect sense of retained earnings, it clearly has no cost."

To guard against such an error, invoke the opportunity cost principle once again.

Theoretically, the firm can return the depreciation-generated funds to its shareholders and lenders (the parties who provided the finance for asset acquisition) and they, in turn, can invest these funds elsewhere. Hence, the opportunity cost of depreciation - generated funds is the average return the shareholders and lenders would earn on these funds by investing them elsewhere. And this would be equal to the average cost of capital of the firm.

8. **Book value weights may be used to calculate the WACC** Often firms use book value weights in the existing capital structure to calculate the WACC. This is not correct.

Weights should be based on market values, not book values. Ideally, the target capital structure (in market value terms) should determine the weights for the WACC. If the target capital structure is not specified, use the current market value weights.

9. **The cost of capital for a project is calculated on the basis of the specific sources of finance used for it** If a firm raises debt when it is investing in some project, it may regard the post-tax cost of debt as the relevant cost of capital. Likewise, if it happens to raise equity when it is investing in some other project, it may consider the cost of equity as the relevant cost of capital. In both these cases, the error stems from calculating the WACC on the basis of the immediate sources of finance tapped

The immediate source of funds used for a project does not necessarily determine the hurdle rate. What matters is the contribution made by the project to overall debt capacity of the firm and not which sources of funds happen to be tapped when the project is being undertaken.

10. **The project cost of capital is the same as firm's WACC** Many firms apply a uniform WACC to all projects, irrespective of differences in their risk characteristics. This practice is based on the following reasoning: "While a project may not have the same risk as the firm, its relevant cost of capital is still the firm's WACC because the investors are paid from the cash flows of the firm, not the cash flows of the project."

The above reasoning is flawed. The return that the investors require from a project is the same as what they would get from an alternative investment with the same risk profile and it has nothing to do with the return that they are currently getting from the firm. For example, if a firm currently engaged in petrochemical business sets up a retailing business, investors will require a return from the retailing business that reflects its riskiness. **Note that it is not the WACC of a firm that determines the cost of capital of a project. Rather, it is the other way.** Each project has its own cost of capital which reflects its riskiness and its debt capacity. The cost of capital of the firm is the weighted average of the cost of capital of various projects undertaken by the firm.

## SUMMARY

- Capital, like any other factor of production, has a cost. A company's **cost of capital** is the weighted average cost of the various sources of finance used by it.
- WACC is a central concept in financial management.
- In general, if a firm uses  $n$  different sources of capital its WACC is:

$$\sum_{i=1}^n p_i r_i$$

- WACC is the right discount rate for a project that is a carbon copy of the firm's existing business. However, in practice WACC is used as a benchmark hurdle rate that is adjusted for variations in risk and financing patterns.
- Since debt and preference stock entail more or less fixed payments, estimating the cost of debt and preference is relatively easy.
- Because interest on debt is a **tax-deductible expense**, the pre-tax cost of debt has to be adjusted for the tax factor to arrive at the post-tax cost of debt.
- The cost of preference is simply equal to its **yield**.
- A popular approach to estimating the cost of equity is the **capital asset pricing model** (CAPM). According to the CAPM, the required return on a company's equity is:

$$r_E = R_f + \beta_i [E(R_M) - R_f]$$

- According to the **dividend growth model** approach, the cost of equity is equal to:

Dividend yield + Expected growth rate in dividends

- For calculating the WACC, **market value proportions** are generally recommended.
- WACC tends to rise as a firm seeks more and more capital.
- A schedule or graph showing the relationship between additional financing and WACC is called the **weighted marginal cost of capital** schedule.
- To determine the optimal capital budget, you have to compare the expected return on proposed capital expenditure projects with the marginal cost of capital schedule.
- There are two ways of handling **floatation costs**. One approach is to adjust the WACC to reflect the floatation costs. A better approach is to leave the WACC unchanged but to consider floatation costs as part of the project cost.
- The cost of capital is affected by several factors, some beyond the control of the firm and others depending on the investment and financing policies of the firm.
- Despite the importance of cost of capital in financial management, we find that several **misperceptions** characterise its application in practice.

## QUESTIONS

1. What are the three steps involved in calculating a firm's WACC?
2. Discuss the conditions that should be satisfied for using a firm's WACC for evaluating new investments.
3. How is the cost of debt calculated?
4. How is the cost of preference calculated?
5. Discuss the application of CAPM to the calculation of cost of equity.
6. What are the pros and cons of using the CAPM approach to calculate the cost of equity?
7. What are the pros and cons of using the bond yield plus risk premium approach to calculate the cost of equity?
8. How is the cost of equity calculated using the dividend growth model approach?
9. What are the pros and cons of using the dividend growth model approach to calculate the cost of equity?
10. Discuss the following bases for determining the proportions (or weights) in the WACC calculation: book values, target capital structure, and market values.
11. Explain the procedure for determining the weighted marginal cost of capital.
12. Describe the procedure for determining the optimal capital budget.
13. How would you handle the floatation costs in computing the cost of capital?
14. Discuss the factors affecting the weighted average cost of capital.
15. What are the common misconceptions surrounding cost of capital in practice? How would you dispel them?
16. What are the best global practices in measuring the cost of capital?

## SOLVED PROBLEMS

14.1 The capital structure of Adamus Ltd. in book value terms is as follows:

Equity capital (20 million shares, ₹ 10 par)	₹ 200 million
Preference capital, 12 percent (500,000 shares, ₹ 100 par)	₹ 50 million
Retained earnings	₹ 350 million
Debentures 14 percent (1,200,000 debentures, ₹ 100 par)	₹ 120 million
Term loans, 13 percent	₹ 80 million
	₹ 800 million

The next expected dividend per share is ₹ 2.00. The dividend per share is expected to grow at the rate of 12 percent. The market price per share is ₹ 50.00. Preference stock, redeemable after 10 years, is currently selling for ₹ 85.00 per share. Debentures, redeemable after 5 years, are selling for ₹ 90.00 per debenture. The tax rate for the company is 30 percent. Calculate the average cost of capital.

*Solution:*

The cost of equity and retained earnings

$$r_E = \frac{D_1}{P_O} + g \\ = \frac{2.00}{50} + 0.12 = 16\%$$

The cost of preference capital, using the approximate formula, is:

$$r_P = \frac{12 + (100 - 85) / 10}{0.6 \times 85 + 0.4 \times 100} = 14.83\%$$

The pre-tax cost of debentures, using the approximate formula, is:

$$r_D = \frac{14 + (100 - 90) / 5}{0.6 \times 90 + 0.4 \times 100} = 17.02\%$$

The post-tax cost of debentures is

$$17.02 (1 - \text{tax rate}) = 17.02 (1 - 0.3) = 11.91\%$$

The post-tax cost of term loans is

$$13 (1 - \text{tax rate}) = 13 (1 - 0.3) = 9.1\%$$

### Average Cost of Capital

Source of capital	Component cost (1)	Market value ₹ in million (2)	Market value proportion (3)	Product of (1) & (3)
Equity capital and retained earnings	16.00%	1000	0.81	12.96
Preference capital	14.83%	42.5	0.03	0.44
Debentures	11.91%	108	0.09	1.07
Term loans	9.10%	80	0.07	0.64
		1230.5	Average cost capital	15.11%

- 14.2 Amit Electronics is evaluating an expansion project that is expected to cost ₹ 20 million and generate an annual after-tax cash flow of ₹ 4 million for the next 10 years. The tax rate for the company is 35 percent.

Amit Electronics has a target debt-equity ratio of 1:1. Its cost of equity is 16.9 percent whereas its pre-tax cost of debt is 14 percent. The floatation cost of equity is 12 percent whereas the floatation cost of debt is 2 percent.

What is the NPV of the expansion project?

*Solution* Since the expansion is in the existing business of the firm, we will use the company's WACC to value it:

$$\begin{aligned}WACC &= E/Vr_E + D/Vr_D (1 - tc) \\&= 0.5 \times 16\% + 0.5 \times 14\% (1 - .35) = 13\%\end{aligned}$$

The NPV of the project, ignoring the floatation costs is:

$$\begin{aligned}NPV &= \text{Present value of benefits} - \text{Investment} \\&= ₹ 4,000,000 \times PVIFA (13\%, 10 \text{ years}) - ₹ 20,000,000 \\&= ₹ 4,000,000 \times 5.426 - ₹ 20,000,000 \\&= ₹ 21,704,000 - ₹ 20,000,000 = ₹ 1,704,000\end{aligned}$$

The weightage average floatation cost is:

$$f_A = 0.5 \times 12\% + 0.5 \times 2\% = 7\%$$

Given that the expansion project needs ₹ 20,000,000 the true cost, including floatation costs is ₹ 20,000,000 / (1 - .07) = ₹ 21,505,376. Since the present value of cash inflows is ₹ 21,704,000, the expansion project, after considering the floatation cost, has an NPV of: ₹ 21,704,000 - ₹ 21,505,376 = ₹ 198,624. The project is still worthwhile.

- 14.3 Mehta Ltd.'s WACC is 11 percent and its tax rate is 35 percent. Mehta's pre-tax cost of debt is 10 percent and its debt-equity ratio is 0.6:1. The risk-free rate is 8 percent and the market risk premium is 7 percent. What is the beta of Mehta's equity?

*Solution*

$$\frac{0.6}{1.6} \times 10\% (1 - 0.35) + \frac{1.0}{1.6} r_E = 11\% \quad \text{So, } r_E = 13.7\%$$

$$8 + \beta_E \times 7 = 13.7\% \quad \text{So, } \beta_E = 0.814$$

## PROBLEMS

- 14.1 Cos of Debt** Abascus Limited issued 15 year, 14 percent bonds five years ago. The bond which has a face value of ₹ 100 is currently selling for ₹ 108.
- What is the pre-tax cost of debt?
  - What is the after-tax cost of debt? (Assume a 35 percent tax rate)
- 14.2 Cost of Preference** Omega Enterprises issued 10 year, 9 percent preference shares four years ago. The preference share which has a face value of ₹ 100 is currently selling for ₹ 92. What is the cost of preference shares?
- 14.3 WACC** Rao Corporation has a target capital structure of 60 percent equity and 40 percent debt. Its cost of equity is 18 percent and its pre-tax cost of debt is 13 percent. If the relevant tax rate is 35 percent, what is Rao Corporation's WACC?
- 14.4 WACC** Unix Limited's equity beta is 1.2. The market risk premium is 7 percent and the risk-free rate is 10 percent. Unix has a debt-equity ratio of 2:3. Its pre-tax cost of debt is 14 percent. If the tax rate is 35 percent, what is the WACC?
- 14.5 Equity Beta** Azeez Corporation's WACC is 12 percent and its tax rate is 35 percent. Azeez's pre-tax cost of debt is 14 percent and its debt-equity ratio is 1:1. The risk-free rate is 11 percent and the market risk premium is 8 percent. What is the beta of Azeez's equity?
- 14.6 Flaw in Reasoning** Satish Kumar, CEO of Vanguard Enterprises argues as follows:
- Vanguard's balance sheet has total debt of ₹ 200 million and Vanguard's total interest burden for the forthcoming year will be ₹ 24 million. Satish argues, "We owe ₹ 200 million and we will pay ₹ 24 million interest. So the cost of our debt is 12 percent ( $24/200$ ).". What is the flaw in this argument?
  - Vanguard's equity currently sells for ₹ 100 per share and the dividend per share will probably be ₹ 6. Satish reasons "Since we plan to pay a dividend of ₹ 6 per share which has a market price of ₹ 100 our cost of equity is 6 percent". What is the error in this reasoning?
- 14.7 Weights** Samanta Company has 20 million equity shares outstanding. The book value per share is ₹ 40 and the market price per share is ₹ 120. Samanta has two debenture issues outstanding. The first issue has a face value of ₹ 300 million, a 12 percent coupon, and sells for 90 percent of its face value. It will mature in 5 years. The second issue has a face value of ₹ 200 million, a 14 percent coupon, and sells for 102 percent of its face value. It will mature in 6 years. Samanta also has a bank loan of ₹ 200 million on which the interest rate is 15 percent.
- What are Samanta's capital structure weights on a book value basis and on a market value basis? (b) Which weights would you use? Why?
- 14.8 Cost of Debt and Equity** Suman Corporation manufactures speciality chemicals. Its debt-equity ratio is 0.8. Its WACC is 15 percent and its tax rate is 30 percent.

- (a) If Suman's cost of equity is 20 percent, what is its pre-tax cost of debt?
- (b) If Suman can issue debt at an interest rate of 13 percent, what is its cost of equity?

**14.9 Breaking Points** Panyam Company's capital structure in terms of market value is:

Debt	₹ 30 million
Equity	₹ 60 million

The company plans to maintain this market-value capital structure. The company has a plan to invest ₹ 15 million next year. This will be financed as follows: Retained earnings (₹ 5 million), Additional equity (₹ 5 million), and Debt (₹ 5 million).

The company's equity stock presently sells for ₹ 30 per share. The next dividend expected is ₹ 3.00. The expected rate of dividend growth is 5 percent. Additional equity can be issued at ₹ 25 per share (net). The interest rate applicable to additional debt would be as follows:

First ₹ 2.5 million	14 percent
Next ₹ 2.5 million	15 percent

The tax rate for the firm is 30 percent.

- Required: (a) At what amounts of new capital will there be breaks in the marginal cost of capital schedule?
- (b) What will be the marginal cost of capital in the interval between each of the breaks?

**14.10 Marginal Cost of Capital** Susheel Corporation has the following book value capital structure:

Equity capital (10 million shares, ₹ 10 par)	₹ 100 million
Preference capital, 11 percent (100,000 shares, ₹ 100 par)	₹ 10 million
Retained earnings	₹ 120 million
Debentures 13.5 percent (500,000 debentures, ₹ 100 par)	₹ 50 million
Term loans, 12 percent	₹ 80 million
	<hr/>
	₹ 360 million

The next expected dividend per share is ₹ 1.50. The dividend per share is expected to grow at the rate of 7 percent. The market price per share is ₹ 20.00. Preference stock, redeemable after 10 years, is currently selling for ₹ 75.00 per share. Debentures, redeemable after 6 years, are selling for ₹ 80.00 per debenture. The tax rate for the company is 50 percent.

- (a) Calculate the cost of capital using book value and market value proportions.

(b) Define the marginal cost of capital if it needs ₹ 100 million next year, assuming that the amount will be raised equally from equity and debt, the firm will retain ₹ 15 million earnings next year, equity issue will fetch a net price of ₹ 16 per share, and debt will cost 14 percent for the first ₹ 25 million and 15 percent for the next ₹ 25 million.

**14.11 WACC, Floatation Costs, and NPV** Microelectronics Corporation is currently at its target debt-equity ratio of 0.5: 1. It is considering a proposal to expand capacity which is expected to cost ₹ 500 million and generate after-tax cash flows of ₹ 130 million per year for the next eight years. The tax rate for the firm is 30 percent. Mahesh, the CFO of the company, has considered two financing options: (i) Issue of equity stock. The required return on the company's new equity is 20 percent and the issuance cost will be 12 percent. (ii) Issue of debentures at a yield of 13 percent. The issuance cost will be 3 percent.

(a) What is the WACC for Microelectronics? (b) What is Microelectronic's weighted average floatation cost? (c) What is the NPV of the proposal after taking into account the floatation costs?

**14.12 Project Hurdle Rate** Bharati Limited, an all-equity firm, is evaluating the following projects:

Project	P	Q	R	S
Beta	0.6	0.9	1.5	1.5
Expected Return (%)	13	14	16	20

The risk-free rate is 10 percent and the expected market premium is 8 percent. Bharathi's cost of capital is 18 percent. Which projects would be accepted or rejected incorrectly on the basis of the firm's cost of capital as a hurdle rate?

## MINICASE

Suman Joshi, Managing Director of Omega Textiles, was reviewing two very different investment proposals. The first one is for expanding the capacity in the main line of business and the second one is for diversifying into a new line of business. The following data is available for the company.

- The latest balance sheet of Omega is given below

₹ in million			
<i>Liabilities</i>		<i>Assets</i>	
Equity capital	350	Fixed assets	700
Preference capital	100	Investments	100
Reserves and surplus	200	Current assets, loans and advances	400
Debentures	450		
Current liabilities & provisions	100		
	1200		1200

- Omega's target capital structure has 50 percent equity, 10 percent preference, and 40 percent debt.

- Omega has ₹ 100 par, 10 percent coupon, annual payment, noncallable debentures with 8 years to maturity. These debentures are selling currently at ₹ 112.
- Omega has ₹ 100 par, 9 percent, annual dividend, preference shares with a residual maturity of 5 years. The market price of these preference shares is ₹ 106.
- Omega's equity stock is currently selling at ₹ 80 per share. Its last dividend was ₹ 2.80 and the dividend per share is expected to grow at a rate of 10 percent in future.
- Omega's equity beta is 1.1, the risk-free rate is 7 percent, and the market risk premium is estimated to be 7 percent.
- Omega's tax rate is 30 percent.
- The new business that Omega is considering has different financial characteristics than Omega's existing business. Firms engaged purely in such business have, on average, the following characteristics: (i) Their capital structure has debt and equity in equal proportions. (ii) Their cost of debt is 11 percent. (iii) Their equity beta is 1.5.
  - (a) What is Omega's post-tax cost of debt and preference?
  - (b) What is Omega's cost of equity as per the dividend discount model and the CAPM?
  - (c) What is Omega's WACC, using CAPM for the cost of equity?
  - (d) What is the WACC for the new business?

## PRACTICAL ASSIGNMENT

Estimate the WACC for the company selected by you using reasonable assumptions.

- 
- <sup>1</sup> In addition, a company in India presently has to pay a dividend distribution tax. We have ignored this from our calculation.
  - <sup>2</sup> This reflects how sensitive the rate of return on a given equity stock is to changes in return on the market portfolio. The procedure for calculating beta is discussed in Chapter 9.

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter14/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter14/index.html)



- Additional Self-Test Problems
- Chapters Excel
- Mini Cases
- Additional Solved Problems
- Excel on Solved Problems
- Answer Key

## **Capital Budgeting: Extensions**

### **Learning Objectives**

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After studying this chapter you should be able to:

- ✓ Calculate the equivalent annual cost (EAC) of a project.
- ✓ Calculate the adjusted NPV of a project.
- ✓ Discuss the methods of capital budgeting under constraints.
- ✓ Estimate informally the value of options embedded in projects.
- ✓ Explain the sources of positive NPV.
- ✓ Discuss the qualitative influences that bear on capital expenditure decisions.
- ✓ Explain the link between corporate strategy and capital budgeting.

By and large, our discussion so far assumed that: (i) Mutually exclusive projects had the same life. (ii) The investment and financing aspects of a project are independent. (iii) The firm has no problem in raising capital for worthwhile projects. (iv) The value of a project lies mostly in the cash flows associated with it. (v) All project requests showing positive NPVs should be accepted. (vi) Project evaluation is essentially a quantitative exercise. Further, we glossed over the linkages between corporate strategy and capital budgeting and certain over-all organisational considerations relevant for capital budgeting.

This chapter discusses decision situations where there are mutually exclusive projects of unequal life, where investment and financing aspects of a project are interrelated, and where projects have valuable options embedded in them. In addition, it examines the sources of positive NPV, looks at how qualitative influences bear on capital budgeting, explores the linkage between corporate strategy and capital budgeting, and discusses other organisational considerations relevant to capital budgeting.

## 15.1 CHOICE BETWEEN PROJECTS OF UNEQUAL LIFE

Alpha Limited is considering two machines, *A* and *B*. Though designed differently, they serve the same function. Machine *A*, a standard model, costs ₹ 75,000 and lasts for 5 years. Its annual operating costs will be ₹ 12,000. Machine *B*, an economy model, costs ₹ 50,000 but lasts for only 3 years. Its annual operating costs will be ₹ 20,000. (All the figures are expressed in real terms; this means that they represent rupees of constant purchasing power.)

How should Alpha Limited choose between the two machines? Since they serve the same function, the choice between them should be based on a comparison of costs. One way of doing this may be to compare the present value of all the costs associated with the two machines, which are as follows:

$$\text{Machine } A: 75,000 + \frac{12,000}{(1.12)} + \frac{12,000}{(1.12)^2} + \frac{12,000}{(1.12)^3} + \frac{12,000}{(1.12)^4} + \frac{12,000}{(1.12)^5} = 118,260$$

$$\text{Machine } B: 50,000 + \frac{15,000}{(1.12)} + \frac{15,000}{(1.12)^2} + \frac{15,000}{(1.12)^3} = 86,030$$

The present value of costs associated with machine *B* is lower than that of machine *A*. Based on such a comparison, one may argue that machine *B* is preferable to machine *A*. Such an argument, however, is flawed because it overlooks the fact that machine *B* has a shorter life and has to be replaced earlier.

For a proper comparison of the two alternatives, that have different lives, we have to convert the present value of cost into a uniform annual equivalent (UAE) figure—it is also referred to as the equivalent annual cost (EAC) figure. The EAC is a function of the present value of cost, the life of the asset, and the discount rate. The EAC is simply:

$$\frac{\text{PV of Costs}}{\text{PVIFA}_{r,n}}$$

The EAC of the two machines is calculated below:

$$\text{Machine } A: \text{EAC} = \frac{118,260}{3.605} = 32,804$$

$$\text{Machine } B: \text{EAC} = \frac{86,030}{2.402} = 35,816$$

What does an EAC value of ₹ 32,804 for machine *A* mean? It simply means that incurring a capital outlay and operating costs which have a present value of ₹ 118,260 for a machine that lasts five years is like incurring an annual cost of ₹ 32,804 for five years. Likewise a UAE value of ₹ 35,816 for machine *B* implies that incurring a capital outlay and operating costs which have a present value of ₹ 86,030 for a machine that lasts three years is like incurring an annual cost of ₹ 35,816 for three years.

The choice between machines *A* and *B* can be made by comparing their EAC. Since the EAC of machine *A* is lower than the EAC of machine *B*, machine *A* is preferable to machine *B*.

## **15.2 ─ INTERRELATIONSHIP BETWEEN INVESTMENT AND FINANCING ASPECTS**

The use of weighted average cost of capital is based, *inter alia*, on the assumption that every project is financed by the same proportions of debt and equity as found in the capital structure of the firm. Projects, however, tend to differ in their debt capacity and other features like availability of subsidies, etc. Hence financing and investment decisions are likely to be interrelated. When this is so, we must take into account the financing impact of an investment decision. This may be done by calculating the adjusted NPV or by using the adjusted discount rate.

## Adjusted Present Value (APV)

The APV of a project is its NPV calculated after making adjustments for the financing impact of the project. The calculation of adjusted NPV begins with the 'base-case' NPV which is the NPV under the assumption that there are no financing side effects. In practical terms it is the NPV of the project assuming that the project is all-equity financed, there are no issuance expenses, and there are no subsidies. Once the 'base case' NPV is obtained, adjustments are made to it to reflect the impact of the financing side effects. Thus

$$APV = \text{Base case NPV} + \text{NPV of financing side effects associated with the project}$$

**Illustration** The APV calculation may be illustrated with an example. Parimal Company is considering a project requiring ₹ 5 million of investment. It is expected to generate a net cash flow of ₹ 1 million per year for 8 years. The opportunity cost of capital is 15 percent - this reflects the return required by equity investors from the project when it is unlevered. The cost of issuing equity is 5 percent. The project enables the firm to raise ₹ 2.4 million of debt finance. The debt finance will carry 14 percent interest and will be repaid in equal annual installments over the eight year period - the first installment will be paid at the end of the first year. The tax rate applicable to the firm is 60 percent.

Given the above information about the project, let us first calculate its base case NPV. This is equal to:

$$-5,000,000 + \sum_{t=1}^8 \frac{1,000,000}{(1.15)^t} = -₹ 512,700$$

The base-case NPV has to be adjusted for two factors: (i) issue cost, and (ii) tax-shield associated with debt.

Out of the total financing requirement of the project ₹ 2,600,000 will come from the equity sources and ₹ 2,400,000 will come in the form of debt finance. As the net equity finance required by the project is ₹ 2,600,000 and issue costs would absorb 5 percent of the gross proceeds of the issue, the firm will have to issue ₹ 2,736,842 (₹ 2,600,000/0.95) of equity stock in order to realise a net amount of ₹ 2,600,000. The difference of ₹ 136,842 is the cost of underwriting, brokerage, printing, and other issue related expenses. The adjusted NPV after adjustment for issue cost is:

$$\begin{aligned}
 APV &= \text{Base case NPV} - \text{Issue cost} \\
 &= -₹ 512,700 - ₹ 136,842 \\
 &= -₹ 649,542
 \end{aligned}$$

Now we consider the adjustment for the tax shield associated with debt finance. The present value of tax shield associated with ₹ 2,400,000 of debt finance is calculated in [Exhibit 15.1](#). From this exhibit we find that the debt finance associated with the project brings a stream of tax shields which has a present value of ₹ 604,000. If we make adjustment for this also, we get:

$$\begin{aligned}
 APV &= \text{Base case NPV} - \text{Issue cost} + \text{Present value of tax shield} \\
 &= -₹ 512,700 - ₹ 136,842 + ₹ 604,000 \\
 &= -₹ 45,542
 \end{aligned}$$

Since the adjusted NPV after both the adjustments is negative, we conclude that the project is not worthwhile.

### **Exhibit 15.1 Calculation of the Present Value of Tax Shield**

Year	Debt Outstanding at the Beginning	Interest	Tax Shield	Present Value of Tax Shield Using a Discount Rate of 14%	(₹ in '000)
1	2,400	336	202	177	
2	2,100	294	176	135	
3	1,800	252	151	102	
4	1,500	210	126	75	
5	1,200	168	101	52	
6	900	126	76	34	
7	600	84	50	20	
8	300	42	25	9	
			Total	604	

## 15.3 ■ CAPITAL BUDGETING UNDER CONSTRAINTS

Often firms draw up their capital budget under the assumption that the availability of funds is limited. This limitation may be due to difficulty in obtaining funds externally or due to restrictions imposed by management. The objective of investment decision making under conditions of capital rationing should be to maximise the NPV of the set of investments selected. Due to size disparity of projects, this objective cannot be realised by merely choosing projects on the basis of individual NPV ranking till the budget is exhausted. To illustrate this point, consider the following set of projects (ranked according to their NPV) being evaluated by a firm which has a capital budget constraint of ₹ 2,500,000.

Project	Outlay	NPV
A	₹ 1,500,000	₹ 600,000
B	1,000,000	450,000
C	800,000	500,000
D	700,000	300,000
E	600,000	250,000

If the selection is based on individual NPV ranking, projects A and B would be included in the capital budget as these projects exhaust the capital budget. A cursory examination, however, would suggest that it is more desirable to select projects B, C, and D. These three projects can be accommodated within the capital budget of ₹ 2,500,000 and have a combined NPV of ₹ 1,250,000 as against a combined NPV of ₹ 1,050,000 for projects A and B.

## Feasible Combinations Approach

The above example suggests that the following procedure may be used for selecting the set of investments under capital rationing<sup>1</sup>.

1. Define all combinations of projects which are feasible, given the capital budget restriction and project interdependencies.
2. Choose the feasible combination that has the highest NPV.

To illustrate this procedure, consider the following projects that are being evaluated by a firm which has a capital budget constraint of ₹ 3,000,000.

Project	Outlay	NPV
A	₹ 1,800,000	₹ 750,000
B	1,500,000	600,000
C	1,200,000	500,000
D	750,000	360,000
E	600,000	300,000

Projects B and C are mutually exclusive. Other projects are independent. Given the above information, the feasible combinations and their NPV are shown below.

Feasible Combination	Outlay	NPV
A	₹ 1,800,000	₹ 750,000
B	1,500,000	600,000
C	1,200,000	500,000
D	750,000	360,000
E	600,000	300,000
A and C	3,000,000	1,250,000
A and D	2,550,000	1,110,000
A and E	2,400,000	1,050,000
B and D	2,250,000	960,000
B and E	2,100,000	900,000
C and D	1,950,000	860,000

<i>C and E</i>	1,800,000	800,000
<i>B, D, and E</i>	2,850,000	1,260,000
<i>C, D, and E</i>	2,550,000	1,160,000

The most desirable feasible combination consists of projects *B, D* and *E* as it has the highest NPV.

## Linear Programming Model<sup>2</sup>

The procedure described above becomes increasingly cumbersome as the number of projects increases and as the number of years in the planning horizon increases. To cope with a problem of this kind it is helpful to resort to mathematical programming models which aid in determining the optimal solution without explicitly evaluating each feasible combination. A popular mathematical programming model is the linear programming model.

The general formula of a linear programming model for the capital rationing problem is:

$$\text{Maximise } \sum_{j=1}^n \text{NPV}_j X_j \quad (15.1)$$

Subject to

$$\sum_{j=1}^m \text{CF}_{jt} X_j \leq K_t \quad (t = 1, 2, \dots, n) \quad (15.2)$$

$$0 \leq X_j \leq 1 \quad (15.3)$$

where  $\text{NPV}_j$  is the net present value of project  $j$ ,  $X_j$  is the proportion of project  $j$  accepted,  $\text{CF}_{jt}$  is the cash outflow required for project  $j$  in period  $t$ , and  $K_t$  is the capital budget available in period  $t$ .

Certain features of the above formulation may be noted: (i)  $X_j$  is allowed to assume any value from 0 to 1. This means that projects are deemed to be perfectly divisible. (ii) Input parameters,  $\text{NPV}_j$  and  $K_t$ , are defined with certainty. (iii) The calculation of  $\text{NPV}_j$  is based on the assumption that the cost of capital is known with certainty.

The above linear programming formulation may be extended to consider (i) carry forward of cash from one period to another, and (ii) non-financial constraints.

If it is not feasible to undertake fractional projects, you can use integer programming which limits the value of  $X$ s to integers. However, integer programming is not common as it is awkward to use.

While linear programming (LP) models seem ideally suited for capital budgeting problems when resources are limited, they are not widely used in practice. Why? One reason is that it is difficult to get reliable data. An LP model assumes that all future investments are known. In real life, investment ideas are not known in advance but unfold over time. Another reason is that if a company has truly worthwhile investment opportunities, capital may not be a constraint. Why do CEOs, then, tell their subordinates

that capital is limited. Perhaps, they want to impose discipline on capital spending by managers who have a natural tendency to ask for more money to pursue their pet projects.

## 15.4 ■ VALUE OF OPTIONS

More often than not, a project has a strategic payoff in the form of new investment opportunities that may possibly open up if the project is undertaken. To illustrate, consider the case of a firm which is evaluating a proposal to set up a project for manufacturing scooters. The long term goal of the firm is to be a market leader in the field of two-wheelers, scooters as well as motorcycles. However, the firm considers entry into the motorcycles market to be infeasible currently as it lacks technical expertise or market image to challenge well-entrenched manufacturers in the field. Thus, the proposal to manufacture motorcycles hinges on expertise developed and success achieved in the field of scooters. Put differently it means that the project for manufacturing scooters has a potential payoff in terms of entry into a new field which may generate a large benefit. So, in assessing the scooter project the value of future options generated by it must be taken into account.

Valuing the options embedded in real life projects with the help of Black-Scholes option pricing model<sup>3</sup> often requires heroic assumptions. Yet the insights provided by this model can be combined with well-informed, experienced judgment to get a handle over option values. If you can identify the options and specify the circumstances under which they would be exercised, you can make an informed estimate of their values. The procedure for doing this would broadly involve three steps:

- Identify options
- Analyse environmental uncertainty
- Value options

**Identify Options** Options embedded in real life projects are basically of two types: incremental options and flexibility options.

An **incremental option** provides the firm with opportunities to make profitable investments in future. Michael Porter calls an investment as a ‘beachhead’ if it opens up new opportunities in future. For example, he refers to Procter and Gamble’s acquisition of the Charmin Paper Company as a beachhead that enabled Procter and Gamble to launch a cluster of products like disposable diapers, paper towels, and bathroom tissue.

A **flexibility option** in a project gives the firm a wider latitude in manufacturing so that it can cope better with unforeseen changes and exploit profitable opportunities that come its way.

**Analyse Environmental Uncertainty** Options are valuable in unpredictable environments. Uncertainty creates opportunities for exercising options. Incremental options multiply when future uncertainty increases. For example, most of the foreign investments made in Europe around 1990 were motivated by future uncertainty, not current profitability. Such investments provide the ‘thin end of the wedge’ that facilitates the exploitation of opportunities that arise in an uncertain environment. By the same token, flexibility options tend to have greater value when the environment is more uncertain.

**Value the Options** Once the options provided by the project are compiled and the environmental uncertainties delineated, the value of options may be assessed. While the Black-Scholes model may not be readily applicable to options embedded in real life projects, the key ideas of this model may be combined with the experience and judgment of managers to develop a practical procedure for valuing options. Bear in mind the following insights provided by the Black-Scholes model:

- The greater the uncertainty characterising a project, the higher the value of the options embedded in the project.
- The longer the duration of a project, the higher the value of the options inherent in it.

**Exhibit 15.2** presents a matrix showing the combined effect of environmental uncertainty and project duration on the relative values of cash flows and options. The percentages shown, however, are merely suggestive. They have to be, of course, specified by the project evaluator to reflect his subjective assessment.

### Exhibit 15.2 Relative Values of Cash Flows and Options

Duration of the Project	Low		High	
	Cash flows : 75		Cash flows : 60	
	Options : 25	Options : 40	Options : 95	Options : 75
Long				
Short	Environmental Uncertainty			

## 15.5 ■ SOURCES OF POSITIVE NPV

It is often taken for granted that there is an abundance of positive NPV projects which can be identified rather easily. However, choosing positive NPV projects is akin to selecting under-valued securities using fundamental analysis. The latter is possible if there are imperfections in the financial market that cause a discrepancy between security prices and their equilibrium values (intrinsic values). Likewise, imperfections in real markets (product and factor markets) lead to entry barriers which cause positive NPVs. Hence, an understanding of entry barriers is helpful in identifying positive NPV projects.

It appears that there are six main entry barriers that result in positive NPV projects which are as follows:

- Economies of scale
- Product differentiation
- Cost advantage
- Marketing reach
- Technological edge
- Government policy

**Economies of Scale** Economies of scale means that an increase in the scale of production, marketing, or distribution results in a decline in the cost per unit. When substantial economies of scale are present, the existing firms are likely to be large in size. The more pronounced the economies of scale, the greater the cost advantage of the existing firms.

In order to exploit the economies of scale, new entrants require substantial investments in plant and machinery, research and development, and market development. Such capital needs serve as an entry barrier. The greater the capital requirement, the higher the barrier to entry. This seems to be especially true in industries like petroleum refining, mineral extraction, iron and steel, and aluminum.

**Product Differentiation** A firm can create an entry barrier by successfully differentiating its products from those of its rivals. The basis for differentiation may be one or more of the following:

- Effective advertising and superior marketing
- Exceptional service

- Innovative product features
- High quality and dependability

**Cost Advantage** If a firm can enjoy cost advantage vis-à-vis its competitors, it can be reasonably assured of earning superior returns. Cost advantage may stem from one or more of the following:

- Accumulated experience and comparative edge on the learning curve
- Monopolistic access to low cost materials
- A favourable location
- More effective cost control and cost reduction

**Marketing Reach** A penetrating marketing reach is an important source of competitive advantage. Two examples illustrate this:

Avon Products markets its products through a worldwide network of 1,200,000 independent sales representatives. Avon's competitors find it almost impossible to replicate this. Thanks to such a nonpareil marketing network, Avon has been able to earn superior returns in a highly competitive industry.

The breadth and depth of Hindustan Unilever's distribution network is miles ahead of its competitors.

**Technological Edge** Technological superiority enables a firm to enjoy excellent returns. Firms like Intel and Apple have earned superior returns over extended periods of time due to, *inter alia*, the technological edge they had over their rivals.

**Government Policy** A government policy that shelters a firm from the onslaught of competition enables it to earn superior returns. Government policies that create entry barriers, partial or absolute, include the following:

- Restrictive licensing
- Import restrictions
- High tariff walls
- Environmental controls
- Special tax reliefs

A number of firms in India benefited substantially from government policies which offered considerable protection to them from potential competition, domestic as well as foreign, for many years. The liberalisation measures of recent years have, of course, dismantled, partly or substantially, entry barriers stemming from earlier government policies. Remember what the government can give, it can also take away.

## 15.6 ■ BEHAVIOURAL FACTORS

Capital investment decision making is a human activity, not an objective, mechanical exercise. There are people behind the capital investment “process.” The rational, economic models of capital budgeting overlook this reality. For a more comprehensive understanding of capital budgeting, we must bear in mind how the following behavioural and qualitative factors impact investment decision making.

**Biases** The human brain is a wondrous organ, but it is not a rational calculating machine as neoclassical economists have assumed. Our decision making is affected by a number of biases. The major ones are: *overconfidence* (tendency to overestimate the accuracy of our forecasts), *confirmation bias* (overweighting information that confirms our opinions), *illusion of control* (exaggerating one’s control over outcomes), *representativeness bias* (forming judgments on the basis of stereotypes and analogues), *availability bias* (relying overly on easily available information), *anchoring* (linking assessment of something to an arbitrary reference point), *loss aversion* (feeling much more strongly about the pain from a loss than the pleasure from an equal gain), *herding* (following the crowd), and *affect heuristic* (deciding mostly on what feels right emotionally and viscerally).

Since these behavioural biases often remain undetected, a conscious and deliberate effort has to be made to “de-bias” decision making. The following are helpful in this task. (a) Develop multiple hypotheses and potential solutions. (b) Use a checklist for evaluating the quality and independence of information. (c) Specify objective decision criteria in advance and examine the possibility of being wrong. A technique like ‘premortem assessment’ (imagining yourself in future where your decision has turned out to be wrong and identifying the reasons for the same) can be helpful.

**Intuition** The use of intuition in major business decisions, including capital expenditure decisions, is far more common than people think. Often the capital expenditure decisions are influenced by the ‘inspired whim’ of a strong person. Many chief executives admit that ultimately their decisions are based on gut-feeling. Robert Docktor conducted an experiment in which he wired up a group of chief executive officers to an electroencephalograph. He found that the brains of chief executive officers were more active in right

hemispheres, suggesting that they frequently relied on intuitive hunches to define complex problems in an open-ended state of ambiguity. Henry Mintzberg's study likewise showed that for making most of the strategic decisions managers depend on the factor of judgment rather than explicit analysis. They are often guided by their intuition and are not able to explain adequately—the how or why—of their strategic decisions.

Bruce D. Henderson, a leading management expert, has expressed the importance of intuition as follows:

"The final choice in all business decisions is, of course, intuitive. It must be. Otherwise, it is not a decision, just a conclusion - a printout"<sup>4</sup>.

"Intuition can be awesome in its value at times. It is known as good judgment in everyday affairs. Intuition is in fact the subconscious integration of all the experiences, conditioning, and knowledge of a lifetime, including the emotional and cultural biases of that life time"<sup>5</sup>.

In a similar vein, Kenichi Ohmae, a Japanese authority on management, says:

"Successful business strategies result not from rigorous analysis (which is necessary) but from a particular state of mind. In the mind of the strategist, insight and a consequent drive for achievement fuel a thought process which is basically creative and intuitive rather than rational."<sup>6</sup>

Nobody doubts the value of intuition as it reflects accumulated experience, conditioning, memory, and pattern recognition. However, since intuition also reflects personal biases and inappropriate analogies, it is useful when it works in tandem with rational analysis. Whoever thinks that intuition is a substitute for reason is indulging in a risky delusion. Detached from rigorous analysis, intuition is a fickle and undependable guide – it is as likely to lead to disaster as to success. So, the right side of the brain, the seat of intuition, must collaborate with the left side of the brain, the source of reason and logic. As Kim Wallace put it: "The key to making a decision is to delay the decision until it makes logical sense and it feels right. The two sides of the brain must agree. If they don't, delay the decision. Get more input from more sources until it eventually relies upon both logical and intuitive perspectives. It sounds very simple, and it is. But I never made a bad decision using this process."

**Vision** Most successful business groups/companies all over the world are guided by a vision of its leaders, which serves as a superordinate goal and influences the investment decisions directly and indirectly. Here are some examples of business vision:

IBM	: Value-added leadership position
Honda	: No.1 producer of the best motorcycles in the world
Reliance Industries	: An integrated empire
Bajaj Auto	: Global player

**Superstition** Many businessmen consult astrologers or depend on some other superstitious counsel. Wit the following statements:

“What do businessmen have to lose if, plain business sense apart, they also want to know if the planets are favourably disposed toward them.”

“The more money a businessman makes, the more insecure he feels. Consulting an astrologer is a therapeutic experience. If you are going through a bad phase and are told that it has been caused due to the adverse effects of planets in your horoscope, you do not completely blame yourself. Moreover, most Indian businessmen are by nature religious.”

“There is hardly any businessman in India who doesn’t consult an astrologer, although most of them lack the conviction and courage to admit it.”

The dependence on astrological advice or superstitious counsel is not confined to India. It is pervasive globally. In a profoundly insightful book, Kenneth Boulding writes:

“The persistence of superstition even into a supposedly scientific age is testimony to the power of traditional images in ambiguous situations. It is a curious fact, for instance, that even in the most advanced societies the daily paper frequently carries a column of astrological advice!”<sup>7</sup>

Astrologers and psychologists have argued that magical rites and superstitious behaviour make the world look more deterministic and instil confidence in our ability to manage it. Superstitious beliefs seem to help in:

- Relieving anxiety
- Imparting a sense of control
- Encouraging necessary activity

Hence such beliefs persist. And the more unpredictable or uncertain the future appears to be, the greater may be the psychological urge to rely on superstitions.

**Politics** Internal political elements often have an important bearing on capital budgeting decisions. Various levels of management tend to get divided into factions. Mutual loyalties among people belonging to the same

faction may lead to acceptance of otherwise marginal or even sub-marginal projects. On the other hand, negative feelings among people belonging to different factions may lead to rejection of otherwise promising projects. Put differently, internal political games can mar the quality of decision making and investment proposals may not be viewed in an unbiased and objective manner.

**Sponsorship** A project cannot be divorced from its sponsor. Research on decision-making processes of top management suggests that a decision at this level is likely to be a bet on the sponsor of the project. The facts, the projections, and even the project tend to be secondary in importance if the questions asked by the top management are: Who is the sponsor of the project? What is his commitment to the project? What is his track record? Will he be able to surmount obstacles on the way and deliver the goods?

**Intangible Benefits** A capital project may generate some benefits that cannot be easily quantified. It may increase the flexibility available to the organisation; it may improve the attractiveness of the product; it may give the organisation a sense of pride; it may make the work environment more pleasing; it may strengthen the technological capability of the firm; it may enhance the morale of the firm. Referred to generally as intangibles, these benefits cannot be translated into monetary terms. Yet, they are relevant and cannot be ignored in investment decision making.

**Multiple Reviews** Capital expenditure proposals are generally reviewed by two to three committees in most companies. Generally, these committees consist of independent, hard-headed individuals.

## 15.7 ■ CORPORATE STRATEGY AND CAPITAL BUDGETING

Capital budgeting is the principal instrument for implementing corporate strategy. Yet the tie-in between corporate strategy and capital budgeting is often loose and tenuous. Wit the following:

- Investment proposals are often considered as self-contained projects and viewed more or less in isolation. The rationale preferred for this approach is that if individual proposals are sound, a collection of such proposals should represent a meaningful commitment of funds.
- The sponsors of proposals, particularly operating personnel, tend to, quite understandably, view the proposals from their limited perspective. An operating person, for example, may justify an investment in terms of increase in output and decrease in unit cost. The effect of the investment on the break-even point or inventory level may be beyond his concern.
- Many investment proposals, suggested by people down the line and apparently fulfilling certain standards of profitability, may be rejected by the capital budgeting committee because they conflict with the rationale of corporate strategy. This may breed frustration and cynicism about the role of formal analysis.

**Strengthening the Links Between Corporate Strategy and Capital Budgeting** In order to ensure that corporate strategy and long-range plans firmly undergird the capital budgeting process, the following ought to be done:

- Long-range planning should precede capital budgeting.
- Long-range plans should be formalised and communicated to all persons involved in the process of capital budgeting.
- During the capital budgeting exercise, investment proposals should be viewed in the context of the critical premises of long-range plans.

A suggested time table linking business planning and capital budgeting is given in [Exhibit 15.3](#).

### Exhibit 15.3 | Linkages Between Business Planning and Capital Budgeting

	<i>Business Planning</i>	<i>Capital Budgeting</i>
April-August	Several scenarios are explored	
September	Initial premises are agreed to	Initial capital budgeting guidelines are formulated
October–December	Work is continued toward developing a final formal business plan.	October – January
January	Final business plan is adopted.	February
		March
		Capital budget selection is carried out in divisions and departments
		Capital budget is approved by the executive committee
		Capital budget is approved by the board

**Strategy and Capital Allocation** Two major issues addressed in the strategy formulation exercise are : What businesses should we be in? What should be our relative commitment of resources to these businesses?

These questions may be answered in various ways. A commonly adopted approach is to employ some portfolio planning model. A popular portfolio planning model is the General Electric's Stoplight Matrix developed by the General Electric Company of the U.S. for guiding its resources allocation. It calls for analysing various products of the firm in terms of two key issues:

- *Business strength* How strong is the firm vis-à-vis its competitors?
- *Industry attractiveness* What is the attractiveness or potential of the industry?

The commitment of funds to various products is guided by how they are rated in terms of the above two dimensions. As shown in [Exhibit 15.4](#) products which are favourably placed justify substantial commitment of funds, products which are unfavourably placed call for divestment, and products which are placed in between qualify for modest investment.

#### **Exhibit 15.4 | General Electric's Stoplight Matrix**

A t t r a c t i v e n e s s  I n d u s t r y	Business strength		
	Strong	Average	Weak
	Invest	Invest	Hold
	Invest	Hold	Divest
		Hold	Divest

Since the resource allocation strategy of the firm shapes, guides, and circumscribes individual project decisions, the desirability of a project cannot be assessed without a reference to the strategy of the firm.

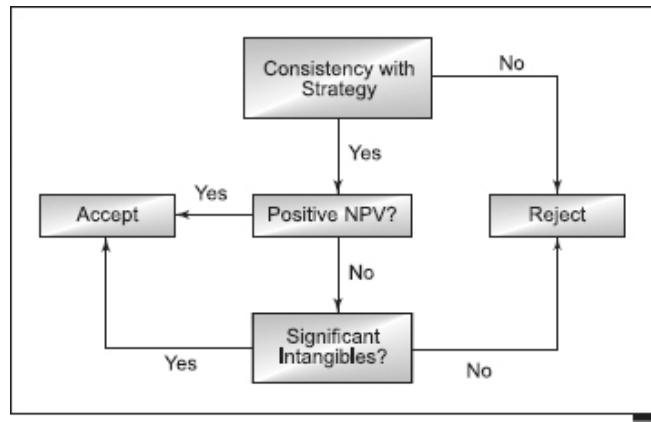
**Mission and Funds Allocation** In the context of our present discussion which is concerned with the linkage between corporate strategy and capital budgeting, it is relevant to mention the use of strategic missions as the basis of funds allocation at the Department of Defence, U.S. Traditionally, the approach used for budgetary allocation at the Department of Defence, U.S., was to allocate the budgetary pie to the three services, Army, Navy and Air Force. When Robert McNamara took office as Secretary, Department of Defence, he introduced a new approach to budgetary allocation which was based on nine program elements reflecting the major missions of the Department of Defence. Program Element No.1, for example, represented the development of "Strategic Retaliatory Force" and the budget for this program covered bombers, Polaris submarines, and land based inter-continental ballistic missiles.

The approach adopted by the Department of Defence, U.S. can be meaningfully applied to a corporate entity. Determining corporate missions admittedly is a significant managerial challenge. If missions are delineated and communicated they serve as the base for resource allocation. If missions are not properly developed and communicated, funds allocation becomes, as Tilles put it, "an exercise in gamesmanship rather than a rational matching of means and ends".

**An Approach to Decision Making** To determine whether a project is worthwhile or not, strategic factors, financial payoffs, and intangible benefits may be combined in the manner shown in [Exhibit 15.5](#). The key guidelines underlying the approach displayed in this exhibit are:

- In a decision involving measurement as well as judgment, as far as possible, separate the quantifiable and intangible factors.
- Don't rely exclusively on measurable factors and spurious over-quantification. Put differently, avoid the 'what counts counts' bias.

### **Exhibit 15.5 An Approach to Decision Making**



**A Glimpse into Practice** As Dick Grannis, Treasurer of QUALCOMM, said, "QUALCOMM evaluates new projects (such as new products, equipment, technologies, research and development, acquisitions, and strategic investments) by using traditional financial measurements including DCF models, IRR levels, peak funding requirements, and time needed to reach cumulative positive cash flows, and the short-term impact of the investment on our reported earnings.

For strategic investments we consider the possible value of financial, competitive, technology and/or market value enhancements to our core business - even if those benefits cannot be quantified. Overall, we make capital budgeting decisions based on a combination of objective analyses and our own business judgement."

## 15.8 ■ ORGANISATIONAL CONSIDERATIONS

In order to be meaningful and viable, the capital budget of a firm must satisfy some conditions:

- It must be compatible with the resources of the firm.
- It must be controllable.
- It must be endorsed by executive management.

**Compatibility with Resources** The capital budget of a firm must be compatible with its resources – financial capacity and managerial capability.

**Controllability** As the business environment is continually changing and evolving, even the best conceived business plans may turn out to be ill-advised and poorly timed. Hence, sound controls should be instituted in the process of capital budgeting.

**Executive Endorsement** The capital budget of the firm must be backed by the executive management. Endorsement of executive management is required at all stages: long-range planning, funds planning, and development of budgetary controls.

### SUMMARY

- For comparing alternative projects with different lives the criterion of **equivalent annual cost** is used. The EAC is simply:  $PV \text{ of costs}/PVIFA_{r,n}$ .
- The **adjusted NPV** or just **APV** is defined as:  
Base case NPV (NPV under the assumption that the project is all-equity financed)
  - + NPV of the financing side effects of the project.
- To cope with the problem of the limited availability of funds, the **feasible combination method**, or even better, a mathematical programming model such as the **linear programming model** may be used.
- There are several important options found in capital projects: investment timing option, expansion option, growth option, shutdown option, abandonment option, and flexibility option.
- The value of options embedded in a project is a function of the degree of uncertainty and the duration of the project.
- The important **entry barriers** that result in positive NPV projects are: economies of scale, product differentiation, cost advantage, marketing reach, technological edge, and government policy.

- Intuition, vision, superstition, politics, project sponsorship, and intangible benefits are the important qualitative influences that have a bearing on capital expenditure decisions.
- Capital budgeting is the principal instrument for implementing corporate strategy.
- **Portfolio planning models** may be used to determine the allocation of resources across different businesses.
- To determine whether a project is worthwhile or not, strategic factors, financial payoffs, and intangible benefits should be considered.

## QUESTIONS

1. How is equivalent annual cost (EAC) calculated?
2. What is APV?
3. Describe the feasible combination method.
4. Discuss the linear programming model formulation for the capital rationing problem.
5. Discuss the procedure for valuing options embedded in real projects in a subjective, judgmental manner.
6. Discuss the sources of positive NPV.
7. Describe the qualitative influences that have an important bearing on capital expenditure decisions.
8. What should be done to strengthen the links between corporate strategy and capital budgeting?
9. Discuss how strategy shapes capital allocation.
10. What are the conditions that the capital budget must satisfy in order to be meaningful and viable.

## SOLVED PROBLEMS

- 15.1 Pioneer Chemicals is evaluating two alternative systems for waste disposal, System A and System B which have lives of 6 years and 4 years respectively. The initial outlay and operating costs for the two systems are expected to be as follows:

	<i>System A</i>	<i>System B</i>
■ Initial outlay	₹ 4 million	₹ 3 million
■ Annual operating costs	₹ 1.2 million	₹ 1 million

If the discount rate is 13%, which system should Pioneer choose? Ignore the salvage value.

*Solution*

The present value of costs associated with System A is:

$$4 + 1.2 \times \text{PVIFA}_{6 \text{ years}, 13\%}$$

$$= 4 + 1.2 \times 3.998 = ₹ 8.7976 \text{ million}$$

The equivalent annual cost (EAC) is:

$$8.7976 / \text{PVIFA}_{4 \text{ years}, 13\%} = ₹ 2.2005 \text{ million}$$

The present value of costs associated with System B is:

$$3 + 1 \times \text{PVIFA}_{4 \text{ years}, 13\%}$$

$$= 3 + 1 \times 2.974 = ₹ 5.974 \text{ million}$$

The equivalent annual cost (EAC) is:

$$5.974 / \text{PVIFA}_{4 \text{ years}, 13\%} = ₹ 2.0087 \text{ million}$$

Since the EAC of System B is less than that of System A, the firm is advised to choose System B.

- 15.2 Growmore Fertilizers Limited is considering a capital project requiring an outlay of ₹ 15 million. It is expected to generate a net cash inflow of ₹ 3.75 million for 6 years. The opportunity cost of capital is 18 percent. Growmore Fertilizers can raise a term loan of ₹ 10 million for the project. The term loan will carry an interest rate of 16 percent and would be repayable in 5 equal annual installments, the first installment falling due at the end of the second year. The balance amount required for the project can be raised by issuing equity. The issue cost is expected to be 8 percent. The tax rate for the company is 50 percent.

(i) What is the base case NPV?

(ii) What is the adjusted present value (APV)?

*Solution*

(i) The base case NPV is:

$$-150,000,000 + \sum_{t=1}^{6} \frac{3,750,000}{(1.18)^t} = -₹ 1,882,500$$

(ii) The net equity required for the project is ₹ 5,000,000. Since the issue cost is 8 percent, the gross proceeds will have to be ₹ 5,000,000/(0.92) = ₹ 5,434,783. Thus the issue cost will be ₹ 434,783. The APV, after adjustment for issue cost is:

$$-1,882,500 - 434,783 = -₹ 2,217,283$$

The present value of tax shield associated with debt is ₹ 2,177,305 are calculated below:

<i>Year</i>	<i>Debt outstanding at the beginning</i>	<i>Interest</i>	<i>Tax shield</i>	<i>Present value of tax shield</i>
1	10,000,000	1,600,000	800,000	689,655
2	10,000,000	1,600,000	800,000	594,530
3	8,000,000	1,280,000	640,000	410,240
4	6,000,000	960,000	480,000	264,960
5	4,000,000	640,000	320,000	152,320
6	2,000,000	320,000	160,000	65,600
				2,177,305

If we make adjustment for tax shield on debt as well, we get:

$$\begin{aligned}
 \text{APV} &= \text{Base case NPV} - \text{Issue cost} + \text{Present value of tax shield} \\
 &= -1,882,500 - 434,783 + 2,177,305 \\
 &= -₹ 140,248
 \end{aligned}$$

## PROBLEMS

**15.1 EAC** Plastic emulsion for a building costs ₹ 300,000 and has a life of 7 years. Distemper painting costs ₹ 180,000 and has a life of 3 years. How does the EAC of plastic emulsion painting compare with that of distemper painting?

**15.2 EAC** The initial outlay on an internal transportation system would be ₹ 1,500,000. The operating costs are expected to be as follows:

<i>Year</i>	<i>Operating Costs (in ₹)</i>
1	300,000
2	360,000
3	400,000
4	450,000
5	500,000

The estimated salvage value at the end of five years is ₹ 300,000. What is the UAE if the cost of capital is 13 percent?

**15.3 EAC** The standard overhaul of an equipment costs ₹ 0.5 million and is required every 6 years. A less costly overhaul can be done for ₹ 0.2 million and is required every 2 years. Which one would you recommend if the cost of capital is 14 percent? Why?

**15.4 APV** Nimesh Electricals Limited is evaluating a capital project requiring an outlay of ₹ 12 million. It is expected to generate an annual cash inflow of ₹ 3 million for 6 years. The opportunity cost of capital is 20 percent. It will carry an interest rate of 18 percent and will be repayable in 8 equal installments, the first installment falling due at the end of the second year.

The balance amount required for the project can be raised by issuing external equity. The issue cost is expected to be 12 percent. The tax rate for the company is 30 percent.

- (a) What is the base case NPV?
- (b) What is the APV if the adjustment is made only for the issue cost of external equity?
- (c) What is the present value of the tax shield on debt finance?

**15.5 APV** Nikhil Electronics Limited is evaluating a capital project requiring an outlay of ₹ 8 million. It is expected to generate a net cash inflow of ₹ 2 million for 6 years. The opportunity cost of capital is 18 percent. Nikhil Electronics Limited can raise a term loan of ₹ 5 million for the project. The term loan will carry an interest rate of 15 percent which would be repayable in 5 equal instalments, the first instalment falling due at the end of the second year. The balance amount required for the project can be raised by issuing external equity. The issue cost is expected to be 10 percent. The tax rate for the company is 40 percent.

- (a) What is the base case NPV?
- (b) What is the APV if the adjustment is made for the issue cost of external equity?
- (c) What is the present value of tax shield on debt finance?

**15.6 EAC** Plastic emulsion for a building costs ₹ 200,000 and has life of 6 years. Distemper painting costs ₹ 140,000 and has a life of 3 years. Which is a better option?

**15.7 EAC** Two offers have been received for fumigation of the godowns of Nirav Bros. The first one costs ₹ 6 lakhs and is required every 4 years. The second one costs ₹ 5 lakhs and is required every 3 years. If the cost of capital is 12 percent, which one would be the better offer?

**15.8 APV** L&S have bagged a capital project that will generate an annual net cash inflow of ₹ 20 million for the next 5 years on an initial investment of ₹ 40 million. The opportunity cost of capital for L&S is 18 percent. For part funding the project, the company intends to go in for a term loan of ₹ 20 million carrying an interest rate of 12 percent and repayable in 4 equal annual instalments, the first instalment falling due at the end of the second year. The balance amount required for the project can be raised by issuing external equity. The issue cost is expected to be 5 percent. The tax rate for the company is 30 percent.

What is the APV if the adjustment is to include the issue cost and the tax shield available on debt finance?

## MINICASE

One thing Shyam Dalmiya has learnt in his life as an industrialist is to never ignore government authorities. So, when the State Industrial Development Corporation (SIDCO) called him for a discussion on his newly planned oil mill, he has readily

agreed and also taken you, his young finance manager, to assist him in the proceedings.

His plan was to import the plant and machinery at a total outlay (including the net working capital) of ₹ 800 million. The useful life of the plant would be 10 years and the annual cash flow ₹ 176.5 million. The plant is expected to fetch a net salvage value of ₹ 50 million after 10 years. The financing would be by way of an equity issue at an issue cost of 8 percent.

SIDCO wanted to prevail on him to buy an indigenous version of that plant from a unit recently commissioned with their assistance. They told him that though the project outlay (including the net working capital) would be somewhat higher at ₹ 980 million, they would make up for that by giving some very good financial support. Firstly, if he came to them, they would be happy to subscribe to as much as ten percent of any equity issue he would launch for this project. Further, they would get for him a term loan for a sizeable amount, without any cash margin, from a nationalised bank using their good offices and also bear on his behalf 2 percent of the interest on the term loan as and when charged by the bank. Shyam was all eager to take full advantage of the largesse but was also too shrewd not to make any commitment without a detailed analysis. As SIDCO wanted some indication from him by the very next day, he has asked you to do some number crunching even if approximate. You have the following details to work with.

As per the project report prepared by SIDCO, the indigenous plant would bring in an annual cash flow of ₹ 189 million during its useful life of ten years but may not fetch any salvage value thereafter. A term loan of ₹ 480 million could be arranged from a bank at an interest rate of 12 percent, repayable in 8 equal annual instalments after a holiday period of 2 years. The same bank would also extend the entire net working capital needed of ₹ 100 million, renewable each year in full in the normal course, at 13 percent interest. To avail of the interest subsidy and also in view of the high floatation cost of 8 percent, you consider it prudent to limit the equity issue to just the balance amount needed. The opportunity cost of capital for your company is 14 percent and the applicable income tax rate is 32 percent. You decide to advise your boss by comparing the net present values of both the options.

1. Show your detailed calculations for comparing the two options.
2. If you were in Shyam's position, what would be your decision?

## **Appendix 15A**

### **Five Principles of Capital Allocation**

Capital allocation is a key responsibility of top management. Unfortunately, many CEOs, though well-intentioned, do not know how to allocate capital effectively. The five key principles of capital allocation are as follows:

**Zero-based Capital Allocation:** Capital in most companies is allocated on an incremental basis. For example, a McKinsey study of more than 1600 U.S. companies found that the correlation between how much capital a business unit received in one year and the next was 0.99. It appears that inertia plays a large role in capital allocation.

Zero-based approach is the proper approach to capital allocation. This approach determines the right amount of capital to support the strategy that will create the most wealth. The thrust is on determining how much should be invested without any reference to how much that has been already invested.

McKinsey research suggests that companies that follow a zero-based approach to capital allocation deliver superior total shareholder return than companies that take more of an incremental approach.

**Fund Strategies, not Projects:** Capital allocation should be concerned with assessing and approving strategies and determining the projects that support the strategies, rather than assessing and approving projects in isolation. This is a critical distinction; there can be value-destroying projects within a sound strategy and value-creating projects within a flawed strategy.

One must be wary of a project approach, as it is easy to manipulate the numbers of a project to make it look good. As Warren Buffett noted, "Any business craving of the leader, however foolish, will be quickly supported by detailed rate-of-return and strategic studies prepared by his troops." As Richard Brealey et al., observed, "Here is a riddle. Are projects proposed because they have positive NPVs, or do they have positive NPVs because they are proposed? No prizes for the correct answer."

It must be recognised that a business strategy entails a bundle of projects and what really matters is the value of the bundle. As Michael Mauboussin said, "The CEO and board must evaluate alternative strategies and consider the financial prospects of each."

**No Capital Rationing:** Many companies limit their investments to internally generated funds which are considered “scarce but free.” This “scarce but free” mindset must be replaced by “plentiful but costly” mindset. After all, a company can always raise external capital to support valuable investments. Hence no worthwhile investment must be rejected just because there is inadequacy of internally generated capital. Further, it must be recognised that capital, irrespective of whether it is internally generated or externally obtained, has an opportunity cost associated with it.

**Zero Tolerance for Bad Growth:** Companies that want to grow will invariably make bad investments. Failed investments are no sin; in fact, they are essential to the process of value creation. What is sin, however, is to remain committed to a bad strategy that drains human and financial resources.

Companies have an opportunity to create value by promptly exiting businesses where they lack advantage. This will reduce cross-subsidisation and direct managerial energies to businesses that create the most value.

**Know the Value of Assets and Act Accordingly:** Capital allocation is similar to portfolio management. An intelligent portfolio manager has a good sense of how the value of a security compares with its price. Likewise, an intelligent capital allocator knows the difference between the value and price of each asset. As Warren Buffett famously said, “I am a better investor because I am a manager and I am a better manager because I am an investor.”

With a good sense of value and price, management should be ready to take action to create value. As Michael Mauboussin put it, “Sometimes that means acquiring, other times that means divesting, and frequently there are no clear gaps between value and price.” He added “As we have seen, managers tend to prefer to buy not sell, even though the empirical record shows quite clearly that sellers fare better than buyers, on average.”

## **Appendix 15B**

### **Agency Problems in Capital Budgeting**

There are agency problems in capital budgeting. The sources of agency costs are:

- *Inadequate effort* To find and implement truly valuable projects requires great effort and strain. Managers will be tempted to slack off.
- *Empire building* Ceteris paribus, managers prefer to preside over a big empire rather than a small one. This may prod them to undertake uneconomic projects. By the same token, they will be reluctant to divest poorly performing projects.
- *Perquisites* When managers are not sufficiently incentivised, they are likely to ask for lavish office accommodations, hold meetings in luxury resorts, and so on. These non-pecuniary benefits are called private benefits or perquisites.
- *Entrenching investment* Managers are likely to propose investments that require or reward their skills. Such investments are called *entrenching investments*.

## Appendix 15C

### WACC, FTE, And APV Approaches

There are three main approaches to valuation: weighted average cost of capital (WACC) approach, flow to equity (FTE) approach and adjusted present value (APV) approach. [Chapter 12](#) discussed the WACC and FTE approaches. This chapter discussed the APV approach. It may be instructive to compare the three approaches.

*Weighted Average Cost of Capital (WACC) Approach* In [Chapter 12](#) we learnt that projects are generally viewed from the point of all investors. The cash flows to all investors are defined as:

PBIT (1 – tax rate) + Depreciation and noncash charges – Capital expenditure – Change in net working capital.

The discount rate applicable to these cash flows is the *weighted average cost of capital* (WACC).

*Flow to Equity (FTE) Approach* As discussed in [Chapter 12](#), a project may be viewed from the point of view of equity investors. The cash flow to equity investors is defined as follows:

Cash flows to equity shareholders = Point after tax  
+ Depreciation and other noncash charges  
– Preference dividend  
– Capital expenditures  
– Change in net working capital  
– Repayment of debt  
+ Proceeds from debt issues  
– Redemption of preference capital  
+ Proceeds from preference issue

Under this approach generally called the flow to equity (FTE), the equity cash flows are discounted at the cost of equity of a levered firm.

*Comparison of APV, WACC, and FTE Approaches* Here is a summary comparison of the three methods of valuation:

#### *Adjusted Present Value (APV) Method*

$$APV = + \sum_{t=1}^n \frac{UCF_t}{(1 + R_{EU})^t} + \text{Financing side effects} - \text{Initial investment}$$

where  $UCF_t$  is the project's cash flow at time  $t$  to the equity shareholders of an unlevered firm, and  $R_{EU}$  is the cost of equity for an unlevered project.

### *Weighted Average Cost of Capital (WACC) Method*

$$NPV = \sum_{t=1}^n \frac{UCF_t}{(1+R_{WACC})^t} - \text{Initial investment}$$

where  $R_{WACC}$  is the weighted average cost of capital

### *Flow to Equity (FTE) Method*

$$\sum_{t=1}^n \frac{ECF_t}{(1+R_{EL})^t} - \text{Initial investment} - \text{Debt}$$

where  $ECF_t$  is the project's cash flow at time  $t$  to equity shareholders of a levered firm,  $R_{EL}$  is the cost of equity for a levered firm.

Here are some guidelines:

1. Use WACC or FTE if the firm's target debt-equity ratio is applicable to the project over its life.
2. Use APV if the debt-equity ratio of the project varies over time and the level of debt applicable to the project is known over the life of the project.

- 
- 1 This procedure can also take care of project interdependence.
  - 2 This section supposes familiarity with mathematical programming. It may be skipped if the reader lacks such familiarity.
  - 3 Black-Scholes option pricing model is discussed in [Chapter 10](#).
  - 4 Bruce D. Henderson, *Henderson on Corporate Strategy*, New York, The New American Library, 1979.
  - 5 Bruce D. Henderson, *Henderson on Corporate Strategy*, New York, The New American Library, 1979.
  - 6 Kenichi Ohmae, *The Mind of the Strategist*, McGraw-Hill Book Company, 1982.
  - 7 Kenneth Boulding, *The Meaning of the 20th Century*, New York : Harper & Row, 1964.

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter15/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter15/index.html)



- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems

## **PART–V**

### **Long Term Financing**

**16**

Market Efficiency and Financing Decisions

**17**

Sources of Long Term Finance

**18**

Raising Long Term Finance

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## Market Efficiency and Financing Decisions

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Argue that financial decisions are relatively easier than investment decisions.
- ✓ Show why stock prices behave like a random walk.
- ✓ Distinguish three levels of market efficiency.
- ✓ Discuss the empirical evidence on efficient market hypothesis.
- ✓ Present the argument of behavioural finance.
- ✓ Discuss the implications of market efficiency or the lack of it for corporate finance.

So far we concentrated mainly on the investment side of the balance sheet. Now we turn our attention to the financing side of the balance sheet.

For our present discussion we take the firm's investment portfolio and investment budget as given and focus on developing the optimal financing strategy. *Inter alia*, we will explore the following issues: How do various sources of finance compare? What are the different ways by which the firm can raise finance? How much should the firm borrow? What proportion of its earnings should the firm pay out as dividend? When does it make sense to buyback shares?

Financing decisions, like investment decisions, are aimed at maximising NPV. However, it may be more difficult to add value through financing decisions because capital markets are generally very competitive and efficient.

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 market 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 market hypothesis is a central idea of modern finance that has profound implications.

An understanding of the efficient market hypothesis will help you to ask the right questions and save you from a lot of confusion that dominates popular thinking in finance. Given the importance of efficient market hypothesis we will devote the bulk of this chapter to discuss it and explore its consequences for corporate financing.

## 16.1 ■ FINANCING DECISIONS VERSUS INVESTMENT DECISIONS

While investment and financing decisions may appear to be different, they should both be evaluated using the same criterion. When you buy a machinery or issue a debenture you have to value a risky asset. Although one asset is real and the other financial, you have to compute the NPV in both the cases.

The phrase NPV of borrowing may appear a little odd. A simple example may be given to explain it. Suppose you want to invest in a windmill costing ₹ 10 million. You learn that the government gives a loan of ₹ 10 million to anyone investing in a windmill at a subsidised interest rate of 8 percent because the government wants to encourage the use of renewable sources of energy. The loan is repayable in a bullet payment after 5 years. What is the NPV of this loan? The NPV of the loan is:

$$\begin{aligned} \text{NPV of the loan} &= \text{Amount borrowed} - \text{Present value of interest payments} - \text{Present value of principal repayment} \\ &= ₹ 10,000,000 - \sum_{t=1}^5 \frac{₹ 800,000}{(1+r)^t} - \frac{₹ 10,000,000}{(1+r)^5} \end{aligned}$$

To compute the NPV of the loan you have to estimate the discount rate,  $r$ . The best estimate of  $r$  is the rate of return offered by other debt securities issued by your firm. Suppose this rate is 14 percent. Then

$$\begin{aligned} \text{NPV of the loan} &= ₹ 10,000,000 - \sum_{t=1}^5 \frac{₹ 800,000}{(1.14)^t} - \frac{₹ 10,000,000}{(1.14)^5} \\ &= ₹ 2,060,000 \end{aligned}$$

Of course, you don't have to do the NPV calculation to decide whether it is worth borrowing at 8 percent when the market rate is 14 percent. The NPV figure, however, tells you the contribution that financing decision will make to the value of the firm.

**Financing Decisions are Relatively Easier** The vocabulary of financing is confusing and the number of complex and exotic financing instruments is expanding. Yet, at a fundamental level, financing decisions, compared to investment decisions, are relatively easier to make and have a lesser impact on firm value, thanks to the following differences:

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*Financing decisions*

*Investment decisions*

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- Financing decisions take place in capital markets which are approximately perfect.
  - While making financial decisions, you can observe the value of similar financial assets.
  - There are very few opportunities in the realm of financing that have an NPV that is significantly different from zero.
  - Investment decisions take place in real markets which tend to be imperfect.
  - While making investment decisions, you have to estimate the value of the capital projects.
  - There are many opportunities in the realm of capital budgeting that have an NPV that is significantly different from zero.
- 

Given the intense competition in capital market, financial economists argue that securities are fairly priced. Put differently, they believe that the capital market is efficient.

## 16.2 ■ RANDOM WALK AND SEARCH FOR THEORY

**Surprise Discovery** 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, examined whether 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). He found a remarkable similarity between stock price movement and the Brownian motion.

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.

**Search for Theory** When the empirical evidence in favour of the random walk hypothesis seemed overwhelming, the more curious among 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:

1. Information is freely and instantaneously available to all the market participants.
2. 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.

3. Prices change only in response to new information that, by definition, is unrelated to previous information (otherwise it will not be new information).
4. Since new information cannot be predicted in advance, price changes too cannot be forecast. Hence, prices behave like a random walk.

## **16.3 ■ 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.

## **Foundations of 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.

**Investor Rationality** If all investors are rational, stock prices will adjust rationally to the flow of new information. Suppose Dr. Reddy's Laboratories announces an acquisition. If investors understand fully the implications of the acquisition for the value of the company and act rationally, the stock price of Dr. Reddy's Laboratories will quickly reflect this piece of information.

**Independent Deviation from Rationality** Suppose the announcement of acquisition by Dr. Reddy's Laboratories 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.

**Effective Arbitrage** Let us assume that there are two types of market participants, viz., irrational amateurs and rational professionals. Irrational amateurs are driven by emotions. At times they become euphoric and push prices to dizzy heights and at times they become depressed and drive down prices to unreasonably low levels.

What happens when the market is thronged by rational professionals as well? Rational professionals are supposed to value companies in a thorough and methodical fashion and assess evidence fairly objectively. Based on their analysis, they will take actions to exploit mispricing of securities caused by the behaviour of irrational amateurs. If they find that Tata Motors is overpriced relative to Maruti Suzuki they will sell Tata Motors and buy Maruti Suzuki.

By simultaneously buying and selling different, but near substitute, securities, they earn arbitrage profits. The arbitrage operation of professionals counters the irrationality of amateurs and makes the market efficient.

## **Levels of Market Efficiency**

Market efficiency is defined in relation to information that is reflected in security prices. Eugene Fama suggested that it is useful to distinguish three levels of market efficiency:

*Weak-form efficiency* Prices reflect all information found in the record of past prices and volumes.

*Semi-strong form efficiency* Prices reflect not only all information found in the record of past prices and volumes but also all other publicly available information.

*Strong-form efficiency* Prices reflect all available information, public as well as private.

## **Misconceptions about the Efficient Market Hypothesis**

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

- Misconception* : The EMH implies that the market has perfect forecasting abilities.
- Answer* : The EMH 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 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 random 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.

## 16.4 ■ EMPIRICAL EVIDENCE

### Evidence in Favour of Efficient Market Hypothesis

There are three important predictions of the EMH, which are fairly supported by empirical evidence.

1. If security prices reflect all publicly available information, then even professional investors (such as mutual fund managers) cannot earn superior risk – adjusted rates of return.

The results of empirical studies strongly support the EMH. Neither technical investors, who use mechanical trading rules, nor professional fund managers, as a group, have been able to consistently outperform a simple buy and hold strategy. (Of course, there are exceptions like Warren Buffett and Peter Lynch).

Even the legendary Benjamin Graham, in an interview given shortly before his death said: “I am no longer an advocate of elaborate techniques of security analysis in order to find superior value opportunities. This was a rewarding activity, say 40 years ago when Graham and Dodd was first published; but the situation has changed..[Today] I doubt whether such extensive efforts will generate superior selections to justify their cost...I’m on the side of the ‘efficient market’ school of thought.”

2. Since current stock price reflects all currently available information, price changes only in response to new information that, by definition, is unrelated to previous information (otherwise it will not be new information). Because new information cannot be predicted in advance, price changes too cannot be forecast. Hence prices behave like a random walk.

This prediction of the EMH has also been supported by empirical evidence over time.

3. Stock prices respond immediately and unbiasedly to new information. For example, suppose that Tata Steel announces unexpectedly lower earnings and as a result the stock drops from ₹ 725 to ₹ 700. As per the EMH, the decline should occur immediately following the announcement. The drop should not occur gradually over several days, nor should the market “overreact” and then recover.

A number of event studies have examined the response of stock prices to announcements regarding earnings, bonus issues, dividends, takeover bids, and so on. By and large, these studies have found that stock prices respond immediately and unbiasedly to new information.

## Evidence against Market Efficiency

While the bulk of the empirical evidence supports the EMH, a number of inefficiencies have been found. They fall into three general categories as follows:

**Patterns in Stock Prices** Researchers have found some seasonal patterns. One well documented anomaly is the “day of the week” effect – stock returns tend to be lower on Mondays than during the rest of the week. Another puzzling calendar anomaly is the January effect. Stock prices seem to rise more in January than in any other month of the year.

**Mispricing of Securities** There is empirical evidence that suggests some mispricing of securities:

- Banz and others have found that investors in small firms have earned significantly higher returns than investors in large firms, after adjustment for risk.
- A number of studies have found that value stocks (stocks with high book-value-to-stock-price ratios and/or low price-earnings ratios) tend to outperform growth stocks (stocks with low book-value-to-stock-price ratios and/or high price-earnings ratios).

**Excess Volatility in Stock Returns** 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. The stock market crash of October 19, 1987, when Dow Jones Industrial Average fell by 23 percent 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. 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 percent 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:

$$\begin{aligned} P_0 &= D_1 / (r - g) \\ 100 &= ₹ 3 / (0.16 - g) \rightarrow g = 0.13 \text{ or } 13 \text{ percent} \end{aligned}$$

Now suppose that investors revise their growth expectation downward by 1 percent (from 13 percent to 12 percent). As a result the stock price falls to ₹ 75.

$$P_0 = \text{₹ } 3 / (0.16 - 0.12) = \text{₹ } 75$$

An identical fall would occur, if the investors revise their required return upward by 1 percent to 17 percent, holding their growth expectation constant.

Thus we find that 1 percent decline in the expected growth rate or 1 percent increase in the investors' required return leads to a fall of 25 percent 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 efficient markets hypothesis, it has undermined the faith of many people in efficient markets hypothesis.

Even though the crash may cast some shadow over market efficiency with respect to absolute prices it does 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 can be reasonably confident the prices of A and B are fairly established relative to each other.

**Normal Range of Interest Rates** Market interest rates tend to move within a normal range. Hence when interest rates are close to the high end of the range, they are likely to decrease. By the same token, when interest rates are toward the low end of the range, they are likely to increase. This hypothesis is supported by the evidence on yield curve, which is a plot of spot interest rates against different maturities, ranging from short term to long term. The yield curve which reflects future expectations about interest rates is typically downward sloping when the interest rates are high and upward sloping when the interest rates are low.

## 16.5 ■ AN ALTERNATIVE PARADIGM: THE BEHAVIOURAL FINANCE VIEW

Given the limitations of the concept of market efficiency, a group of finance scholars known as behaviouralists have proposed an alternative approach to the efficient markets hypothesis. Their approach rests on two assumptions:

1. Some investors – called as 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.

**Noise Trading** Many investors trade on pseudo-signals, or noise, and not on fundamentals. As long as these investors trade randomly, their trades cancel out and are likely to have no perceptible impact on demand. True, this happens to some extent because the market is thronged by noise traders who employ different models and, hence, their moves cancel each other out. However, a good portion of noise traders 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:

- 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.
- Portfolio managers are evaluated every few months. This limits their horizon of arbitrage.

**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. Andrei Scheifer and Lawrence H. Summers say: “The effect of arbitrage 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 a 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. Culler, Poterba, and Summers found evidence of positive correlations of returns over horizons of a few weeks or months and negative correlations of returns over horizons of a few years in several markets for stocks, bonds, foreign exchange, and gold. Debondt

and Thaler found that stocks that have appreciated in the past tend to perform poorly in future and vice versa.

**View of Experts** While the efficient market hypothesis implies that the market establishes the right price of equities, the alternative paradigm argues that there is often a divergence between the fundamental value and market price. Many distinguished economists, investment professionals, and finance experts seem to hold views that are sympathetic with what the alternative paradigm says. Here is a sampling of their views:

Graham and Dodd: "The market's evaluation of the same data can vary over a wide range, dependent on bullish enthusiasm, concentrated speculative interest and similar influences, or bullish disillusionment. Knowledge is only one ingredient in arriving at a stock's price. The other ingredient, fully as important as information, is sound judgment."

J.M. Keynes: "In point of fact, all sorts of consideration enter into the market valuation which are in no way relevant to the prospective yield."

Manmohan Singh: "Well, I think the stock market's behaviour in India has often had no relation with the fundamental strength of the economy. It is often in response to the sentiments that are shared in the market."

Barr Rosenberg: "My impression is that cycles in the relative valuation of equity market sectors are quite real, and that they do violate market efficiency ... A true market cycle is a sign of an inefficient market, because it implies that prices are at one time 'unfairly' low and later on are 'unfairly' high".

In essence the views expressed above imply that the market may at times display high irrationality causing substantial discrepancy between intrinsic value and market price. This is evident from the boom and bust cycles witnessed in most of the stock markets around the globe.

## 16.6 ■ WHAT IS THE VERDICT

Despite the anomalies and puzzles and the challenge of behaviouralists and their sympathisers, the substantial evidence in favour of the efficient market hypothesis cannot be gainsaid.

The advocates of efficient market hypothesis argue that it is not surprising that several anomalies and puzzles have been discovered. When data is mined extensively, one is bound to find a number of patterns. As Bradford Cornell put it: "Even a set of random numbers generated by a computer will appear to have some pattern after the fact. Those patterns, however, are spurious and will not be replicated in another generation of random numbers. Many scholars feel that the same is true of stock prices." William Sharpe put it more vividly: "If you torture the data long enough it will confess to any crime."

Even if inefficiencies exist, it is difficult to take advantage of them. As Richard Roll says: "Over the past decade, I have attempted to exploit many of the seemingly most promising 'inefficiencies' by actually trading significant amounts of money according to a trading rule suggested by the 'inefficiencies' ... I have never yet found one that worked in practice, in the sense that it returned more after cost than a buy-and-hold strategy."

True, the efficient markets hypothesis, like all theories, is an imperfect and limited description of the stock market. However, there does not, at least for the present, seem to be a better alternative. As Merton Miller put it: "The failure of so many successive attempts to reject the efficient markets hypothesis in a simple and decisive test has led some to believe that perhaps it can't be done. The hypothesis is simply too broad and too flexible (and has too much of truth in it) to fall at a single blow." He adds "It is closer to being a 'paradigm' than a mere hypothesis, bringing a common and coherent explanatory framework to a wide variety of seemingly unrelated phenomena. Like all scientific paradigms, it will survive until displaced by a better one. At the moment, at least, no better paradigm is in sight."

The controversy over efficient market hypothesis persists. At one end of the spectrum are the advocates of efficient market hypothesis led by people like Eugene Fama and at the other end of the spectrum are the proponents of behavioural finance led by people like Robert Shiller who are convinced of market irrationality. In between are others (perhaps the majority) who

seem to see merit in both sides of the argument and believe that neither side has achieved victory.

## 16.7 ■ IMPLICATIONS FOR CORPORATE FINANCE

Based on what we have learnt so far about market efficiency or the lack of it, we can draw the following lessons for corporate finance:

1. By and large market prices are the best proxies for intrinsic values. Hence the objective of corporate finance should be to maximise the current market value of the firm.
2. The return earned by shareholders in the market place represents the most meaningful measure of firm performance. Hence, one can judge a corporate policy or event in terms of its impact on security returns.
3. Firms should not try to take advantage of short term forecasts of stock prices based on past price movements. Put differently, it is futile to “time” security issues, at least in the short run.
4. There are no financial illusions in the market. Hence, manipulation of accounting earnings does not pay. Likewise, stock splits and bonus issues, *per se*, represent inconsequential decisions.
5. If your firm’s stock is significantly overpriced, sell additional stock and invest the proceeds in other capital market securities. But don’t deploy the money in negative – NPV projects. If your firm’s stock is significantly underpriced, avoid selling additional stock, even if it means foregoing positive – NPV projects.
6. If interest rates are at their historic lows, debt may be issued if the firm requires debt currently or in the foreseeable future. If interest rates are at their historical highs, debt financing may be deferred if the firm can do so.
7. Security prices convey a lot of information about the future. If the stock of a firm has an unusually low price-earnings multiple, it means that there are serious concerns about its future. Likewise, if the yield on the bonds of a firm is much above the average, it means that the firm will have financial difficulties in servicing its debt.
8. As securities are bought for their prospective cash flows, they are akin to unbranded products or commodities. Hence the demand for them is very elastic. This means that a company should be able to sell large blocks of additional securities without depressing prices, provided it can convince investors that it does not have private information.

- If new securities are issued at market prices, there should be no
9. concern about the transfer of wealth from existing shareholders to new shareholders.
  10. Investors will not pay for what they can accomplish on their own. For example, if investors can diversify on their own they will not regard favourably a merger proposal that promises them the benefit of diversification. Likewise, if investors can resort to personal leverage the way a company does, they will not perceive any gain from corporate leverage.

## SUMMARY

- The efficient market hypothesis says that the intense competition in the capital market leads to fair pricing of securities. A sweeping statement, it continues to stimulate insight and controversy even today.
- Eugene Fama suggested that it is useful to distinguish three levels of efficiency: weak-form, semi-strong form, and strong-form. The weak-form efficient market hypothesis says that the current price of a stock reflects all information found in the record of past prices and volumes. Empirical evidence substantially supports this form of efficient market hypothesis.
- The semi-strong form efficient market hypothesis holds that stock prices adjust rapidly to all publicly available information. Empirical evidence for this hypothesis is mixed.
- The strong form efficient market hypothesis holds that all available information, public as well as private, is reflected in stock prices. Obviously, this represents an extreme hypothesis and we would be surprised if it were true.
- Given the limitations of the concept of a market efficiency, a group of finance scholars known as behaviouralists have argued that under the influence of investor sentiment market prices often vary more than what is warranted by fundamentals.
- Despite the anomalies and puzzles and the challenge of behaviouralists and their sympathisers, the substantial evidence in favour of the efficient market hypothesis cannot be gainsaid.
- The efficient market hypothesis, like all theories is an imperfect and limited description of the stock market. However, at least for the present, there does not seem to be a better alternative.
- Efficient market hypothesis has important implications for corporate finance: like creative accounting does not pay, a firm cannot time its security issues, and the issue of securities by a firm cannot depress prices.

## **QUESTIONS**

1. How would you calculate the NPV of a loan?
2. Why are financial decisions, compared to investment decisions, relatively easier to make and have a lesser impact on firm value?
3. What is the economic process that produces a random walk?
4. What is an efficient market?
5. Distinguish the three levels of market efficiency.
6. Discuss the common misconceptions surrounding the efficient market hypothesis.
7. Comment on the crash of 1987.
8. Discuss the alternative paradigm of 'noise trading and limited arbitrage' as articulated by Scheifer, Summers, and others.
9. What is the verdict on efficient market hypothesis?
10. Discuss the lessons that can be drawn from what we have learnt about market efficiency or the lack of it.

## **Appendix 16A**

### **Six Tests of Market Efficiency**

The EMH implies that prices should respond instantly to news that alters the fundamental values. EMH thus leads to the following six testable implications.

- T1: Stale information should not have any bearing on current prices of securities. This means that past prices, returns, turnover, and so on should not affect current prices. This is called the *weak form EMH*.
- T2: Publicly available information should not have any bearing on current prices of securities. This is called the *semi-strong form EMH*.
- T3: Even privately available information (as possessed by corporate insiders) cannot produce superior risk-adjusted returns. The argument here is that such information would be quickly picked up by other investors and the potential for abnormal profits would be wiped out. This is called the *strong form EMH*.
- T4: Security prices should not initially underreact (or overreact) to news about fundamental values and then subsequently overreact (or underreact) before finally reverting to new fundamental value over a period of time.
- T5: Strictly substitute securities should trade at the same price.
- T6: Security prices should not react to non-information (information that is unrelated to fundamental values).

## **Appendix 16B**

### **Two Aspects of EMH**

It is necessary to distinguish between two important aspects of EMH because the global financial crisis has provided diametrically opposite views on them:

1. *There is no free lunch.* It is not possible to consistently outperform the market in risk-adjusted terms. The global financial crisis has reinforced this claim. The apparently low risk, high return investments turned out to be very risky investments. Remember the old adage: “If something is too good to be true, it is not probably true.”
2. *The prices are “right.”* The claim that prices reflect fundamentals is hard to sustain in the wake of the global financial crisis. Clearly, many prices were not right. The ‘limits to arbitrage’ literature can reconcile these two lessons from the global financial crisis.

## Sources of Long Term Finance

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe the features of various sources of long term finance used by a company.
- ✓ Compare the various sources of long term finance.

To support its investments, a firm must find the means to finance them. Equity and debt represent the two broad sources of finance for a business firm. Equity (referred to as shareholders' funds on balance sheets in India) consists of equity capital, retained earnings, and preference capital<sup>1</sup>. Debt (referred to as loan funds on balance sheets in India) consists of term loans, debentures, and short-term borrowings.

The key differences between equity and debt are as follows: (i) Debt investors are entitled to a contractual set of cash flows (interest and principal), whereas equity investors have a claim on the residual cash flows of the firm, after it has satisfied all other claims and liabilities. (ii) Interest paid to debt investors represents a tax-deductible expense, whereas dividend paid to equity investors has to come out of profit after tax. (iii) Debt has a fixed maturity, whereas equity ordinarily has an infinite life. (iv) Equity investors enjoy the prerogative to control the affairs of the firm, whereas debt investors play a passive role – of course, they often impose certain restrictions on the way the firm is run to protect their interests.

We have already looked at various sources of finance in some context or the other. Our task here is to present a reasonably systematic picture of financing by assembling various pieces in a coherent manner. The concepts of financing are fairly simple and logical, though the language may be somewhat unfamiliar.

In this chapter, we describe the main features of long-term sources of finance<sup>2</sup>, while deferring to the [next chapter](#) the discussion of mechanics

and procedures of raising finance.

## **17.1 ■ EQUITY CAPITAL**

Equity capital represents ownership capital, as equity shareholders collectively own the company. They enjoy the rewards and bear the risks of ownership. However, their liability, unlike the liability of the owner in a proprietary firm and the partners in a partnership concern, is limited to their capital contribution. Thanks to its limited downside and unlimited upside, equity provides enormous incentive for all sorts of innovation.

## Some Terms

**Authorised, Issued, Subscribed, and Paid-up Capital** The amount of capital that a company can potentially issue, as per its memorandum, represents the *authorised capital*. The amount offered by the company to the investors is called the *issued capital*. That part of issued capital which has been subscribed to by the investors represents the *subscribed capital*. The actual amount paid up by the investors is called the *paid-up capital* – typically the issued, subscribed, and paid-up capital are the same.

**Par Value, Issue Price, Book Value, and Market Value** The *par value* of an equity share is the value stated in the memorandum and written on the share scrip. The par value of equity shares is generally ₹ 1, ₹ 2, ₹ 5, or ₹ 10. Infrequently, one comes across par values like ₹ 50, ₹ 100 and ₹ 1,000.

The *issue price* is the price at which the equity share is issued. Often, the issue price is higher than the par value. When the issue price exceeds the par value, the difference is referred to as the share premium. It may be noted that the issue price cannot be, as per law, lower than the par value.

The *book value* of an equity share is equal to:

$$\frac{\text{Paid-up equity capital + Reserves and surplus}}{\text{Number of outstanding equity shares}}$$

Quite naturally, the book value of an equity share tends to increase as the ratio of reserves and surplus to paid-up equity capital increases.

The *market value* of an equity share is the price at which it is traded in the market. This price can be easily established for a company which is listed on the stock market and actively traded. For a company which is listed on the stock market but traded very infrequently, it is difficult to obtain a reliable market quotation. For a company which is not listed on the stock market, one can merely conjecture as to what its market price would be if it were traded. The market price is determined by a variety of factors like current earnings, growth prospects, risk, and company size.

## **Rights and Position of Equity Shareholders**

**Right to Income** Equity investors have a residual claim to the income of the firm. The income left after satisfying the claims of all other investors belongs to the equity shareholders. This income is simply equal to profit after tax minus preferred dividend.

The income of equity shareholders may be retained by the firm or paid out as dividends. Equity earnings which are ploughed back in the firm tend to increase the market value of equity shares and equity earnings distributed as dividend provide current income to equity shareholders.

Note that equity shareholders are entitled to approve the dividend that is declared by the board of directors. The dividend decision is the prerogative of the board of directors and equity shareholders cannot challenge this decision in a court of law.

**Right to Control** Equity shareholders, as owners of the firm, elect the board of directors and enjoy voting rights at the meetings of the company in person or by proxy (except in a poll) or by postal ballot. The board of directors, in turn, selects the management which controls the operations of the firm. Hence, equity shareholders, in theory, exercise an indirect control over the operations of the firm.

In India, most of the firms in the private sector are effectively controlled by business groups or families which often have a shareholding of 25 to 60 percent or even more. While institutional investors that have a sizable stake may exercise some influence, individual investors often have negligible influence as they have small holdings and they are ill-organised.

Companies in India can issue shares with differential voting rights (DVR). For example, in 2008 Tata Motors issued DVR shares carrying one-tenth the voting rights of and 5 percent more dividend than the ordinary shares.

**Voting Procedures** As per Section 152 (2) of the Companies Act, 2013 directors have to be appointed by the shareholders in a general meeting. While a maximum of 33 percent of the directors can be permanent, the articles of association of a company can provide for all directors to be rotational. At the annual general meeting, one-third of the rotational directors retire and their positions have to be filled by fresh election. Often, however, the rotational directors contest the election again and get re-elected.

Two systems of voting are permitted under the Companies Act 2013: (i) the majority voting system, and (ii) the proportionate representation voting system. Usually, the articles of association of a company provide for electing directors by a majority voting system. Under this system of voting, each share carries one vote and each director position is filled individually. This means that a group that owns 51 percent of the equity can ensure that all the director positions are filled by its candidates.

As per Section 163 of the Companies Act, 2013, the articles of association of a company can provide for proportionate representation voting system for not less than two-third of its directors. Under the proportional voting system (also called the cumulative voting system), if there are  $n$  directors to be elected each share carries  $n$  votes.

The principal difference between the majority rule and proportionate rule voting systems is that under the former a majority is able to elect all members of the board whereas under the latter a significant minority, if it casts its votes intelligently, is assured of some representation on the board.

**Pre-emptive Right** The pre-emptive right enables existing equity shareholders to maintain their proportional ownership by purchasing the additional equity shares issued by the firm. The law requires companies to give existing equity shareholders the first opportunity to purchase, on a *pro rata* basis, additional issues of equity capital.

What kind of protection is offered by the pre-emptive right? This right ensures that the management cannot issue additional shares to persons or groups who are favourably disposed towards it and thereby strengthen its control over the firm. More important, the pre-emptive right protects the existing shareholders from the dilution of their financial interest, as a result of additional equity issue. This point may be illustrated by a numerical example. Pradhan Enterprises has 1,000,000 outstanding equity shares with a par value of ₹ 10 and a market price of ₹ 20. The firm plans to issue 500,000 additional equity shares at a price of ₹ 12 per share. The market price per share after this issue is expected to drop to ₹ 17.33<sup>3</sup>. Now, if a shareholder has 100 shares in the outstanding equity capital, his financial situation with respect to Pradhan's equity when he enjoys the pre-emptive right and when he does not enjoy the pre-emptive right would be as shown below:

<i>Pre-emptive right</i>	<i>No Pre-emptive right</i>
Value of initial holding ( $\text{₹ } 20 \times 100$ ) = $\text{₹ } 2,000$	Value of initial holding ( $\text{₹ } 20 \times 100$ ) = $\text{₹ } 2,000$
Additional subscription ( $\text{₹ } 12 \times 50$ ) = $\text{₹ } 600$	Additional subscription = 0
Value of equity holding after the additional issue ( $\text{₹ } 17.33 \times 150$ ) = $\text{₹ } 2,600$	Value of equity holding after the additional issue ( $\text{₹ } 17.33 \times 100$ ) = $\text{₹ } 1,733$

From this example, it is clear that the shareholder suffers dilution of financial interest when the pre-emptive right is not enjoyed. Thus the pre-emptive right protects the shareholder.

**Right in Liquidation** As in the case of income, equity shareholders have a residual claim over the assets of the firm in the event of liquidation. Claims of all others – debenture holders, secured lenders, unsecured lenders, other creditors, and preferred shareholders – are prior to the claim of equity shareholders. More often than not, equity shareholders do not get anything in the event of liquidation because the liquidation value of assets is not adequate to meet fully the claims of others.

## **Advantages and Disadvantages of Equity Capital**

An important source of long-term finance, equity capital offers the following advantages:

- There is no compulsion to pay dividends. If the firm has insufficiency of cash it can skip equity dividends without suffering any legal consequences.
- Equity capital has no maturity date and hence the firm has no obligation to redeem.
- Because equity capital provides a cushion to lenders, it enhances the creditworthiness of the company. In general, other things being equal, the larger the equity base, the greater the ability of the firm to raise debt finance on favourable terms.
- Presently, dividends are tax-exempt in the hands of investors. The company paying equity dividend, however, is required to pay a dividend distribution tax of 15.0 percent plus surcharge and cess.

The disadvantages of raising finances by issuing equity shares are as follows:

- Sale of equity shares to outsiders dilutes the control of existing owners.
- The cost of equity capital is high, usually the highest. The rate of return required by equity shareholders is generally higher than the rate of return required by other investors.
- Equity dividends are paid out of profit after tax, whereas interest payments are tax-deductible expenses. This makes the relative cost of equity more. Partially offsetting this disadvantage is the fact that equity dividends are tax-exempt, whereas interest income is taxable in the hands of investors.
- The cost of issuing equity shares is generally higher than the cost of issuing other types of securities. Underwriting commission, brokerage costs, and other issue expenses are high for equity issues.

## 17.2 ■ INTERNAL ACCRUALS

The internal accruals of a firm consist of depreciation charges and retained earnings. Depreciation represents a periodic writeoff of a capital cost incurred in the beginning. Put differently, it is a non-cash charge. Hence, it is considered an internal source of finance.

Retained earnings are that portion of equity earnings (profit after tax less preference dividends) which are ploughed back in the firm. Because retained earnings are the sacrifice made by equity shareholders, they are referred to as internal equity. Companies normally retain 30 percent to 80 percent of profit after tax for financing growth. If you look at a sample of corporate balance sheets you will find that reserves and surplus (other than share premium reserve and revaluation reserve), which essentially represent accumulated retained earnings, are often the dominant source of long-term finance. Even this is an understatement of the contribution of retained earnings to long-term finance because a portion of reserves and surplus would have been capitalised by the firm if it had issued bonus shares.

## **Advantages and Disadvantages of Internal Accruals**

Internal accruals are viewed very favourably by most corporate managements for the following reasons:

- Retained earnings are readily available internally. They do not require talking to outsiders (shareholders or lenders).
- Retained earnings effectively represent infusion of additional equity in the firm. Use of retained earnings, in contrast to external equity, eliminates issue costs and losses on account of underpricing.
- There is no dilution of control when a firm relies on retained earnings.
- The stock market generally views an equity issue with skepticism. Retained earnings, however, do not carry any negative connotation.

The disadvantages of retained earnings include the following:

- The amount that can be raised by way of retained earnings may be limited. Further, the quantum of retained earnings tends to be highly variable because companies typically pursue a stable dividend policy. As a result, the variability of profit after tax is substantially transmitted to retained earnings.
- The opportunity cost of retained earnings is quite high for the firm. Remember that retained earnings, in essence, represents dividends foregone by equity shareholders.
- Many firms do not fully appreciate the opportunity cost of retained earnings. They impute a low cost to it. As a result, they may, comforted by the easy availability of retained earnings, invest in sub-marginal projects that have a negative NPV. Obviously, such a sub-optimal investment policy hurts the shareholders.

## **17.3 ■ PREFERENCE CAPITAL**

Preference capital represents a hybrid form of financing – it partakes some characteristics of equity and some attributes of debentures. It resembles equity in the following ways: (i) preference dividend is payable only out of distributable profits; (ii) preference dividend is not an obligatory payment (the payment of preference dividend is entirely within the discretion of directors); and (iii) preference dividend is not a tax-deductible payment.

Preference capital is similar to debentures in several ways: (i) the dividend rate of preference capital is fixed – since preference shares in India usually carry a cumulative feature with respect to dividends, unpaid dividends are carried forward and payable when the dividend is restored; (ii) the claim of preference shareholders is prior to the claim of equity shareholders; (iii) preference shareholders do not normally enjoy the right to vote; and (iv) preference capital is typically repayable.

## **Advantages and Disadvantages of Preference Capital**

Preference capital offers the following advantages.

- There is no legal obligation to pay preference dividend. A company does not face bankruptcy or legal action if it skips preference dividend.
- Financial distress on account of redemption obligation is not high because preference shares are redeemable only out of profits or proceeds of a fresh issue of share (equity or preference).
- Preference capital is generally regarded as part of net worth. Hence, it enhances the creditworthiness of the firm.
- Preference shares do not, under normal circumstances, carry voting right. Hence, there is no dilution of control.
- No assets are pledged in favour of preference shareholders. Hence, the mortgageable assets of the firm are conserved.

Preference capital, however, suffers from some serious shortcomings:

- Compared to debt capital, it is a very expensive source of financing because the dividend paid to preference shareholders is not, unlike debt interest, a tax-deductible expense. Further, there is a dividend distribution tax.
- Though there is no legal obligation to pay preference dividends, preference dividends are typically payable with arrears.
- Compared to equity shareholders, preference shareholders have a prior claim on the assets and earnings of the firm.
- Preference shareholders acquire voting rights if the company skips preference dividend for a certain period.

## 17.4 ■ TERM LOANS

So far we looked at the sources of finance which fall under the broad category of equity finance (or shareholders' funds). Now we turn our attention to long-term debt. Firms obtain long term debt mainly by raising term loans or issuing debentures. Historically, term loans given by financial institutions and banks have been the primary source of long-term debt for private firms and most public firms. Term loans, also referred to as term finance, represent a source of debt finance which is generally repayable in less than 10 years. They are mainly employed to finance acquisition of fixed assets and working capital margin. Term loans differ from short-term bank loans which are employed to finance short-term working capital need and tend to be self-liquidating over a period of time, usually less than one year<sup>4</sup>.

## **Features of Term Loans**

**Currency** Financial institutions (and banks) give rupee loans as well as foreign currency term loans. The most significant form of assistance provided by financial institutions, rupee term loans are given directly to business concerns for setting up new projects as well as for expansion, modernisation, and renovation projects. These funds are provided for incurring expenditure for land, building, plant and machinery, technical know-how, miscellaneous fixed assets, preliminary expenses, preoperative expenses, and margin money for working capital. Financial institutions (and banks) give rupee loans as well as foreign currency term loans.

Financial institutions provide foreign currency term loans for meeting the foreign currency expenditure towards import of plant, machinery and equipment, and payment of foreign technical know-how fees. The periodical liability for interest and principal remains in the currency/currencies of the loan and is translated into rupees at the prevailing rate of exchange for making payments to the financial institutions.

**Security** Term loans typically represent secured borrowing. Usually assets which are financed with the proceeds of the term loan provide the *prime* security. Other assets of the firm may serve as *collateral* security.

All loans provided by financial institutions, along with interest, liquidated damages, commitment charges, expenses, etc., are secured by way of:

- First equitable mortgage of all immovable properties of the borrower, both present and future.
- Hypothecation of all movable properties of the borrower, both present and future, subject to prior charges in favour of commercial banks for obtaining working capital advance in the normal course of business.

**Interest Payment and Principal Repayment** The interest and principal repayment on term loans are definite obligations that are payable irrespective of the financial situation of the firm. To the general category of borrowers, financial institutions charge an interest rate that is related to the credit risk of the proposal, subject usually to a certain floor rate. Financial institutions impose a penalty for defaults. If there is a default in payment of installments of principal and/or interest, the borrower is liable to pay by way of liquidated damages additional interest calculated for the period of default on the amount of principal and/or interest in default. In addition to interest,

lending institutions may levy a commitment fee on the unutilised loan amount.

The principal amount of a term loan is generally repayable over a period of 5 to 10 years after an initial grace period of 1 to 2 years. Typically, term loans provided by financial institutions are repayable in equal semi-annual installments or equal quarterly installments.

Note that the interest burden declines overtime, whereas the principal repayment remains constant. This means that the total debt servicing burden (consisting of interest payment and principal repayment) declines over time. This pattern of debt servicing burden, typical in India, differs from the pattern obtaining in western economies where debt is typically amortised in equal periodic installments.

**Restrictive Covenants** In order to protect their interest, financial institutions generally impose restrictive conditions on the borrowers. While the specific set of restrictive covenants depends on the nature of the project and the financial situation of the borrower, loan contracts often require that the borrowing firm:

- Broad-base its board of directors and finalise its management set-up in consultation with and to the satisfaction of the financial institutions.
- Make arrangements to bring additional funds in the form of unsecured loans/deposits for meeting overruns/shortfalls.
- Refrain from undertaking any new project and/or expansion or make any investment without the prior approval of the financial institutions.
- Obtain clearances and licences from various government agencies.
- Repay existing loans with the concurrence of financial institutions.
- Refrain from additional borrowings or seek the consent of financial institutions for additional borrowings.
- Reduce the proportion of debt in its capital structure by issuing additional equity and preference capital.
- Limit its dividend payment to a certain rate or seek the consent of financial institutions to declare dividend at a higher rate.
- Refrain from creating further charges on its assets.
- Provide periodic information about its operations.
- Limit the freedom of the promoters to dispose of their shareholding.
- Effect organisational changes and appoint suitable professional staff.
- Give financial institutions the right to appoint nominee directors.

## **Advantages and Disadvantages of Debt Financing**

Term loans and debentures are two important ways of raising long-term debt. The advantages of debt financing are as follows:

- Interest on debt is a tax-deductible expense, whereas equity and preference dividend are paid out of profit after tax.
- Debt financing does not result in dilution of control because debt holders (term lending institutions and debenture holders) are not entitled to vote.
- Debt holders do not partake in the value created by the company as payments to them are limited to interest and principal.
- The maturity of a debt instrument can be tailored to synchronise with the period for which the firm needs funds.
- If there is a precipitous decline in the value of the firm, shareholders have the option of defaulting on debt obligations and turning over the firm to debt holders.
- Issue costs of debt are significantly lower than those on equity and preference capital.
- The burden of servicing debt is generally fixed in nominal terms. Hence, debt provides protection against high unanticipated inflation.
- Debt has a disciplining effect on the management of the firm.
- It is generally easier for management to communicate their proprietary information about the firm's prospects to private lenders than to public capital markets.

Debt financing is not an unmixed blessing. It has several disadvantages associated with it:

- Debt financing entails fixed interest and principal repayment obligation. Failure to meet these commitments can cause a great deal of financial embarrassment and even lead to bankruptcy.
- Debt financing increases financial leverage which, according to CAPM, raises the cost of equity to the firm.
- Debt contracts impose restrictions that limit the borrowing firm's financial and operating flexibility. These restrictions may impair the borrowing firm's ability to resort to value-maximising behaviour.
- If the rate of inflation turns out to be unexpectedly low, the real cost of debt will be greater than expected.

## **17.5 ■ DEBENTURES**

For large publicly traded firms, debentures are a viable alternative to term loans. Akin to promissory notes, debentures are instruments for raising long term debt. Debenture holders are the creditors of company. The obligation of a company toward its debenture holders is similar to that of a borrower who promises to pay interest and principal at specified times. Debentures often provide more flexibility than term loans as they offer greater variety of choices with respect to maturity, interest rate, security, repayment, and special features.

## Features of Debentures

**Trustee** When a debenture issue is sold to the investing public, a trustee is appointed through a trust deed. The trustee is usually a bank or a financial institution or an insurance company. Entrusted with the role of protecting the interest of debenture holders, the trustee is supposed to ensure that the borrowing firm fulfills its contractual obligations.

**Security** Most debenture issues in India are secured by mortgages/charges on the immovable properties of the company and a floating charge on its other assets (subject to prior charges created in favour of the company's bankers over the current assets). However, the order of priority of mortgages/charges may vary across different debenture issues. Occasionally, companies issue unsecured debentures. These are regarded as deposits under the Companies Act.

**Interest Rate** Debentures may carry a fixed interest rate or a floating interest rate or a zero interest rate. The fixed interest rate debenture issue has been the most popular debenture instrument in India. Typically, the interest rate is payable in two equal semi-annual instalments.

**Maturity and Redemption** Corporate debt may be short-term, medium term, or long term. Short-term corporate debt of less than one year is called commercial paper. Since this is an instrument of working capital financing, it is discussed in [Chapter 27](#). Medium term debentures may have a maturity of 1 year to 5 years<sup>5</sup>. Long-term debentures typically have a maturity period of 5-15 years. While financial markets are generally not receptive to debentures that mature beyond 15 to 20 years, some firms like Disney, Boeing, and Reliance have issued debentures with maturities of even 50 to 100 years in recent times. Medium term debentures are often redeemed by way of a bullet payment, whereas long term debentures are generally redeemed in installments of 2-3 years.

For all debenture issues with a maturity period of more than 18 months, a Debenture Redemption Reserve (DRR) has to be created. The company should create a DRR equivalent to at least 25 percent of the amount of issue before redemption commences.

**Call and Put Feature** Debentures may carry a 'call' feature which provides the issuing company the option to redeem the debentures at a certain price before the maturity date. Sometimes the debentures may have

a ‘put’ feature which gives the holder the right to seek redemption at specified times at predetermined prices.

**Convertibility** A company may issue debentures which are convertible into equity shares at the option of the debenture holders. The ratio of conversion and the period during which conversion can be effected are specified at the time of debenture issue.

## **Advantages and Disadvantages of Debentures**

The advantages and disadvantages of debt financing, discussed in the previous section which focused on term loans, are more or less applicable to debenture financing as well. One important difference between debentures and term loans may be noted here. Before the issue, a firm enjoys greater flexibility in designing the debenture issue. After the issue, however, the firm hardly has any freedom in re-negotiating the terms of the issue.

By comparison, a firm has lesser flexibility in hammering out the features of a term loan. After taking the term loan, however, the firm enjoys greater real freedom in re-negotiating the terms of the loan contract.

The reason for this difference is fairly straightforward. In the case of a debenture issue a firm deals with numerous investors whereas in the case of a term loan a firm deals with one or a few institutional investors.

## 17.6 ■ COMPARATIVE PICTURE

We looked at the pros and cons of various instruments of long-term financing. [Exhibit 17.1](#) provides a summary comparison.

**Exhibit 17.1 Comparison of Various Sources of Long-term Financing**

	<i>Cost</i>	<i>Dilution of Control</i>	<i>Risk</i>	<i>Restraint on Managerial Freedom</i>
Equity capital	High	Yes	Nil	No
Retained earnings	High	No	Nil	No
Preference capital	High	No	Negligible	No
Term loans	Low	No	High	Moderate
Debentures	Low	No	High	Some

## 17.7 ■ PATTERN OF CORPORATE FINANCING IN INDIA

We discussed different sources of long-term financing. The distribution of capital issues, over the period 2001–2013, by the type of security is given in [Exhibit 17.2](#).

### Exhibit 17.2 New Capital Issues

Year		Equity	Preference	Debentures	Year	Equity	Preference	Debentures	₹ in billion
2000-01	26.08	1.42		30.68	2007–08	568.48	54.81	8.09	
2001-02	8.60	0.00		48.32	2008–09	146.71	0.00	15.00	
2002-03	4.60	0.00		14.18	2009–10	252.99	0.00	26.80	
2003-04	24.71	0.00		12.51	2010–11	248.30	0.00	26.26	
2004-05	114.52	0.00		16.27	2011–12	81.52	0.00	75.28	
2005-06	208.99	0.10		2.45	2012–13	138.84	0.00	22.17	
2006-07	297.56	0.00		8.50					

### SUMMARY

- The basic sources of long-term finance are equity (including retained earnings), preference, and long-term debt.
- Equity shareholders enjoy the rewards as well as bear the risk of ownership. The advantages of equity are that it represents a permanent source of finance, does not carry any fixed burden, and enhances the creditworthiness of the firm. The disadvantages of equity are that its cost is high and issue of equity to outsiders causes dilution of control.
- Preference capital represents a hybrid form of financing – it partakes some characteristics of equity and some attributes of debt.
- Long-term debt comes mainly in the form of term loans and debentures. Term loans are provided by banks and financial institutions. They typically represent a secured form of borrowing and carry a number of restrictive covenants to protect the interest of the lending institution.
- Debentures provide more flexibility than term loans.
- Debt provides tax shield and prevents dilution of control. But it can cause financial distress and impair operational flexibility.

## QUESTIONS

1. What are the key differences between debt and equity?
2. Define the following terms in relation to an equity share: par value, issue price, book value, and market value.
3. What is the equity shareholders' right to income and control?
4. Discuss the pre-emptive right of equity shareholders.
5. What kind of protection is provided by the pre-emptive right?
6. What are the advantages and disadvantages of equity capital?
7. What are the advantages and disadvantages of retained earnings?
8. Why is preference capital considered as a hybrid form of financing?
9. What are the advantages and disadvantages of preference capital?
10. Discuss the important features of term loans in India.
11. What are the advantages and disadvantages of debt financing?
12. Discuss the salient features of debentures.
13. How do various instruments of long-term financing compare?
14. What has been the pattern of corporate financing in India?

## PRACTICAL ASSIGNMENT

For the company chosen by you, analyse the pattern of financing for the past three years.

- 
- 1 Strictly speaking, preference capital is a hybrid source of financing. Sacrificing some rigour, we have included it under equity here.
  - 2 Short-term sources of finance will be discussed in [Chapter 27](#).
  - 3 The expected price is calculated as follows  
$$(1,000,000 \times ₹ 20 + 500,000 \times ₹ 12)/1,500,000 = ₹ 17.33$$
  - 4 In practice, of course, due to the phenomenon of "roll over", their effective maturity is longer.
  - 5 Many companies issue debentures that have a maturity of slightly less than 18 months to circumvent a SEBI regulation that calls for compulsory credit rating of all debenture issues that have a maturity of 18 months or more.

## Raising Long Term Finance

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe the features of venture capital and private equity.
- ✓ Understand the pros and cons of a public offering.
- ✓ Appreciate the characteristics of a rights issue.
- ✓ Know the procedure associated with a term loan.
- ✓ Explain the services provided by an investment banker.

When a company is formed, it first issues equity shares to the promoters (founders) and also, in most cases, raises loans from banks, financial institutions, and other sources. As the need for financing increases, the company may issue shares and debentures privately to promoters' relatives, friends, business partners, employees, financial institutions, banks, mutual funds, venture capital funds, and private equity funds – the last two are likely to be an important source of finance for a nascent venture. Such investors are specific and small in number.

As the company grows further, it may have to raise capital from the public. The first issue of equity shares to the public by an unlisted company is called the initial public offering (IPO). Subsequent offerings are called seasoned offerings.

In [Chapter 17](#) we looked at the features of various securities and term loans used by business firms for raising long term finance. This chapter discusses the procedures involved in issuing securities and raising term loans. While the procedures described in this chapter apply to both debt and equity, our emphasis will be more on equity. The focus will be on when, how, and to whom securities are issued.

## 18.1 ■ VENTURE CAPITAL AND PRIVATE EQUITY

A young private company that is not yet ready or willing to tap the public financial market may seek venture capital (VC). Such capital is provided by venture capital funds which are prepared to finance an untried concept that appears to have promising prospects. Venture capital funds seek to support growing firms during their initial stages, before they are ready to make a public offering of securities. Venture capital is provided mainly in the form of equity capital.

Venture capital represents financial investment in a highly risky proposition made in the hope of earning a high rate of return. While the concept of venture capital is perhaps as old as the human race, the practice of venture capitalism has remained somewhat fragmented and individualised throughout its long history. Only in the last five decades or so, the field of venture capital has acquired a certain degree of coalescence, maturity, and sophistication, particularly in the U.S. Venture capital, a relatively new phenomenon on the Indian scene, is expected to assume greater significance in the years to come.

A related term in industry circles is private equity (PE). While there are some differences between the two, there is considerable overlap between the two. Most of the discussion here would apply equally to VC and PE.

**Evolution of Indian VC Industry<sup>1</sup>** The Indian VC industry is of relatively recent origin. Prior to the formation of these VC institutions, Indian development financial institutions provided risk capital to industry in the form of subscription to equity, seed capital to first generation entrepreneurs, and other similar forms of risk capital. They were playing the role of VCs in a way, although they did not follow the rigorous processes that a modern day VC would follow. ICICI Ventures (formerly TDICI Ltd.) was the first VC institution and was promoted as a joint venture of ICICI Ltd. and Unit Trust of India (UTI) in 1988. Several other commercial banks and development financial institutions followed with their own VC subsidiaries. With the liberalisation of foreign investment into Indian companies, international investors emerged as more significant players in the Indian VC industry from the mid 1990s.

Foreign investors brought with them the lessons they had learned in various other developed as well as emerging markets. They have introduced the western investment philosophy and processes into their

transactions with Indian companies. Rigorous due diligence, tight contracting, active post financing involvement, and a sharp focus on timely and profitable exit are among their more important contribution. Since their investible funds are part of a global pool of capital, investment sentiments of foreign VC investors in India became closely tied into international investment sentiments.

**Features of Venture Capital** Although the terms and conditions on which venture capital is provided are not standardised, the following appear to be the salient features of venture capital arrangements:

- The venture capitalist (VC, hereafter) is inclined to assume a high degree of risk in the expectation of earning a high rate of return.
- The VC typically subscribes to equity or quasi-equity financing instruments, which enable it to share the risks and rewards of the investee firm.
- The VC, in addition to providing funds, takes an active interest in guiding the assisted firm.
- The financial burden for the assisted firm tends to be negligible in the first few years.
- The VC normally plans to liquidate its investment in the assisted firm after 3 to 7 years. Typically, the promoter of the assisted firm is given the first option to acquire the equity investment held by the VC.

**Private Equity and Venture Capital** Private equity (PE) and venture capital (VC) have some common features:

- They invest in companies that are not able or ready to raise capital from the public.
- They are set up as independent pools of capital contributed by institutions or high net worth individuals and run by managers with strong financial incentives linked to the performance of the funds.
- Armed with tightly written investment agreements, they actively oversee the investee companies.
- Their activities are subject to few regulations.

There are, however, some differences between the operations of PE and VC:

- In contrast to VC, PE investors invest mostly in later stage operations with a substantial operating history.

- PE investment may be used for financial or operational restructuring of the investee company.
- PE investment package may include debt, which is rare in a VC investment package.
- The PE investor puts more emphasis on corporate governance, whereas the VC investor focuses more on management capability.

**Growing Prominence of PE** In its formative years, the Indian industry was characterised more by VC style investing in small, early stage companies. More recently, in the past decade years or so, PE type investments have become more common. One possible explanation for the shift away from small and early stage investments might be the difficulty in disposing of such investments. Another reason could possibly be that larger investments enable fund managers to manage larger pools of capital without increasing the number of companies in the portfolio. This in turn allows the fund management companies to realise economies of scale by earning higher fee income without expanding the staff complement. It is also equally likely that the absence of high quality early stage opportunities that one finds in the U.S. and the lack of experience among investment managers to deal with the risks in those investments are some of the other reasons for the shift to larger investments, as has been the experience in Europe.

**Preparing a Business Plan** If you are approaching a venture capitalist or a private equity fund to finance your project, how should you prepare your business plan? Here are some guidelines:

- Use simple and clear language. Avoid bombastic presentation and technical language.
- Focus on four basic elements, viz., people, product, market, and competition.
- Give projections for about two years with emphasis on cash flows.
- Identify risks and develop a strategy to cope with the same.
- Convince that the management team is talented, committed, and determined.

### Relevance of Private Equity

Globally, private equity has become an integral part of the financial services industry in the last two decades. There has been a paradigm shift in the investment model. Partnership and mutual dependence have become the basis of the relationship between private equity investors and investee companies.

In India, too, private equity has become quite important in the last decade or so. It seems to be an attractive funding option. David Rubenstein, co-founder of The Carlyle Group, argues: "Large private equity firms have the experience, organisation, processes, and risk appetite to move rapidly to evaluate and close investments. It is the only class of investors who have the ability, track record and willingness to add value without any ultimate control desires."

## **18.2 ■ INITIAL PUBLIC OFFER**

The first public offering of equity shares of a company, which is followed by a listing of its shares on the stock market, is called the initial public offer (IPO). An IPO is often considered as an important milestone in a company's lifecycle marking its transition from a small closely-held company to a listed entity.

An IPO can be done either through a fresh issue of shares by the company or through an offer for sale of existing shares to investors. In the former case, fresh capital is injected into the company and its equity base expands. In the latter case, there is no infusion of capital in the company because the proceeds of the issue go to shareholders who offer their shares for sale.

In 2010, SEBI prescribed a minimum threshold level of public holding to be 25 percent for all listed companies. If the post issue capital of a company, calculated at the offer price, is more than ₹ 4,000 crore, the company is allowed to go public with 10 percent public shareholding and comply with the mandatory 25 percent public shareholding requirement by increasing its public shareholding by at least 5 percent per annum. Likewise, existing listed companies having less than 25 percent public shareholding have to comply with 25 percent public shareholding norm by an annual increase of not less than 5 percent to public shareholding.

## **Decision to Go Public**

The decision to go public (or more precisely the decision to make an IPO so that the securities of the company are listed on the stock market and publicly traded) is a very important, but not well studied, question in finance. It is a complex decision which calls for carefully weighing the benefits against costs.

**Benefits of Going Public** The potential advantages that seem to prod companies to go public are as follows:

*Access to Capital* The principal motivation for going public is to have access to larger capital. A company that does not tap the public financial market may find it difficult to grow beyond a certain point for want of capital.

*Respectability* Many entrepreneurs believe that they have “arrived” in some sense if their company goes public because a public company may command greater respectability. Competent and ambitious executives would like to work for growth. Other things being equal, public companies offer greater growth potential compared to non-public companies. Hence, they can attract superior talent.

*Investor Recognition* In his capital asset pricing model with incomplete information, Robert Merton shows that, other things being equal, stock prices are higher, the larger the number of investors who are aware of the securities of the firm.

*Window of Opportunity* As suggested by Jay Ritter and others, there are periods in which stocks are overpriced. Hence, when a non-public company recognises that other companies in its industry are overpriced, it has an incentive to go public and exploit that opportunity.

*Liquidity* Promoters of a company would eventually like their investment to become liquid. This becomes easier when they take their company public.

*Benefit of Diversification* When a firm goes public those who have investment in it – original owners, investors, managers, and others – can cash out of the firm and build a diversified portfolio.

*Signals from the Market* Stock prices represent useful information to the managers. Everyday, investors render judgment about the prospects of the firm. Although the market may not be perfect, it provides a useful reality check.

**Costs of Going Public** A public company, of course, is not an unmixed blessing. There are several disadvantages of going public.

*Adverse Selection* Investors, in general, know less than the issuers about the value of companies that go public. Put differently, they are potential victims of adverse selection. Aware of this trap, they are reluctant to participate in public issues unless they are significantly underpriced. Hence, a company making an IPO, typically has to underprice its securities in order to stimulate investor interest and participation.

*Dilution* When a company issues shares to public, existing shareholders suffer dilution of their proportionate ownership in the firm.

*Loss of Flexibility* The affairs of a public company are subject to fairly comprehensive regulations. Hence, when a non-public company is transformed into a public company there is some loss of flexibility.

*Disclosures* A public company is required to disclose a lot of information to investors and others. Hence, it cannot maintain a strict veil of secrecy over its expansion plans and product market strategies as its non-public counterpart can do.

*Accountability* Understandably, the degree of accountability of a public company is higher. It has to explain a lot to its investors.

*Public Pressure* Because of its greater visibility, a public company may be pressurised to do things that it may not otherwise do.

*Costs* Apart from the cost of issuing securities, a public company has to incur recurring costs for providing investors with periodical reports, holding shareholder meetings, communicating with institutional investors and financial analysts, and fulfilling various statutory obligations.

## **Eligibility for an IPO<sup>2</sup>**

To be eligible to make an IPO a company has to satisfy all the following conditions.

**Track Record** The company should have net tangible assets of at least ₹ 3 crore, net worth of at least ₹ 1 crore, and minimum average pre-tax profit of ₹ 15 crore in 3 out of preceding five years on a consolidated basis. The issue size should not exceed five times the pre-issue net worth.

If a company does not fulfil the above eligibility criteria, it has to necessarily make an IPO through the book-building route.

**QIB Participation** The issue is made through the book-building process, with at least 75 percent of the issue size being allotted to Qualified Institutional Buyers<sup>3</sup>. The post-issue capital has to be at least ₹ 10 crore, failing which the company may choose to list on the SME platform with compulsory market making for three years.

## Issue Pricing

As per the present SEBI Issue of Capital and Disclosure Requirements (ICDR) Regulation, every company, whether unlisted or listed, which is eligible to make a public issue can freely price its shares. However, the issuing company has to disclose the basis for the issue price in terms of the following:

- Adjusted EPS (for past three years)
- P/E ratio in relation to issue price
- Return on net worth
- Minimum return on the total net worth after the issue needed to maintain EPS
- Net asset value

IPOs are priced by companies in conjunction with merchant bankers. There are three ways of pricing an IPO: fixed price mechanism, book building, and French auction. In the **fixed price mechanism**, the price at which the shares are to be issued to the public is fixed before the issue opens for subscription.

In the **book-building mechanism**, the company announces a price band within which potential investors are required to bid for the shares. During the bidding process, investors can change their bids. After the bidding is over, the cut-off price is determined based on the demand for the share. Retail investors can opt for the cut-off price.

Under the **French auction**, retail investors are free to bid at the floor price but institutional investors have to bid at a higher price: Investors cannot change their bids during the bidding process. In a French auction, successful institutional bidders pay the actual price they bid for, while retail and non-institutional investors pay the floor price. For their follow on public offers in 2010, NTPC and REC used the French auction.

## **Principal Steps in an IPO**

The issue of securities to members of the public through a prospectus involves a fairly elaborate process, the principal steps of which are as follows.

1. The board of directors approves the proposal to raise capital from the public and authorises the managing director (or a board committee) to proceed with it.
2. The company convenes a meeting to seek the approval of shareholders and the shareholders pass a special resolution under the Companies Act authorising the company to make the public issue.
3. The company appoints a merchant banker as the lead manager (LM) to the issue.
4. The LM carries out due diligence to check all relevant information, documents, and certificates for the issue.
5. The company, advised by the LM, appoints various intermediaries such as the registrar to the issue, the bankers to the issue, the printers, and advertiser.
6. The LM draws up the issue budget, keeping in mind the guidelines issued by the Ministry of Finance on issue expenses, and the company approves the same (The main components of the issue expenses are fees for LM, underwriters, registrar and bankers, brokerage, postage, stationery, issue marketing expenses, etc.)
7. The LM prepares the draft prospectus in consultation with management and seeks the approval of the board.
8. The LM files the draft prospectus, approved by the board, with SEBI for its observation along with a soft copy on the CD. SEBI places the same on its website for comments from the public.
9. The company makes listing application to all the stock exchanges where the shares are proposed to be listed along with copies of the draft prospectus. The draft prospectus is also hosted on the websites of the LM and the underwriters.
10. The company enters into a tripartite agreement with the registrar and all the depositories for providing the facility of offering the shares in a dematerialised mode.
11. If the issue is proposed to be underwritten (it is optional in a retail issue and mandatory in a book built issue to the extent of the net

public offer), the LM makes underwriting arrangements.

12. Within 21 days, SEBI makes its observations on the draft prospectus. The stock exchanges also suggest changes, if any. The company carries out the modifications to the satisfaction of these authorities.
13. The company files the prospectus with the Registrar of Companies (ROC).
14. The LM and the company market the issue using a combination of press meetings, brokers' meetings, investors' meetings, and so on.
15. The company releases a mandatory advertisement, called the 'announcement advertisement' 10 days prior to the opening of the issue. This has to conform to Form 2A, also called the abridged prospectus.
16. The LM and the printer dispatch the application forms to all stock exchanges, SEBI, collection centres brokers, underwriters, and investor associations. Every application form is accompanied by the abridged prospectus.
17. The issue is kept open for a minimum of 3 days and a maximum of 10 days, in the case of a book built offer.
18. After the issue is closed, the basis of allotment is finalised by the stock exchange, LM, and the registrar, in conformity with certain SEBI- prescribed rules.
19. The LM ensures that the demat credit or dispatch of share certificates and refund orders to the allottees is completed within two working days after the basis of allotment is finalised and the shares are listed within 7 days of the finalisation of the basis of allotment.
20. If there is a devolvement on the underwriters, the LM ensures that the underwriters honour their commitments within 60 days from the date of closure of the issue.
21. If the issuing company avails of the Green Shoe option(under which the company retains a portion of the over-subscription), the company appoints one of the issue managers as the stabilisation agent (SA), who will be responsible for the price stabilisation process.

## **Role of the Lead Manager of the Issue**

The lead manager of a public issue may be likened to the ‘conductor’ of an opera who has to ensure the overall success of the issue. His principal tasks are to:

- Structure the issue, taking into account the funds requirements of the company, the expectations of the investors, and other relevant factors.
- Submit the draft prospectus to SEBI.
- Arrange underwriting by financial institutions, commercial banks, and brokers.
- Finalise the prospectus in consultation with solicitors, stock exchange authorities, and others.
- Coordinate the efforts of brokers, bankers, registrars, advertising agencies, printers, and others.
- Develop the strategy for marketing the issue by using a judicious mix of conferences (press, broker, and investor), advertisements, mailings, etc.
- Monitor the issue during the subscription period.
- Help in finalising the basis of allotment.
- Assist in securing stock exchange listing.

## **Cost of Public Issue**

The cost of public issue is normally between 6 and 12 percent, depending on the size of the issue and the level of marketing effort. The important expenses incurred for a public issue are as follows:

***Underwriting Expenses*** The underwriting commission may be upto 2.5 percent of the nominal value (including premium, if any) of the equity capital being issued to public.

***Brokerage*** Brokerage applicable to all types of public issues of industrial securities is fixed at not more than 1.5 percent, whether the issue is underwritten or not. The managing brokers (if any) can be paid a maximum remuneration of 0.5 percent of the nominal value of the capital being issued to the public.

***Fees to the Managers to the Issue*** Previously the aggregate amount payable as fees to the managers to the issue was subject to certain limits. Presently there are no such restrictions. The fees is fixed on the basis of negotiation.

***Fees for Registrars to the Issue*** The compensation to the registrars, typically based on a piece rate system, depends on the number of applications received, number of allottees, and the number of unsuccessful applicants.

***Printing Expenses*** These relate to the printing of prospectus, application forms, brochures, share certificates, allotment/refund letters, envelopes, etc.

***Postage Expenses*** These pertain to the mailing of application forms, brochures, and prospectus to investors by ordinary post and the mailing of allotment/ refund letters and share certificates by registered post.

***Advertising and Publicity Expenses*** These are incurred primarily toward statutory announcements, other advertisements, press conferences, and investor conferences.

***Listing Fees*** This is the fees payable to concerned stock exchanges where the securities are listed. It consists of two components: initial listing fees and annual listing fees.

***Stamp Duty*** This is the duty payable on share certificates issued by the company. As this is a state subject, it tends to vary from state to state.

In order to control the costs of public issues, the following overall ceiling limits were fixed sometime back under the Companies Act. Though redundant now, they serve as guidelines.

<i>Particulars of Issue</i>	<i>Limit of the Cost</i>
(a) Equity and convertible debentures	
—Up to ₹ 5 crore	Mandatory costs + 5 percent
—In excess of ₹ 5 crore	Mandatory costs + 2 percent
(b) Non-convertible debentures	
—Up to ₹ 5 crore	Mandatory costs + 2 percent
—In excess of ₹ 5 crore	Mandatory costs + 1 percent

Mandatory costs include underwriting commission, brokerage, fees of managers to the issue, expenses on statutory announcements, listing fees, and stamp duty. SEBI guidelines, however, have not prescribed any cost ceiling.

## **Underpricing of Initial Public Offerings (IPOs)<sup>4</sup>**

Underpricing of IPOs appears to be a universal phenomenon, though the degree of underpricing varies widely across countries. Why does such underpricing happen? Financial economists offer the following explanations.

- *Winner's Curse* Investors may be divided into two categories, viz., 'informed' and 'uninformed'. In general, financial institutions are likely to be informed and individual investors uninformed. Individual investors, uninformed as they are, tend to be victims of the winner's curse. When they receive allotment of shares they have applied for in an IPO, it may be because the shares are overpriced and informed investors have, in general, stayed away from the issue. Hence, the uninformed investors will need an incentive in the form of substantial underpricing of the IPO to remain in the market.
- *Bait for Future Offerings* A company making an IPO would like the investors to have a rewarding experience. Satisfied investors develop a loyalty toward the company. This helps the company in raising more capital at a higher price in future.
- *Informational Asymmetry* In general, merchant bankers (also referred to as investment bankers) know the market better than the issuing company. They may exploit this superior knowledge to underprice issues. This makes their job easier and helps them earn the goodwill of investors.
- *Regulatory Constraints* Sometimes regulatory guidelines lead to underpricing. During the days of the Controller of Capital Issues, the issue price in India was governed by a very conservative formula.
- *Political goals* Companies may deliberately underprice their issues and allot them to people in power. In Japan, for example, the Recruitment Company sold the shares of its subsidiary Cosmos through a severely underpriced IPO to several politicians including the then Prime Minister Takeshita (when the scandal was exposed Takeshita had to resign). In U.K., Margaret Thatcher privatised firms like British Airways and British Steel through underpriced IPOs to garner acceptance for her privatisation initiatives and promote popular capitalism.

Financial economists are puzzled by four characteristics of IPOs.

- One, on average, IPOs appear to be underpriced. The closing price on the day of issue is often significantly higher than the issue price.
- Two, the number of issues is highly cyclical. During good times, the market is flooded with new issues; during bad times, the number of issues falls substantially.
- Three, issue costs of IPOs are quite high.
- Four, the long-run performance (three to five years from the date of issue) of IPOs is poor.

## 18.3 ■ FOLLOW ON PUBLIC OFFER

For most companies, their IPO is seldom their last public issue. As companies grow, they are likely to make further trips to the capital market with issues of debt and equity. These issues may be public issues offered to investors at large (called follow on public offers or FPOs) or rights issues offered to existing shareholders. This section looks at a follow on public issue and the following section at a rights issue.

The procedure for an FPO of equity is similar to that of an IPO. Hence, most of the steps involved in an IPO, discussed in the previous section, are applicable to a secondary public offer as well. However, an FPO is subject to fewer regulations, when compared to an IPO.

The key provisions applicable to a FPO are as follows:

- A listed company is eligible to a public offer of equity shares or a convertible instrument provided that the aggregate size of the proposed issue and all previous issues made in the same financial year by the company do not exceed five times its pre-issue net worth as per the audited balance sheet of the last financial year. For this purpose, the aggregate size of the issue should be reckoned at the net public offer through the offer document + firm allotments + promoters' contribution through the offer document.
- The promoters shall either participate to the extent of 20 percent of the proposed issue or ensure that their holding in the post-issue equity capital is at least 20 percent.
- If the promoters wish to subscribe in the FPO beyond the required minimum of 20 percent, such excess contribution shall be subject to preferential allotment guidelines. Participation by the promoters in the secondary offer in excess of the required minimum percentage of 20 percent shall be locked in for a period one year.
- The requirement of minimum promoters' contribution and lock-in of excess contribution shall not be applicable in case of a secondary offer by a company that has been listed on a stock exchange for a minimum of 3 years and has a track record of dividend payment for the immediately preceding 3 years. The requirement for promoter's contribution also does not apply for companies where no identifiable promoter or promoter group exists.

**Public Offer of Debt** At the outset it may be noted that as far as debt issues are concerned, no distinction is made between an IPO and FPO. The most important distinction in the case of debt is between a public offer and a private placement. Public offers of debt securities are governed by a separate set of regulations issued by SEBI.

The mechanics of a public offer of a debt security are much the same as that of a public offer at equity. However, there are some differences:

- Pure debt securities are typically offered through the 100 percent retail route because the book-building route is not appropriate for them.
- Debt securities are generally secured against the assets of the issuing company and the security should be created within six months of the close of the issue of debentures.
- The prospectus for a debt offering typically emphasises a company's stable cash flows, whereas the prospectus for an equity offering highlights the company's growth prospects.

As per SEBI (Issue and Listing of Debt Securities) Regulations, 2008, for making a public issue of debt securities the following conditions have to be satisfied as on the date of filing of draft offer document and final offer document with the designated stock exchange through the lead merchant banker.

- An application has been made to one or more recognised stock exchanges for listing of such securities and an in-principle approval for the listing has been obtained.
- Credit rating has been obtained from at least one credit rating agency registered with SEBI and the same is disclosed in the offer document.
- An arrangement for dematerialisation of the debt securities with a SEBI-registered depository has been made in accordance with the Depositories Act, 1996.
- One or more SEBI-registered merchant bankers have been appointed with at least one of them serving as the lead merchant banker.
- One or more debenture trustees have been appointed in accordance with the provisions of the Companies Act and SEBI (Debenture Trustees) Regulations.
- Where the issuer desires to roll-over the debt securities issued by it, it shall do so only upon passing of a special resolution of holders of

such securities and give twenty one days' notice of the proposed roll out to them.

- An issuer may list its debt securities issued on private placement basis on a recognised stock exchange provided it is credit-rated and dematerialised and the issuer makes required disclosures.

## 18.4 ■ RIGHTS ISSUE

A rights issue is an issue of capital to the existing shareholders of the company through a 'Letter of Offer' made in the first instance to the existing shareholders on a *pro rata* basis. This is required under the Companies Act. The shareholders, however, may by a special resolution forfeit this right, partially or fully, to enable the company to issue additional capital to public. As an alternative, after shareholders pass a general resolution, the Board of Directors can seek the approval of the Central Government to issue additional shares to outsiders. The Indian law regarding rights issue is similar to that of European countries. In the U.S., however, rights issues are made mostly by closed-end investment companies.

**Characteristics of Rights** The important characteristics of rights are:

- The issuing firm decides on the number of rights shares to be issued. For example, a firm that currently has 100 million outstanding shares may decide to issue 20 million right shares.
- Based on the number of rights shares proposed to be issued, the rights entitlement of the existing shareholders is determined. Thus, in the above case 5 existing shares are required to subscribe to 1 rights share.
- The price per share for additional equity, called the subscription price, is left to the discretion of the company.
- Rights are negotiable. The holder of rights can sell them.
- Rights can be exercised only during a fixed period which is usually about 30 days.

**Procedure for a Rights Issue** A company making a rights issue sends a 'letter of offer', along with a composite application form consisting of four forms (A, B, C, and D) to the shareholders. Form A is meant for acceptance of the rights and application for additional shares. This form shows the number of rights shares the shareholder is entitled to. It also has a column through which a request for additional shares may be made. Form B is to be used for renouncing the rights in favour of someone. Form C is meant for application by the renouncee in whose favour the rights have been renounced, by the original allottee, through Form B. Form D is to be used to make a request for split forms. The composite application form must

be mailed to the company within a stipulated period, which is usually about 10 days.

**Conditions** The conditions that have to be satisfied for obtaining the approval for rights issues are as follows:

- Existing shareholders, who exercise their rights in full, are given an opportunity to apply for additional shares.
- Existing shareholders who renounce their rights, wholly or partially, are not entitled to apply for additional shares.
- Shares which become available, due to non-exercise of rights by some shareholders, are allotted to shareholders who have applied for additional shares in proportion to their shareholding.
- Any balance shares, left after meeting requests for additional shares by the existing shareholders, are disposed of at the ruling market price or the issue price, whichever is higher.

**Consequences of a Rights Issue** What are the likely consequences of a rights issue on the market value per share, value of a right, earnings per share, and the wealth of shareholders? To answer this question, let us look at the illustrative data of the Right and Left Company given in [Exhibit 18.1](#).

### Exhibit 18.1 Illustrative Data of the Right and Left Company

Paid-up equity capital (1,000,000 shares of ₹ 10 each)	₹ 10,000,000
Retained earnings	20,000,000
Earnings before interests and taxes	12,000,000
Interest	2,000,000
Profit before tax	10,000,000
Taxes (50 percent)	5,000,000
Profit after taxes	5,000,000
Earnings per share	₹ 5
Market price per share (Price-earnings ratio of 8 is assumed)	₹ 40
Number of additional equity shares proposed to be issued as rights shares	200,000
Proposed subscription price	₹ 20
Number of existing shares required for a rights share (1,000,000/200,000)	5

**Value of a Share** The value of a share, after the rights issue, is expected to be:

$$\frac{NP_0 + S}{N + 1} \quad (18.1)$$

where  $N$  is the number of existing shares required for a rights share,  $P_0$  is the cum-rights market price per share, and  $S$  is the subscription price at which the rights share are issued.

The rationale behind this formula is as follows: For every  $N$  shares before the rights issue, there would be  $N + 1$  shares after the rights issue. The market value of these  $N + 1$  shares is expected to be the market value of  $N$  cum-rights shares plus  $S$ , the subscription price.

Applying this formula to the data given in [Exhibit 18.1](#) we find that the value per share after the rights issue is expected to be:

$$\frac{5 \times 40 + 20}{5+1} = ₹ 36.67$$

**Value of a Right** The theoretical value of a right is:

$$\frac{N(P_0 - S)}{N+1} \quad (18.2)$$

The value is determined as follows. The difference between the market price of a share after the rights issue and the subscription price is the benefit derived from a right, which is required along with the subscription price to obtain one rights share. This means that the value of a right is:

$$\frac{NP_0 + S}{N+1} - S = \frac{N(P_0 - S)}{N+1} \quad (18.3)$$

Applying the above formula to the data given in the [Exhibit 18.1](#), we find that the value of one right of the Left and Right Company is:

$$\frac{5(40-20)}{5+1} = ₹ 16.67$$

**Wealth of Shareholders** The wealth of existing shareholders, *per se*, is not affected by the rights offering, provided, of course, the existing shareholders exercise their rights in full or sell their rights. To illustrate this point, consider what happens to a shareholder who owns 100 equity shares of the Left and Right Company that has a market value of ₹ 40 each before the rights issue. The impact on his wealth when he exercises his rights, when he sells his rights, and when he allows his rights to expire is shown below.

#### *He exercises his rights*

Market value of original shareholding at the rate of ₹ 40 per share	= ₹ 4,000
Additional subscription price paid for 20 rights shares at the rate of ₹ 20 per share	= ₹ 400

Total investment	= ₹ 4,400
Market value of 120 shares at the rate of ₹ 36.67 per share after the rights subscription	= ₹ 4,400
Change in wealth (₹ 4,400 – ₹ 4,400)	= ₹ 0

*He sells his rights*

Market value of original shareholding at the rate of ₹ 40 per share	= ₹ 4,000
Value realised from the sale of 20 rights at ₹ 16.67 per right	= ₹ 333
Market value of 100 shares held after the rights issue at the rate of ₹ 36.67 per share	= ₹ 3,667
Change in wealth (₹ 3,667 + ₹ 333 – ₹ 4,000)	= ₹ 0

*He allows his rights to expire*

Market value of original shareholding at the rate of ₹ 40 per share	= ₹ 4,000
Market value of 100 shares held after the rights issue at the rate of ₹ 36.67 per share	= ₹ 3,667
Change in wealth (₹ 3,667 – ₹ 4,000)	= ₹ (333)

**Setting the Subscription Price** Theoretically, the subscription price is irrelevant because the wealth of a shareholder who subscribes to the rights shares or sells the rights remains unchanged, irrespective of what the subscription price is. To illustrate this point, consider a shareholder who has  $N$  shares valued at  $P_0$  and who enjoys the right to subscribe to an additional share for  $S$ . His total investment would be:

$$NP_0 + S \quad (18.4)$$

The value of his shareholding after subscription would be:

Number of shares × Market value per share after rights issue

This is equal to:

$$(N + 1) \times \frac{NP_0 + S}{(N + 1)} = NP_0 + S \quad (18.5)$$

Thus the value of his shareholding after subscription is equal to the value of his investment, irrespective of the subscription price  $S$ .

In practice, however, the subscription price is important. Existing shareholders do not like the idea of  $S$  being higher than  $P_0$  because when  $S$  is higher than  $P_0$ , the market value after issue would be lower than  $S$ . Non-shareholders, who have an opportunity to subscribe to shares not taken by existing shareholders, will have no interest in the shares if  $S$  is higher than  $P_0$  because they would then suffer a loss when the market value falls below  $S$  after the issue.

Hence,  $S$  has to be set equal to or lower than  $P_0$ . A value of  $S$  equal to  $P_0$  is not advisable because it has no appeal to existing shareholders and other investors as they do not see any opportunity of gain in such a case. So,  $S$  has to be set lower than  $P_0$ , may be 10% lower.

**Comparison between Rights Issue and Public Issue** Here is a comparison between a rights issue and a public issue: (i) A rights issue is likely to be more successful than a public issue because it is made to investors who are familiar with the operations of the company. (ii) Since the rights issue is not underwritten, the floatation costs of a rights issue are significantly lower than those of a public issue. (iii) A rights issue generally has to be made at a lower price than a public issue because existing shareholders expect rights issue to be made at a lower price. Due to this, a rights issue tends to result in a dilution of earnings per share.

## **18.5 ■ PRIVATE PLACEMENT**

A private placement is an issue of securities to a select group of persons not exceeding 200. Private placement of shares and convertible debentures by a listed company can be of two types: preferential allotment and qualified institutional placement.

## **Preferential Allotment**

When a listed company issues shares or debentures to a select group of persons (such as promoters, foreign partners, and private equity funds) in terms of the provisions of Chapter VII of SEBI (ICDR) Regulations, it is referred to as a preferential allotment. Since preferential allotment is amenable to potential abuse, it is subject to the following regulations:

**Special Resolution** The shareholders of the company must pass a special resolution or the central government must grant a special approval before a company makes a preferential allotment.

**Pricing** The price at which a preferential allotment of shares is made should not be lower than the higher of the volume weighted average of the weekly high and low of the closing prices of the shares quoted on the stock exchange during the six months period before the relevant date or during the two-week period before the relevant date.

**Open Offer** A preferential allotment of more than 25 percent of the equity necessitates an open offer to the existing shareholders under the SEBI takeover code. However, this can be done away with, if the special resolution passing the preferential allotment also ratifies the change in control.

**Lock-in Period** Securities issued to the promoter group by way of a preferential issue are subject to a lock-in period of three years—this means that they are not transferable for that period. However, securities issued to other categories of investors by way of a preferential allotment are subject to a lock-in period of one year.

## **Qualified Institutional Placement (QIP)**

A QIP is an issue of equity shares or convertible securities to Qualified Institutional Buyers (QIBs) in terms of the provisions of Chapter VIII of the SEBI (ICDR) Regulations 2009. It represents a private placement with QIBs.

QIPs are a very popular form for raising equity capital. They offer the following advantages:

1. QIPs are placed with institutional investors who are well informed. So they can be issued at a price close to the current market price. Indeed, according to the above regulations, the issue price of a QIP cannot be less than the volume-weighted average of the weekly high and low of the closing prices during the two preceding weeks.
2. Compared to a public issue, a QIP requires less preparatory work and limited marketing effort. Hence, the issue cost of a QIP is considerably less than that of a public issue.
3. QIPs can be timed opportunistically. Typically, the company planning a QIP has the statutory approvals and offer documents in place. It times its issue after its stock has enjoyed a rising trend for two weeks or more.
4. A QIP is normally completed in a few hours.

To sum up, QIPs fetch a good price, entail minimal effort and cost, and can be completed in few hours.

In July 2009, SEBI introduced the concept of “anchor investor.” An anchor investor is a qualified institutional buyer (QIB) making an application for a value of ₹ 10 crore or more through the book-building process. An anchor investor(s) gives a guideline for issue pricing and infuses confidence in the market, thereby attracting QIBs and retail investors. SEBI has stipulated several conditions for anchor investors.

## **Private Placement of Bonds**

Corporate bonds in India are largely privately placed. Private placement of corporate bonds is mostly done through a book built issue to institutional investors. Details of the issuer and the bond are provided in the placement document (information memorandum). When the book building mechanism is used, the issue manager collates investor interest in the issue. Potential investors indicate how much they are willing to buy and at what yield; or they may indicate how much they are willing to buy at the cut-off yield. Based on the letters of commitment received the lead manager (book runner) to the issue decides on the cut-off yield and the same will be applicable to all investors in the issue. If the issue is over-subscribed, the allocation will be determined by the company and the book runners.

Earlier, the information and disclosures to be included in the Private Placement Memorandum were not defined, credit rating was not mandatory, listing was not compulsory, and banks and financial institutions could subscribe to these issues without too many constraints. The regulatory framework changed significantly in late 2003 when SEBI and RBI tightened their regulations over the issuance of privately placed debentures and the subscription of the same by banks and financial institutions. The key features of the new regulatory dispensation are:

- The disclosure requirements for privately placed debentures are similar to those of publicly offered debentures under SEBI regulations.
- Debt securities shall carry a credit rating of not less than investment grade from a credit rating agency registered with SEBI.
- Debt securities shall be issued and traded in demat form.
- The trading in privately placed debt shall take place between QIBs and HNIs (High Networth Individuals) in standard denomination of ₹ 10 lakh.
- Banks should not invest in non-SLR securities of original maturity of less than one year other than commercial paper and certificates of deposits which are covered under RBI guidelines.
- Banks should not invest in unrated non-SLR securities.

### **How Do the Various Methods of Offering Compare**

How do the three methods compare broadly in terms of the amount that can be raised, the cost of issue, dilution of control, degree of underpricing, and market

perception? The following table presents a summary comparison for an equity issue. As far as a debt issue is concerned, dilution of control is a non-issue and the market perception is neutral to positive under all the methods.

	<i>Public issue</i>	<i>Rights issue</i>	<i>Private placement</i>
■ Amount that can be raised	Large	Moderate	Moderate
■ Cost of issue	High	Negligible	Negligible
■ Dilution of control	Yes	No	Yes
■ Degree of underpricing	Large	Irrelevant	Small
■ Market perception	Negative	Neutral	Neutral

## 18.6 ■ OBTAINING A TERM LOAN

### Term Loan Procedure

The procedure associated with a term loan involves the following principal steps:

**Submission of Loan Application** The borrower submits an application form which seeks comprehensive information about the project. The application form covers the following aspects:

- Promoters' background
- Particulars of the industrial concern
- Particulars of the project (capacity, process, technical arrangements, management, location, land and buildings, plant and machinery, raw materials, effluents, labour, housing, and schedule of implementation)
- Cost of project
- Means of financing
- Marketing and selling arrangements
- Profitability and cash flow
- Economic considerations
- Government consents

**Initial Processing of Loan Application** When the application is received, an officer of the financial institution reviews it to ascertain whether it is complete for processing. If it is incomplete the borrower is asked to provide the required additional information. When the application is considered complete, the financial institution prepares a 'Flash Report' which is essentially a summarisation of the loan application. On the basis of the 'Flash Report', it is decided whether the project justifies a detailed appraisal or not.

**Appraisal of the Proposed Project** The detailed appraisal of the project covers the marketing, technical, financial, managerial, and economic aspects. The appraisal memorandum is normally prepared within two months after site inspection. Based on that a decision is taken whether the project will be accepted or not.

**Issue of the Letter of Sanction** If the project is accepted, a financial letter of sanction is issued to the borrower. This communicates to the

borrower the assistance sanctioned and the terms and conditions relating thereto.

### **Acceptance of the Terms and Conditions by the Borrowing Unit**

**On receiving the letter of sanction from the financial institution, the borrowing unit convenes its board meeting at which the terms and conditions associated with the letter of sanction are accepted and an appropriate resolution is passed to that effect. The acceptance of the terms and conditions has to be conveyed to the financial institution within a stipulated period.**

**Execution of Loan Agreement** The financial institution, after receiving the letter of acceptance from the borrower, sends the draft of the agreement to the borrower to be executed by authorised persons and properly stamped as per the Indian Stamp Act, 1899. The agreement, properly executed and stamped, along with other documents as required by the financial institution must be returned to it. Once the financial institution also signs the agreement, it becomes effective.

**Disbursement of Loans** Periodically, the borrower is required to submit information on the physical progress of the projects, financial status of the project, arrangements made for financing the project, contribution made by the promoters, projected funds flow statement, compliance with various statutory requirements, and fulfillment of the pre-disbursement conditions. Based on the information provided by the borrower, the financial institution will determine the amount of term loan to be disbursed from time to time. Before the entire term loan is disbursed, the borrower must fully comply with all pre-disbursement terms and conditions of the loan agreement.

**Creation of Security** The term loans (both rupee and foreign currency) and the deferred payment guarantee assistance provided by the financial institutions are secured through the first mortgage, by way of deposit of title deeds, of immovable properties and hypothecation of movable properties. As the creation of mortgage, particularly in the case of land, tends to be a time consuming process, the institution generally permits interim disbursements against alternate security (in the form of guarantees by the promoters). The mortgage, however, has to be created within a year from the date of the first disbursement. Otherwise the borrower has to pay an additional charge of 1 percent interest.

**Monitoring** Monitoring of the project is done at the implementation stage as well as at the operational stage. During the implementation stage, the project is monitored through: (i) regular reports, furnished by the promoters, which provide information about placement of orders, construction of buildings, procurement of plant, installation of plant and machinery, trial production, etc., (ii) periodic site visits, (iii) discussion with promoters, bankers, suppliers, creditors, and others connected with the project, (iv) progress reports submitted by the nominee directors, and (v) audited accounts of the company.

During the operational stage, the project is monitored with the help of (i) quarterly progress report on the project, (ii) site inspection, (iii) reports of nominee directors, and (iv) comparison of performance with promise.

The most important aspect of monitoring, of course, is the recovery of dues represented by interest and principal repayment.

## **Project Appraisal**

Financial institutions appraise a project from the marketing, technical, financial, economic, and managerial angles. The principal issues considered and the criteria employed in such appraisal are discussed below.

**Market Appraisal** The importance of the potential market and the need to develop a suitable marketing strategy cannot be over-emphasised. Hence efforts are made to:

- Examine the reasonableness of the demand projections by utilising the findings of available surveys, industry association projections, and independent market surveys (which may sometimes be commissioned).
- Assess the adequacy of the marketing infrastructure in terms of promotional effort, distribution network, transport facilities, stock levels, etc.
- Judge the knowledge, experience, and competence of the key marketing personnel.

**Technical Appraisal** The technical review done by the financial institutions focuses mainly on the following aspects: product mix, capacity, process of manufacture, engineering know-how and technical collaboration, raw materials and consumables, location and site, buildings, plant and equipments, manpower requirements, and break-even point.

The technical review is done by qualified and experienced personnel available in the Institutions and/or outside experts (particularly where large and technologically sophisticated projects are involved).

**Financial Appraisal** The financial appraisal seeks to assess the following:

*Reasonableness of the Estimate of Capital Cost* While assessing the capital cost estimates, efforts are made to ensure that (a) padding or under-estimation of costs is avoided, (b) specification of machinery is proper, (c) proper quotations are obtained from potential suppliers, (d) contingencies are provided, and (e) inflation factors are considered.

*Reasonableness of the Estimate of Working Results* The estimate of working results is sought to be based on (a) a realistic market demand forecast, (b) price computations for inputs and outputs that are based on

current quotations and inflationary factors, (c) an approximate time schedule for capacity utilisation, and (d) cost projections that distinguish between fixed and variable costs.

**Adequacy of Rate of Return** The general norms for financial desirability are as follows:

- Internal rate of return : 15% or 3 – 5% more than WACC
- Return on investment : 20-25 percent after tax
- Debt-service coverage ratio : 1.50 and above
- Loan life coverage ratio : This is a DCF version of the DSCR
- Break-even point : The break-even point in the optimal year (the year when the project is expected to achieve the Highest capacity utilisation) must result in a margin of safety over installed capacity.

In applying these norms, however, a certain degree of flexibility is shown on the basis of the nature of the project, the risks inherent in the project, and the status of the promoter.

**Appropriateness of the Financing Pattern** The institutions consider the following in assessing the financial pattern:

- A general debt-equity ratio norm of 1: 1. For capital-intensive projects a higher debt- equity ratio is permitted.
- A requirement that promoters should contribute a certain percentage of the project cost (30-50 percent)
- Stock exchange listing requirements
- The means of the promoter and his capacity to contribute a reasonable share of the project finance

**Economic Appraisal** The economic appraisal looks at the project from the larger social point of view. The methodology adopted by the financial institutions for the purpose of economic appraisal is labeled as ‘Partial Little Mirrlees’ approach. In addition to the calculation of the economic rate of return as per this approach, they also look at two other economic indicators: (i) effective rate of protection, and (ii) domestic resource cost. Admittedly, the economic appraisal done by financial institutions is not very rigorous and sophisticated. Also, the emphasis placed on this appraisal is rather limited.

**Managerial Appraisal** In order to judge the managerial capability of the promoters, the financial institutions examine the following:

**Resourcefulness** This is judged in terms of the prior experience of the promoters, the progress achieved in organising various aspects of the project, and the skill with which the project is presented.

**Understanding** This is assessed in terms of the credibility of the project plan (including, *inter alia*, the organisation structure, the staffing plan, the estimated costs, the financing pattern, the assessment of various inputs, and the marketing programme) and the details furnished to the financial institutions.

**Commitment** This is gauged by the resources (financial, managerial, material, and other) applied to the project and the zeal with which the objectives of the project, short-term as well as long-term, are pursued.

Managerial appraisal also involves an assessment of the calibre of the key technical and managerial personnel working on the projects, the schedule for training them, and the remuneration structure for rewarding and motivating them.

## **18.7 ■ INVESTMENT BANKING**

The term investment banking may suggest that it has something to do with investment or banking. In reality, it is neither. Investment banking, also referred to as merchant banking, primarily refers to the business of raising capital for companies and advising them on mergers, acquisitions, and restructuring. Investment banks also have businesses like asset management (mutual funds, hedge funds, private equity, and venture capital), stock broking and investment advisory, risk advisory and management, and custodial services. While a commercial bank has an inventory of cash deposits that it lends, an investment bank is just an intermediary that matches sellers of securities and businesses with the buyers of securities and businesses. Of course, in recent years investment banks with deep pockets have also supported their clients with financing arrangements.

## **Global and Indian Investment Banks<sup>5</sup>**

Globally, the investment banking industry is dominated by a handful players called the ‘Global Bulge Group’ comprising of Goldman Sachs, Merrill Lynch, Credit Swisse First Boston, Salomon Smith Barney (Citigroup), Morgan Stanley Dean Witter, J.P. Morgan, UBS Warburg, and Deutsche Bank. In addition, there are a number of ‘boutique’ firms specialising in niche areas. These banks handle significant fund-based business along with non-fund services.

Depending on the regulatory requirements in the operating environment of each country these activities are handled either on the same balance sheet or through subsidiaries and affiliates. As far as the U.S. investment banks are concerned, proprietary trading and investment contribute significantly to their revenues.

The major investment banks in India are Kotak Capital, Axis Capital, SBI Capital Markets, Citigroup, and JP Morgan. The core services provided by Indian investment banks are: (a) merchant banking, underwriting, and book running, (b) mergers and acquisitions advisory, and (c) corporate advisory relating to project financing, corporate restructuring, capital restructuring through repurchases, private equity, and so on. The allied services provided by Indian investment banks are (a) securities business, (b) asset management business, and (c) investment advisory and wealth management.

The Indian regulatory framework does not allow all investment banking functions to be performed within one legal entity. So, Indian investment banks follow a conglomerate structure in which different business segments are handled by different corporate entities to meet regulatory norms. For example, merchant banking business has to be in a separate company with a merchant banking license from SEBI. Asset management business has to be done by a mutual fund that requires a 3-tier structure under SEBI regulation. Securities business has to be done in a different company which requires stock exchange membership apart from SEBI registration.

## Role of Investment Bankers

### ***Investment Bankers are Not***

- **Consultants** who are asked to analyse market share, generate new product ideas, and so on.
- **Accountants** who audit a company's financial statements and certify their validity.
- **Lawyers** who understand every minor technicality in a merger agreement or covenant package.
- **Operations specialists** who do a detailed evaluation of internal processes and suggest measures for improvements.

### ***But Investment Bankers Do***

- Analyse a company's strategic position vis-à-vis its competitors and evaluate its viability.
- Provide a 'sanity check' on a company's financials and use the same for valuation purposes.
- Understand all the significant items in a legal agreement that affect their clients.
- Conduct a comparative evaluation of the operations of the client and its peers and highlight the key differences.

## SUMMARY

- Business firms raise money from promoters, banks, financial institutions, private investors, and general public.
- **Venture capital and private equity funds** support promising firms during their initial stages before they are ready to make a public offering of securities.
- The decision to **go public** is a complex one which calls for carefully weighing the benefits against costs. A company has to satisfy certain conditions before making an **initial public offering (IPO)**.
- A series of steps are involved in a public issue, whether it is an **IPO** or a **secondary offer**.
- The manager of a public issue may be likened to the 'conductor' of an opera who has to ensure the overall success of the issue.
- The **cost of a public issue** is between 6 and 12 percent. Underpricing of public issues appears to be a universal phenomenon.
- A **rights issue** involves selling securities in the primary market to the existing shareholders. In theory, the value of a share after the rights issue is expected to be  $(NP_0 + S)/(N + 1)$  and the value of a right is expected to be  $(P_0 - S)/(N+1)$ . The **subscription price** of a rights issue is irrelevant from the point of view of shareholder wealth.
- **Private placement** and **preferential allotment** involve sale of securities to a limited number of sophisticated investors such as financial institutions, mutual

funds, venture capital funds, private equity funds, banks, and so on.

- When a firm plans to sell securities, **dilution** is an issue that often comes up.
- The procedure associated with a **term loan** involves several steps.
- Financial institutions appraise a project from the marketing, technical, financial, economic, and managerial angles.

## QUESTIONS

1. What are the features of venture capital and private equity?
2. Discuss the state of the venture capital industry in India.
3. How should you prepare your business plan when you approach a venture capitalist/private equity fund?
4. What are the benefits and costs of going public?
5. List the conditions that an Indian company should satisfy for making an IPO.
6. Discuss the steps involved in a public issue.
7. What are the tasks of the manager of a public issue?
8. What costs are incurred in a public issue?
9. Why are IPOs generally underpriced?
10. What are the characteristics of rights?
11. Discuss the procedure for a rights issue.
12. What conditions have to be satisfied for obtaining the approval for a rights issue?
13. What is the theoretical value of a share after the rights issue?
14. What is the theoretical value of a right?
15. Discuss the impact of a rights issue on the wealth of shareholders with the help of a suitable example.
16. Compare a rights issue with a public issue.
17. What is the difference between private placement and preferential allotment?
18. What are the key features of the regulatory framework for the private placement of debt?
19. What regulations apply to preferential allotment?
20. Discuss the key steps involved in obtaining a term loan.
21. What are the types of appraisal done by financial institutions?
22. What is the role of investment bankers – what they are and what they are not?

## SOLVED PROBLEMS

- 18.1 The equity stock of Karnataka Beverages is selling for ₹ 120 per share. The company is planning to issue rights shares at ₹ 80 each in the ratio of 1:2 – this means that for every two shares held one rights share will be issued.

Calculate:

- (a) the theoretical value per share of the ex-rights stock
- (b) the theoretical value of a right

*Solution*

- (a) The theoretical value per share of the ex-rights stock is:

$$\frac{NP_0 + S}{N+1} = \frac{2 \times 120 + 80}{2+1} = ₹ 106.7$$

The theoretical value of a right is:

$$\frac{NP_0 + S}{N+1} - S = \frac{2 \times 120 + 80}{2+1} - 80 = ₹ 26.7$$

## PROBLEM

**18.1 Value of a Right** The equity stock of Narmada Foods is selling for ₹ 180 per share. The firm is planning to issue rights shares in the ratio of one right share for every existing five shares:

- (a) What is the theoretical value of a right if the subscription price is ₹ 150?
- (b) What is the ex-rights value per share if the subscription price is ₹ 160?
- (c) What is the theoretical value per share when the stock goes ex-rights, if the subscription price is ₹ 180? ₹ 100?

## MINICASE

PTR is a venerable restaurant of Bangalore set up decades ago by Prakash Naik. Despite its phenomenal success, Prakash Naik was unwilling to set up branches because he was concerned about the dilution of quality. In the last decade, however, alluring business opportunities and competitive compulsions persuaded Prakash Naik to set up a few branches of PTR at select locations in Bangalore and Chennai. This initiative, financed mainly through internal accruals, turned out to be quite profitable. Buoyed by this success, the Naik family, which owns 100 percent equity of PTR Limited, has chalked up an ambitious plan to set up a nation-wide chain of PTR restaurants and to support this initiative it wants to raise ₹ 100 crore through an initial public offering.

Prakash Naik has asked you to brief the family members on various issues associated with the move, by answering the following questions

- (a) What are the pros of going public?
- (b) What are the cons of going public?
- (c) What conditions should a company satisfy to make an IPO?
- (d) What is book building?
- (e) What are the principal steps in an IPO?
- (f) What role is played by the lead manager?

- (g) What are the costs of a public issue?
- (h) Can a company making a public issue freely price its shares?
- (i) Why is under-pricing of IPOs a universal phenomenon?
- (j) What is a rights issue?
- (k) What are the different kinds of dilution?

## PRACTICAL ASSIGNMENT

For the company chosen by you, identify the ways in which different forms of long-term finance was raised in the past ten years. Discuss the rationale for the same.

## **Appendix 18A**

### **Shift from Loans to Bonds**

While companies across the world raise debt funds using a mix of bank loans and bond issues, Indian companies traditionally have relied heavily on bank loans. Not much was done to develop the corporate bond market in India. Thanks to the mounting non-performing loans of the banking sector which is dominated by public sector banks, serious initiatives are being taken to shunt companies away from banks and toward bonds. Two such policy measures deserve a special mention. First, the maximum bank borrowing permitted for a company by 2019 has been set at ₹ 10,000 crore. Second, banks will be allowed to use corporate bonds as collateral for borrowing under the central bank's "repo" facility (presently only government banks are permitted). Once banks can use their holdings of corporate bonds for "repo" purposes they will have greater appetite for such bonds, either as creditors or as market-makers in their investment banking roles. This will facilitate the buying and selling of bonds by institutional clients. If these initiatives and other measures meant to create a vibrant corporate bond succeed, we will see a significant shift from loans to bonds in India.

## **Appendix 18B**

### **A Life Cycle View of Financing**

<b><i>Stage of Business</i></b>	<b><i>Sources of Financing</i></b>
Start-up Phase	<ul style="list-style-type: none"><li>• Personal savings</li><li>• Friends and relatives</li><li>• Angel investors</li><li>• Venture capital</li><li>• Corporate investors</li></ul>
Growth Phase One	<ul style="list-style-type: none"><li>• Banks and financial institutions</li><li>• Venture capital</li><li>• Private equity</li><li>• Leasing</li></ul>
Growth Phase Two	<ul style="list-style-type: none"><li>• Initial public offer</li><li>• Banks and financial institutions</li><li>• Leasing</li></ul>
Maturity Phase	<ul style="list-style-type: none"><li>• Commercial paper</li><li>• Bond issues</li><li>• Secondary equity offerings</li><li>• Banks and financial institutions</li><li>• Leasing</li></ul>

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<sup>1</sup> This section has been contributed by Prof. G. Sabarinathan of IIM, Bangalore.

<sup>2</sup> SEBI guidelines on IPOs tend to change. To know the latest guidelines, you are advised to visit the SEBI website: [www.sebi.gov.in](http://www.sebi.gov.in).

<sup>3</sup> QIBs mean public financial institutions as defined under the Companies Act, scheduled commercial banks, mutual funds, foreign institutional investors

registered with SEBI, multilateral and bilateral development financial institutions, venture capital funds and foreign venture capital funds registered with SEBI, insurance companies registered with the Insurance Regulatory and Development Authority, provident funds and pension funds with a minimum corpus of ₹ 25 crore and State Industrial Development Corporations.

- 4 This section draws heavily on K. Chandrasekhar, “IPO Underpricing : the International Experience”, an unpublished paper.
- 5 This section draws on the book, *Investment Banking: Concepts Analyses and Cases*, by Pratap G. Subramanyam and published by Tata McGraw Hill.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter18/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter18/index.html)

- Additional Solved Problems • Excel on Solved Problems



## PART–VI

### Capital Structure and Dividend Decisions

**19**

Capital Structure and Firm Value

**20**

Capital Structure Decision

**21**

Dividend Policy and Firm Value

**22**

Dividend Decision

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**19**  
**C H A P T E R**

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## **Capital Structure and Firm Value**

### **Learning Objectives**

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After studying this chapter you should be able to:

- ✓ Discuss the relationship between financial leverage and cost of capital as per the net income approach, net operating income approach, and traditional approach.
- ✓ State the two propositions of Modigliani and Miller position.
- ✓ Explain how the arbitrage mechanism works.
- ✓ Understand the implications of imperfections like taxes, bankruptcy costs, and agency costs for capital structure.
- ✓ Discuss the signalling theory and its implications for capital structure.

The two principal sources of finance for a business firm are equity and debt. What should be the proportions of equity and debt in the capital structure of a firm? Put differently, how much financial leverage should a firm employ?

The choice of a firm's capital structure is a marketing problem. It is essentially concerned with how the firm decides to divide its cash flows into two broad components, a fixed component that is earmarked to meet the obligations toward debt capital and a residual component that belongs to equity shareholders.

Since the objective of financial management is to maximise the value of the firm, the key issue is: What is the relationship between capital structure and firm value? Alternatively, what is the relationship between capital structure and cost of capital? Remember that valuation and cost of capital are inversely related. Given a certain level of earnings, the value of the firm is maximised when the cost of capital is minimised and vice versa.

There are different views on how capital structure influences value. Some argue that there is no relationship whatsoever between capital structure and firm value; others believe that financial leverage (i.e. the use of debt capital) has a positive effect on firm value up to a point and negative

effect thereafter; still others contend that, other things being equal, greater the leverage, greater the value of the firm.

This chapter explores the various positions taken on the relationship between financial leverage and cost of capital, one of the most controversial issues in finance.

## 19.1 ■ ASSUMPTIONS AND DEFINITIONS

To examine the relationship between capital structure and cost of capital (or firm value) the following simplifying assumptions are commonly made:

- There is no income tax, corporate or personal. We shall, however, later in the chapter consider the implications of taxes.
- The firm pursues a policy of paying all of its earnings as dividends. Put differently a 100 percent dividend payout ratio is assumed.
- Investors have identical subjective probability distributions of operating income (earnings before income and taxes) for each company.
- The operating income is not expected to grow or decline over time.
- A firm can change its capital structure almost instantaneously without incurring transaction costs.

The rationale for the above assumptions is to abstract away the influence of taxation, dividend policy, varying perceptions about risk, growth, and market imperfections so that the influence of financial leverage on cost of capital can be studied with greater clarity.

Given the above assumptions, the analysis focuses on the following rates:

$$r_D = \frac{I}{D} = \frac{\text{Annual interest charges}}{\text{Market value of debt}}$$

Assuming that the debt is perpetual,  $r_D$  represents the cost of debt.

$$r_E = \frac{E}{P} = \frac{\text{Equity earnings}}{\text{Market value of equity}}$$

When the dividend payout ratio is 100 percent and earnings constant,  $r_E$ , as defined here, represents the cost of equity.

$$r_A = \frac{O}{V} = \frac{\text{Operating income}}{\text{Market value of the firm}}$$

where  $V = D + E$ .  $r_A$  is the overall capitalisation rate of the firm. Since it is the weighted average cost of capital, it may be expressed as follows:

$$r_A = r_D \left[ \frac{D}{D+E} \right] + r_E \left[ \frac{E}{D+E} \right] \quad (19.1)$$

In terms of the above definitions, the question of interest to us is: **What happens to  $r_D$ ,  $r_E$ , and  $r_A$  when financial leverage,  $D/E$ , changes?** The

important answers to these questions are discussed in the following sections.

## 19.2 ■ NET INCOME APPROACH

According to this approach, the cost of debt,  $r_D$ , and the cost of equity,  $r_E$ , remain unchanged when  $D/E$  varies. The constancy of  $r_D$  and  $r_E$  with respect to  $D/E$  means that  $r_A$ , the average cost of capital, measured as

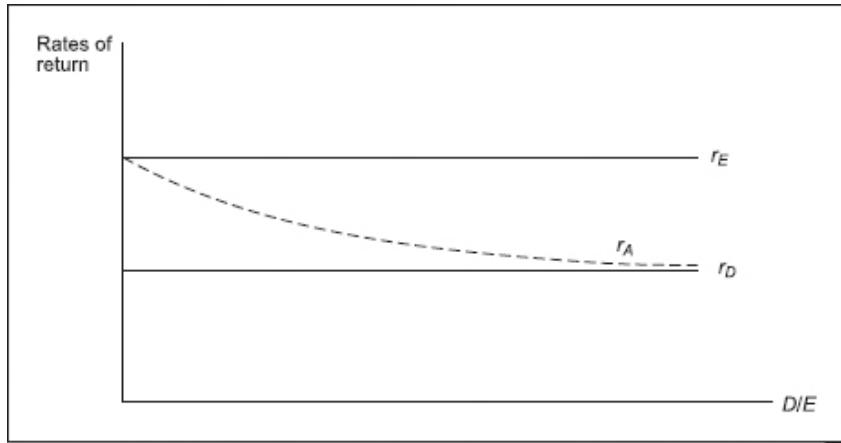
$$r_A = r_D \left[ \frac{D}{D+E} \right] + r_E \left[ \frac{E}{D+E} \right] \quad (19.1)$$

declines as  $D/E$  increases. This happens because when  $D/E$  increases,  $r_D$ , which is lower than  $r_E$ , receives a higher weight in the calculation of  $r_A$ .

The net income approach is graphically shown in [Exhibit 19.1](#).  $D/E$  is plotted on the abscissa;  $r_E$ ,  $r_D$ , and  $r_A$  are plotted on the ordinate.

From the graph it is clear that as  $D/E$  increases,  $r_A$  decreases because the proportion of debt, the cheaper source of finance, increases in the capital structure.

### Exhibit 19.1 Behaviour of $r_A$ , $r_D$ , and $r_E$ as per the Net Income Approach



**Illustration** The net income approach may be illustrated with a numerical example. There are two firms *A* and *B* similar in all aspects except in the degree of leverage employed by them. Financial data for these firms are shown below:

		<i>Firm A</i>	<i>Firm B</i>
<i>O</i>	Operating income <sup>1</sup>	₹ 10,000	₹ 10,000
<i>I</i>	Interest on debt	₹ 0	₹ 3,000
<i>P</i>	Equity earnings	₹ 10,000	₹ 7,000
<i>r<sub>E</sub></i>	Cost of equity capital	10%	10%
<i>r<sub>D</sub></i>	Cost of debt capital	6%	6%
<i>E</i>	Market value of equity	₹ 100,000	₹ 70,000
<i>D</i>	Market value of debt	₹ 0	₹ 50,000
<i>V</i>	Total value of the firm	₹ 100,000	₹ 120,000

The average cost of capital for firm *A* is:

$$6\% \times \frac{0}{100,000} + 10\% \times \frac{100,000}{100,000} = 10\%$$

The average cost of capital for firm *B* is:

$$6\% \times \frac{50,000}{120,000} + 10\% \times \frac{70,000}{120,000} = 8.3\%$$

## 19.3 ■ NET OPERATING INCOME APPROACH

According to the net operating income approach, the overall capitalisation rate and the cost of debt remain constant for all degrees of leverage. In the equation

$$r_A = r_D \left[ \frac{D}{D+E} \right] + r_E \left[ \frac{E}{D+E} \right] \quad (19.1)$$

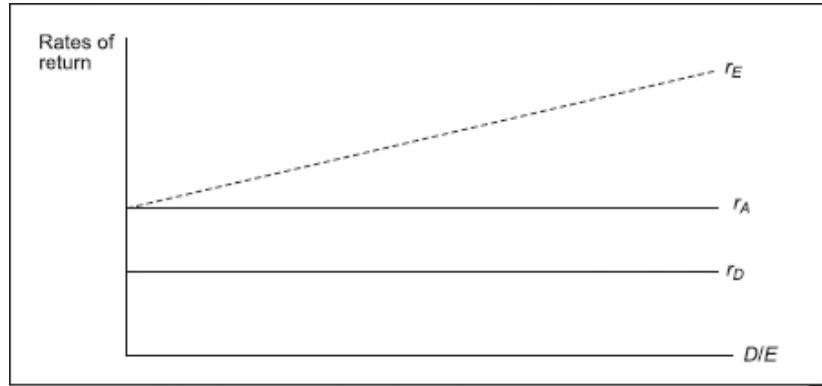
$r_A$  and  $r_D$  are constant for all degrees of leverage. Given this, the cost of equity can be expressed as:

$$r_E = r_A + (r_A - r_D) (D/E) \quad (19.2)$$

The above behaviour of  $r_D$ ,  $r_E$ , and  $r_A$  in response to changes in  $(D/E)$  is shown graphically in [Exhibit 19.2](#).

The critical premise of this approach is that the market capitalises the firm as a whole at a discount rate which is independent of the firm's debt-equity ratio. As a consequence, the division between debt and equity is irrelevant. An increase in the use of debt funds which are 'apparently cheaper' is offset by an increase in the equity capitalisation rate. This happens because equity investors seek higher compensation as they are exposed to greater risk arising from increase in the degree of leverage. They raise the capitalisation rate  $r_E$  (lower the price-earnings ratio, P/E), as the degree of leverage increases.

### Exhibit 19.2 Behaviour of $r_A$ , $r_D$ , and $r_E$ as per the Net Income Approach



The net operating income position has been advocated eloquently by David Durand. He argued that the market value of a firm depends on its net operating income and business risk. The change in the degree of leverage employed by a firm cannot change these underlying factors. It merely changes the distribution of income and risk between debt and equity without affecting the total income and risk which influence the market value of the firm. Hence the degree of leverage per se cannot influence the market value (or equivalently the average cost of capital) of the firm. Arguing in a similar vein, Modigliani and Miller, in a seminal contribution made in 1958, forcefully advanced the proposition that the cost of capital of a firm is independent of its capital structure. We will discuss their contribution later in this chapter.

**Illustration** Two firms, *A* and *B*, are similar in all respects except for the degree of leverage employed by them. Relevant financial data for these firms are shown below:

		<i>Firm A</i>	<i>Firm B</i>
<i>O</i>	Net operating income	10,000	10,000
<i>r<sub>A</sub></i>	Overall capitalisation rate	0.15	0.15
<i>V</i>	Total market value	66,667	66,667
<i>I</i>	Interest on debt	1,000	3,000
<i>r<sub>D</sub></i>	Debt capitalisation rate	0.10	0.10
<i>D</i>	Market value of debt	10,000	30,000
<i>E</i>	Market value of equity	56,667	36,667
<i>D/E</i>	Debt-equity ratio	0.176	0.818

The equity capitalisation rates of firms *A* and *B* are as follows:

$$\text{Firm } A : \frac{\text{Equity earnings}}{\text{Market value of equity}} = \frac{9,000}{56,667} = 0.159 = 15.9\%$$

$$\text{Firm } B : \frac{\text{Equity earnings}}{\text{Market value of equity}} = \frac{7,000}{36,667} = 0.191 = 19.1\%$$

The equity capitalisation rates of firms *A* and *B* can be calculated readily by employing Eq. (19.2)

$$\text{Firm } A: r_E = 15 + (15 - 10) 0.176 = 15.9\%$$

$$\text{Firm } B: r_E = 15 + (15 - 10) 0.818 = 19.1\%$$

## 19.4 ■ TRADITIONAL POSITION

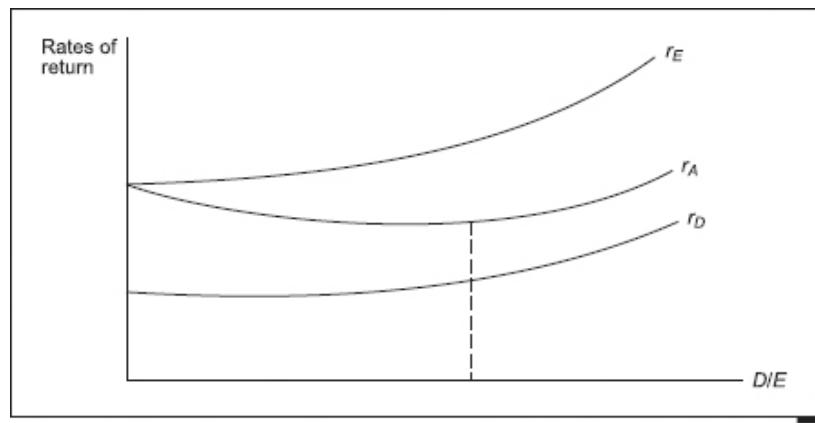
The main propositions of the traditional approach are:

1. The cost of debt capital,  $r_D$ , remains more or less constant up to a certain level of leverage but rises thereafter at an increasing rate.
2. The cost of equity capital,  $r_E$ , remains more or less constant or rises only gradually up to a certain level of leverage and rises sharply thereafter.
3. The average cost of capital,  $r_A$ , as a consequence of the above behaviour of  $r_E$  and  $r_D$ , (i) decreases up to a certain point; (ii) remains more or less unchanged for moderate increases in leverage thereafter; and (iii) rises beyond a certain point.

The traditional approach is not as sharply defined as the net income approach or the net operating income approach. Several shapes of  $r_D$ ,  $r_E$ , and  $r_A$  are consistent with this approach. [Exhibit 19.3](#) illustrates this approach graphically.

The principal implication of the traditional position is that the cost of capital is dependent on the capital structure and there is an optimal capital structure which minimises the cost of capital. At the optimal capital structure the real marginal cost of debt and equity is the same. Before the optimal point the real marginal cost of debt is less than the real marginal cost of equity and beyond the optimal point the real marginal cost of debt is more than the real marginal cost of equity.

**Exhibit 19.3 | Behaviour of  $r_A$ ,  $r_D$ , and  $r_E$  under the Traditional Approach**



## 19.5 ■ MODIGLIANI AND MILLER POSITION

We examined three conflicting views on capital structure. Which one is correct? To answer this question we need a formal theory of capital structure. Such a theory was first proposed by Franco Modigliani and Merton Miller<sup>3</sup> (MM, hereafter) in their classic contribution on capital structure which is regarded by many as the most important paper on modern finance – incidentally both of them subsequently 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.”

## **Assumptions**

Before discussing the MM propositions, let us look at the assumptions underlying their analysis:

*Perfect Capital Market* Information is freely available and there is no problem of asymmetric information; transactions are costless; there are no bankruptcy costs; securities are infinitely divisible.

*Rational Investors and Managers* Investors rationally choose a combination of risk and return that is most advantageous to them. Managers act in the interest of shareholders.

*Homogeneous Expectations* Investors hold identical expectations about future operating earnings.

*Equivalent Risk Classes* Firms can be grouped into 'equivalent risk classes' on the basis of their business risk.

*Absence of Taxes* There is no tax.

## Proposition I

Based on the above assumptions, MM's first proposition is:

"The value of a firm is equal to its expected operating income divided by the discount rate appropriate to its risk class. It is independent of its capital structure."

In symbols

$$V = D + E = O/r \quad (19.3)$$

where  $V$  is the market value of the firm,  $D$  is the market value of debt,  $E$  is the market value of equity,  $O$  is the expected operating income, and  $r$  is the discount rate applicable to the risk class to which the firm belongs.

Proposition I is identical to the net operating income approach. MM invoked an arbitrage argument to prove this proposition. In equilibrium, identical assets must sell for the same price, irrespective of how they are financed. Put differently, no matter how you package a set of cash flows its value remains unchanged. This is what the **law of conservation of value** implies. We have already encountered this idea in capital budgeting where it is called the **principle of value additivity**.

## Arbitrage Argument

To see how the arbitrage mechanism works, consider two firms,  $U$  and  $L$ , similar in all respects except in their capital structure. Firm  $U$  is an unlevered firm financed by equity alone whereas firm  $L$  is a levered firm financed by a mix of equity and debt. Relevant financial particulars of the two firms are shown in [Exhibit 19.4](#).

**Exhibit 19.4**

**Financial Particulars of Firms  $U$  and  $L$**

	<i>Firm U</i>	<i>Firm L</i>
Operating income (EBIT)	150,000	150,000
Interest	0	60,000
Equity earnings	150,000	90,000
Cost of equity	0.15	0.16
Market value of equity	1,000,000	562,500
Cost of debt	—	0.12
Market value of debt	0	500,000
Market value of the firm	1,000,000	1,062,500
Average cost of capital	0.15	0.1412

According to [Exhibit 19.4](#), the value of the levered firm  $L$  is higher than that of the unlevered firm even though both the firms have the same operating income and belong to the same risk class. Such a situation, argue MM, cannot persist because equity investors would do well to sell their equity in firm  $L$  (the firm which is valued more) and invest in firm  $U$  (the firm which is valued less) with personal leverage. For example, if an investor owns 10 percent equity in firm  $L$ , he would do well to:

1. Sell his equity in firm  $L$  for ₹ 56,250.
2. Borrow ₹ 50,000, an amount equal to 10 percent of  $L$ 's debt, at an interest rate of 12 percent.
3. Buy 10 percent of firm  $U$ 's equity for ₹ 100,000.

Note that while he collects ₹ 106,250 (₹ 56,250 as sale proceeds of his equity plus ₹ 50,000 as borrowings), his investment is only ₹ 100,000, leaving him with a surplus amount of ₹ 6,250. Yet his income remains the same:

<i>Old income from</i>	<i>New income from</i>

	<i>investment in L</i>	<i>investment in U</i>
■ 10% of firm's equity income	9,000	15,000
■ 12% interest on ₹ 50,000 loan		(6,000)
	9,000	9,000

If he invests the surplus amount of ₹ 6,250 also, his new income will be greater than his old income. Note that his risk exposure remains unchanged because he has merely replaced ₹ 50,000 of personal borrowing for his share of firm *L*'s corporate borrowing. Put differently, he has substituted homemade leverage for corporate leverage.

When investors sell their equity in firm *L* and buy the equity in firm *U* with personal leverage, the market value of firm *L* tends to decline and the market value of firm *U* tends to rise. This process continues until the market values of both the firms become equal because only then the possibility of earning a higher income, for a given level of investment and leverage, by arbitraging is eliminated. As a result, the cost of capital for both the firms becomes the same.

The above argument can be easily generalised. Consider the same two firms, an unlevered firm (*U*) and a levered firm (*L*), which have identical EBIT but different capital structure. Because firm *U* has no debt its market value,  $V_U$ , is the same as its equity value,  $E_U$ . For firm *L*, however, the market value of equity,  $E_L$ , is the value of the firm less the value of its debt; this means that  $E_L = V_L - D_L$

If an investor owns 10 percent of firm *L*'s stock, his investment and return would be as follows:

	<i>Investment</i>	<i>Income</i>
Equity	$.10 E_L$ $= .10 (V_L - D_L)$	$.10 (\text{EBIT} - \text{Interest})$

Alternatively, if he borrows 0.10  $D_L$  on personal account and buys 10 percent of firm *U*'s equity, his investment and income would be as follows:

	<i>Investment</i>	<i>Income</i>
Equity Borrowing	$.10 E_U$ $- .10 D_L$ $= .10 (V_U - D_L)$	$.10 \text{EBIT}$ $- .10 \text{Interest}$ $= .10 (\text{EBIT} - \text{Interest})$

Both the strategies provide the same income (10 percent of the profit of the firm after interest) and have the same risk exposure. In an efficient

market, investments that provide the same income and have the same risk must sell at the same price. So

$$.10(V_L - D_L) = .10(V_U - D_L)$$

Hence, the value of the unlevered firm,  $V_U$  must be the same as the value of the levered firm,  $V_L$ .

It makes no difference whether investors love risk or abhor risk. All would agree that the unlevered firm  $U$  and the levered firm  $L$  should have the same value. If investors can borrow and lend on their personal account on the same terms as the firm, they can mimic whatever a firm can do. Hence the value of the firm will be independent of its capital structure.

**Illustration** Ram Electronics currently is an all-equity financed company. Its financials are as follows:

Expected operating income	:	₹ 4,000,000
Number of shares	:	1,000,000
Earnings per share	:	₹ 4
Dividend per share	:	₹ 4
(All earnings are paid as dividends)		
Price per share	:	₹ 20
Market value of shares	:	₹ 20,000,000

Ram, the CEO of the company, believes that shareholders would benefit if the company employs debt and equity in equal proportions. So he proposes to issue ₹ 10 million of debentures carrying an interest rate of 15 percent and use the proceeds to buy back 500,000 equity shares. In defense of his proposal he has examined the situation under varying assumptions about operating income and the results of his analysis are presented in [Exhibit 19.5](#). The same results are shown graphically in [Exhibit 19.6](#).

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## Exhibit 19.5 | Return to Shareholders

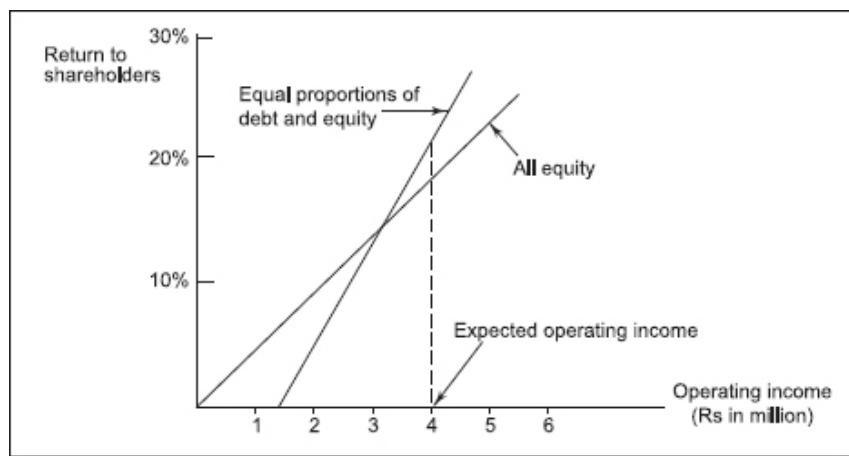
<i>A : Existing Capital Structure</i>			
<i>Basic Data</i>			
Operating income	₹ 4,000,000		
Number of shares	1,000,000		
Price per share	₹ 20		
Market value of shares	₹ 20,000,000		
<i>Possible Outcomes</i>			
Operating income	₹ 2,000,000	₹ 4,000,000	₹ 6,000,000
Equity earnings	₹ 2,000,000	₹ 4,000,000	₹ 6,000,000
Earnings per share	₹ 2	₹ 4	₹ 6
Return on equity	10%	20%	30%
		Expected outcome	
<i>B : Proposed Capital Structure</i>			
<i>Basic Data</i>			
Operating income	₹ 4,000,000		
Number of shares	500,000		
Price per share	₹ 20		
Market value of shares	₹ 10,000,000		
Market value of debt	₹ 10,000,000		
Interest at 15 percent	₹ 1,500,000		
<i>Possible Outcomes</i>			
Operating income	₹ 2,000,000	₹ 4,000,000	₹ 6,000,000
Interest	₹ 1,500,000	₹ 1,500,000	₹ 1,500,000
Equity earnings	₹ 500,000	₹ 2,500,000	₹ 4,500,000
Earnings per share	₹ 1	₹ 5	₹ 9
Return on equity	5%	25%	45%
		Expected outcome	

Armed with these results, Ram argues as follows: "The impact of leverage depends on the operating income. If the operating income exceeds ₹ 3,000,000, leverage increases the return on equity. If the operating income is ₹ 3,000,000, leverage has no effect on the return on equity. If the operating income is less than ₹ 3,000,000, leverage decreases the return on equity. Since we expect the operating income to be greater than ₹ 3,000,000, the break-even level, I believe that our shareholders will benefit from the proposed change in the capital structure."

To correct the flaw in Ram's argument, Shyam, the CFO of Ram Electronics, reasons as follows: "It is true that leverage will help shareholders as long as the operating income exceeds ₹ 3,000,000. However, shareholders can achieve that benefit on their own. For example, an investor can put ₹ 20 of his own, borrow ₹ 20 at an interest rate of 15 percent, and invest ₹ 40 to buy two unlevered shares of Ram Electronics. His payoff from such a strategy varies with Ram's operating income as shown in [Exhibit 19.7](#). This is identical to what he would get if he buys one

levered share of Ram Electronics – this is evident from a comparison of the last two lines of [Exhibit 19.5](#) and [19.7](#). Hence a share in the levered company must also sell for ₹ 20. If Ram Electronics resorts to financial leverage, it will not permit investors to achieve what they can do on their own and hence it will not benefit them.” Note that the argument of Shyam is the same as the one used by MM in support of their proposition I.

### **Exhibit 19.6 Return to Shareholders**



### **Exhibit 19.7 Payoff to an Investor Who Resorts to Personal Leverage**

	Operating income		
Earnings per share	₹ 2,000,000	₹ 4,000,000	₹ 6,000,000
Earnings on two shares	₹ 2	₹ 4	₹ 6
Less: interest at 15% on ₹ 20 of borrowing	₹ 4	₹ 8	₹ 12
Net earnings	₹ 3	₹ 3	₹ 3
Return on ₹ 20 investment	5%	25%	45%

## Proposition II

Look at the implications of proposition I for the expected return to the equity shareholders of Ram Electronics:

	<i>Current capital structure 100% equity</i>	<i>Proposed capital structure 50% equity &amp; 50% debt</i>
Expected earnings per share	₹ 4	₹ 5
Price per share	₹ 20	₹ 20
Expected return to equity shareholders	20%	25%

An increase in financial leverage increases the expected earnings per share but not the share price. Why? The answer is that the change in the expected earnings is offset by a corresponding change in the return required by the shareholders. Let us see how this comes about.

The expected return on Ram Electronics' assets is:

$$\text{Expected return on assets} = r_A = \frac{\text{Expected operating income}}{\text{Market value of all securities}}$$

$r_A$  is not affected by leverage because in perfect capital markets, leverage has no effect on a firm's operating income or the market value of its securities.

Suppose that an investor owns all of a firm's equity as well as its debt, entitling him to all of the operating income of the firm. Therefore the expected return on his portfolio will be equal to  $r_A$ .

The expected return on a portfolio is equal to the weighted average of expected returns on its individual securities. Hence

$$r_A = \left[ \frac{D}{D+E} \right] r_D + \left[ \frac{E}{D+E} \right] r_E \quad (19.4)$$

$$\begin{aligned} \text{Expected return on assets} &= \text{Proportion of debt} \times \text{Expected return on debt} \\ &\quad + \text{Proportion of equity} \times \text{Expected return on equity} \end{aligned}$$

Rearranging this equation we get:

$$r_E = r_A + (r_A - r_D) (D/E) \quad (19.5)$$

Expected return on equity =  $\frac{\text{Expected return on assets}}{\text{Expected return of assets}} + \left[ \frac{\text{Expected return of assets}}{\text{Expected return on debt}} - 1 \right] \text{Debt-equity ratio}$

This is the second proposition of MM. It says: "The expected return on equity is equal to the expected rate of return on assets, plus a premium. The premium is equal to the debt-equity ratio times the difference between the expected return on assets and the expected return on debt."

Let us verify MM's proposition II for Ram Electronics. If Ram Electronics has an all-equity capital structure, the expected return on its equity is:

$$r_E = r_A = \frac{4,000,000}{2,000,000} = 0.20 \text{ or } 20 \text{ percent}$$

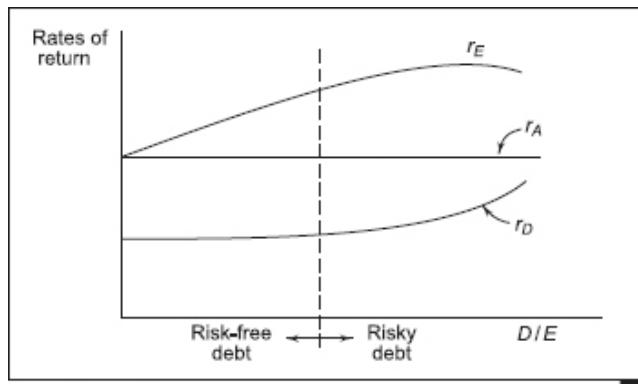
If Ram Electronics switches to a debt-equity ratio of 1 (a capital structure in which debt and equity are in equal proportions), the expected return on equity is:

$$\begin{aligned} r_E &= r_A + (r_A - r_D) (D/E) \\ &= 0.20 + (0.20 - 0.15) 1 \\ &= 0.25 \text{ or } 25 \text{ percent} \end{aligned}$$

The general implications of MM's proposition II are shown in the figure displayed in [Exhibit 19.8](#). This figure assumes that for low levels of debt, the firm's debt is considered risk-free. This implies that  $r_D$  is independent of  $D/E$  and hence  $r_E$  increases linearly with  $D/E$ . As the debt of the firm crosses a threshold limit, the risk of default increases and the expected return on debt,  $r_D$ , rises. To compensate for this, the rate of increase in  $r_E$  decreases, as shown in [Exhibit 19.8](#). It essentially means that at higher levels of debt,  $r_E$  becomes less sensitive to further borrowings. Why? This happens because as the  $D/E$  ratio increases beyond the threshold level, a portion of the firm's business risk is borne by the suppliers of debt capital. As the firm borrows more, more of its business risk is shifted from shareholders to creditors.

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## Exhibit 19.8 | Implications of MM's Proposition II



## The Risk-Return Tradeoff

Proposition I says that financial leverage has no effect on the wealth of shareholders and proposition II says that the rate of return expected by shareholders increases with financial leverage.

Why are shareholders indifferent to increased leverage when it enhances expected return? The reason is that an increase in expected return is accompanied by an increase in risk which in turn raises the shareholders' required rate of return.

### Exhibit 19.9 Effect of Leverage on Risk

	Operating Income	
	2,000,000	4,000,000
<u>Debt-equity Ratio = 0:1</u>		
Earnings per share	₹ 2	₹ 4
Return on equity	10%	20%
<u>Debt-equity Ratio = 1:1</u>		
Earnings per share	₹ 1	₹ 5
Return on equity	5%	25%

Let us look at what happens to the risk of Ram Electronics' shareholders if it shifts to a debt-equity ratio of 1:1. [Exhibit 19.9](#) shows how a shortfall in operating income affects the payoff under alternative capital structures. From this exhibit we find that when Ram Electronics has an all-equity capital structure, a decline of ₹ 2,000,000 in operating income reduces the return on equity by 10 percent. On the other hand, if the firm shifts to a debt-equity ratio of 1:1, a decline of ₹ 2,000,000 in operating income reduces the return on equity by 20 percent. Thus, leverage magnifies the spread of percentage returns. This means that it raises the beta of the firm's equity shares.

We learnt that the expected return on the firm's assets is a weighted average of the expected return on its securities. Likewise, the beta of a firm's assets is the weighted average of the beta of its securities.

$$\beta_A = \left[ \frac{D}{D+E} \right] \times \beta_D + \left[ \frac{E}{D+E} \right] \beta_E \quad (19.6)$$

Beta of assets = Proportion of debt × Beta of debt + Proportion of equity × Beta of equity

Rearranging this equation gives the expression for the beta of the firm's equity.

$$\beta_E = \beta_A + D / E \times (\beta_A - \beta_D) \quad (19.7)$$

$$\text{Beta of Equity} = \frac{\text{Beta of assets}}{\text{equity}} + \frac{\text{Debt-}}{\text{assets}} \left[ \frac{\text{Beta of assets}}{\text{debt}} - \frac{\text{Beta of debt}}{\text{debt}} \right]$$

The reason why investors require higher return as leverage increases is now obvious. The required return rises to match the increased risk (beta).

## Criticisms of MM Theory

The leverage irrelevance theorem of MM is valid if the perfect market assumptions underlying their analysis are satisfied. The real world, however, is characterised by various imperfections:

- Firms are liable to pay taxes on their income. In addition, investors who receive returns from their investments in firms are subject to taxes at a personal level.
- Bankruptcy costs can be quite high.
- Agency costs exist because of the conflict of interest between managers and shareholders and between shareholders and creditors.
- Managers seem to have a preference for a certain sequence of financing.
- Informational asymmetry exists because managers are better informed than investors.
- Personal leverage and corporate leverage are not perfect substitutes.

Thanks to these imperfections, the capital structure of the firm has a bearing on valuation and firms do regard the capital structure decision as a major issue. The following sections will examine the implications of these imperfections.

## **19.6 ■ TAXATION AND CAPITAL STRUCTURE**

Presence of taxes is a major imperfection in the real world. This section examines the implications of corporate and personal taxes for the capital structure.

## Corporate Taxes

When taxes are applicable to corporate income, debt financing is advantageous. Why? While dividends and retained earnings are not deductible for tax purposes, interest on debt is a tax-deductible expense. As a result, the total income available for both shareholders and debtholders is greater when debt capital is used.

To illustrate, consider two firms which have an expected operating income of ₹ 1 million and which are similar in all respects, except in the degree of leverage employed by them. Firm A employs no debt capital whereas firm B has ₹ 4 million in debt capital on which it pays 12 percent interest. The corporate tax rate applicable to both the firms is 50 percent. The income to shareholders and debtholders of these two firms is shown in [Exhibit 19.10](#). From this exhibit it is clear that the combined income of debtholders and shareholders of the levered firm (firm B) is higher than that of the unlevered firm (firm A).

**Exhibit 19.10 Corporate Taxes and Income of Debtholders and Shareholders**

	A	B
Operating income	1,000,000	1,000,000
Interest on debt	0	480,000
Profit before taxes	1,000,000	520,000
Taxes	500,000	260,000
Profit after tax (Income available to shareholders)	500,000	260,000
Combined income of debtholders and shareholders	500,000	740,000

The explanation for this is fairly simple: the interest payment of ₹ 480,000 made by the levered firm brings a tax shield of ₹ 240,000 (₹ 480,000 x tax rate). Hence the combined income of debtholders and shareholders of firm B is higher by this amount.

If the debt employed by a levered firm is perpetual in nature, the present value of the tax shield associated with interest payment can be obtained by applying the formula for perpetuity.

$$\text{Present value of tax shield} = \frac{t_C r_D D}{r_D} = t_C D \quad (19.8)$$

where  $t_C$  is the corporate tax rate,  $D$  is the market value of debt, and  $r_D$  is the interest rate on debt.

For firm *B* the present value of tax shield works out to: 0.5 (₹ 4,000,000) = ₹ 2,000,000. This represents the increase in its market value arising from financial leverage.

In general, the value of a firm may be represented as:

$$V = \frac{O(1-t_C)}{r} + t_C D \quad (19.9)$$

where *V* is the value of the firm, *O* is the operating income, *t<sub>C</sub>* is the corporate tax rate, *r* is the capitalisation rate for the unlevered firm, and *D* is the market value of debt.

The first term in the above equation, *O* (1 - *t<sub>C</sub>*)/*r*, represents the value of the unlevered firm and the second term, *t<sub>C</sub>* *D*, denotes the value of tax shield arising out of financial leverage. Hence it implies that:

$$\begin{aligned} \text{Value of levered firm} &= \text{Value of unlevered firm} + \text{Gain from leverage} \\ V_L &= V_U + t_C D \end{aligned} \quad (19.10)^4$$

From Eq. (19.10) it is evident that greater the leverage, greater the value of the firm, other things being equal. This implies that the optimal strategy of a firm should be to maximise the degree of leverage in its capital structure.

## Corporate Taxes and Personal Taxes

What happens when personal taxes are considered along with corporate taxes? If investors pay the same rate of personal taxes on debt returns as well as equity returns, the advantage of corporate tax in favour of debt capital remains intact. This point can be proved by applying a 30 percent personal tax rate to debt as well as equity returns in the previous example. The income to debtholders and shareholders after taxes, both corporate and personal, is calculated in [Exhibit 19.11](#). From this exhibit it is clear that although the combined post-tax income of shareholders and debtholders decreases in both the firms, the proportional advantage of debt remains unaffected because the combined income of shareholders and debtholders still is higher by 48 percent in the levered firm.

If the personal tax rate is  $t_p$ , the tax advantage of debt becomes:

$$t_c D (1 - t_p) \quad (19.11)$$

### Exhibit 19.11 Personal Taxes and Income of Debtholders and Shareholders

	Firm A	Firm B
Income available to shareholders	500,000	260,000
Less personal taxes at 30%	150,000	78,000
Income available to shareholders after personal taxes	350,000	182,000
Income to debtholders	0	480,000
Less personal taxes at 30%	-	144,000
Income to debtholders after personal taxes	0	336,000
Combined income of shareholders and debtholders after personal taxes	350,000	518,000

This formula is valid when the personal tax rate applicable to equity as well as debt income is the same as was assumed in the preceding example. In many countries, including India, this is not true. Equity income, which comprises of dividend income and capital gains, is taxed at a rate which is effectively lower than that of debt income. When the tax rate on equity income ( $t_{pe}$ ) differs from the tax rate on debt income ( $t_{pd}$ ), the tax advantage of a rupee of debt may be expressed as follows:

$$\left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right] \quad (19.12) \quad 5$$

To illustrate, if  $t_c$  is 50 percent,  $t_{pe}$  5 percent, and  $t_{pd}$  30 percent, the tax advantage of every rupee of debt is:

$$1 - \left[ \frac{(0.5)(0.95)}{(0.70)} \right] = 0.32 \text{ rupee}$$

This means that:

$$V_L = V_U + D \left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right] \quad (19.13)$$

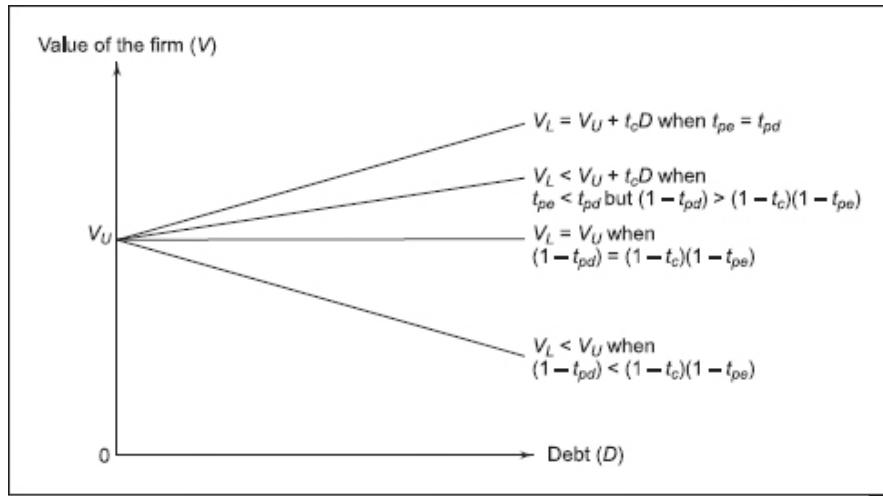
Thus the effect of financial leverage on firm value depends on corporate tax rate, personal tax rate on equity income, and personal tax rate on debt income.

From Eq. (19.13) we get the following:

- | <b>When</b>  | <b>The value of the firm is</b>                             |
|--|---|
| ■ $t_{pe} = t_{pd}$  | ■ $V_L = V_U + t_c D$                                       |
| ■ $t_{pe} < t_{pd}$ but $(1 - t_{pd}) > (1 - t_c)(1 - t_{pe})$ | ■ $V_L$ is lesser than $V_U + t_c D$ but greater than $V_U$ |
| ■ $(1 - t_{pe}) = (1 - t_c)(1 - t_{pe})$                       | ■ $V_L = V_U$   |
| ■ $(1 - t_{pd}) < (1 - t_c)(1 - t_{pe})$                       | ■ $V_L < V_U$   |

The above relationships are shown graphically in [Exhibit 19.12](#).

### Exhibit 19.12 Effect of Financial Leverage on Firm Value with Corporate and Personal Taxes



## **19.7 ■ TRADEOFF THEORY**

So far we glossed over financial distress costs and agency costs. When these are considered the MM results are changed significantly.

## **Costs of Financial Distress**

When a firm is unable to meet its obligations, it results in financial distress that can lead to bankruptcy. When a firm experiences financial distress several things can happen.

1. Arguments between shareholders and creditors delay the liquidation of assets. Bankruptcy cases often take years to settle and during this period machineries and equipments rust, buildings deteriorate, inventories become obsolete, so on and so forth.
2. If assets are sold under distress conditions, they may fetch a price that is significantly less than their economic value.
3. The legal and administrative costs associated with bankruptcy proceedings are quite high.
4. Managers become myopic. They may lower the quality of goods, provide inadequate after sales service, ignore employee welfare, and unfairly stretch payments to suppliers and creditors. In a bid to survive in the short run, they may sacrifice actions meant to build value in the long run.
5. Employees, customers, suppliers, distributors, investors, and other stakeholders dilute their commitment to the firm and this has an adverse impact on sales, operating costs, and financing costs.

1, 2, and 3 are called the direct costs of financial distress whereas 4 and 5 are called the indirect costs of financial distress. Together the direct and indirect costs of financial distress tend to be quite high.

A major contributor to financial distress is debt. The greater the level of debt and the larger the debt servicing burden associated with it, the higher the probability of financial distress.

## Agency Costs

We introduced the notion of agency costs in [Chapter 1](#). There is an agency relationship between the shareholders and creditors of firms that have substantial amounts of debt. In such firms shareholders have little incentive to limit losses in the event of a bankruptcy. Hence, managers acting in the interest of shareholders tend to invest in highly risky and volatile projects that increase the wealth of shareholders at the expense of creditors.

To illustrate, suppose that a firm presently has assets worth ₹ 500 million (they are either in cash or easily convertible into cash) and a debt with a par value of ₹ 540 million maturing in a year from now. Management has two investment options. It can invest ₹ 500 million in a risk-free certificate of deposit that pays an interest of 8 percent or it can invest in a risky project that will either be worth ₹ 1000 million or nothing in a year from now.

Even if the risky project has a low probability of success and a negative NPV, management (acting in the interest of shareholders) will plump for it. Why? If the management invests in the risk-free certificate of deposit, the payoff from it, ₹ 540 million, will be just sufficient to meet the creditors' claim of ₹ 540 million, leaving a nil residual value for shareholders. So the value of the firm's shares will fall to zero. On the other hand, if the management invests in the risky project, there is a chance, no matter how small, the firm will be worth ₹ 1000 million a year from now and hence the shares will have some value. In essence, the creditors bear the downside risk of the risky project whereas the shareholders enjoy the upside potential.

Thus, creditors face the problem of moral hazard when they lend to a firm that has a large outstanding debt in relation to the value of its assets. In such a firm, managers are likely to redeploy the assets of the firm in such a way that it actually diminishes the value of the firm but still benefits the shareholders at the expense of the creditors. Hence, prudent creditors would limit their lending to such a firm in the first place.

Because shareholders may exploit creditors in these and other ways, creditors seek protection in the form of various restrictive covenants which may hamper the operational flexibility of the firm. In addition, the firm has to be monitored to ensure that the covenants are being adhered to and the costs of monitoring are almost invariably passed on to shareholders in the form of higher debt costs. The loss in efficiency on account of restrictions on operational freedom plus the cost of monitoring represent agency costs associated with debt.

We discussed the agency costs of debt. Can there be agency benefits of debt? Yes, because a firm that employs debt is subject to the disciplining effect of debt. Often, managers have a tendency to over-invest in their favourite projects, even though they may be negative-NPV projects. This is likely to happen more in firms that have substantial free cash flows. Use of debt may check the empire-building tendencies of managers and restrain them from investing in negative-NPV projects.

## Effect of Financial Distress and Agency Costs

If the MM model with tax effect is valid, the value of a levered firm is expressed as

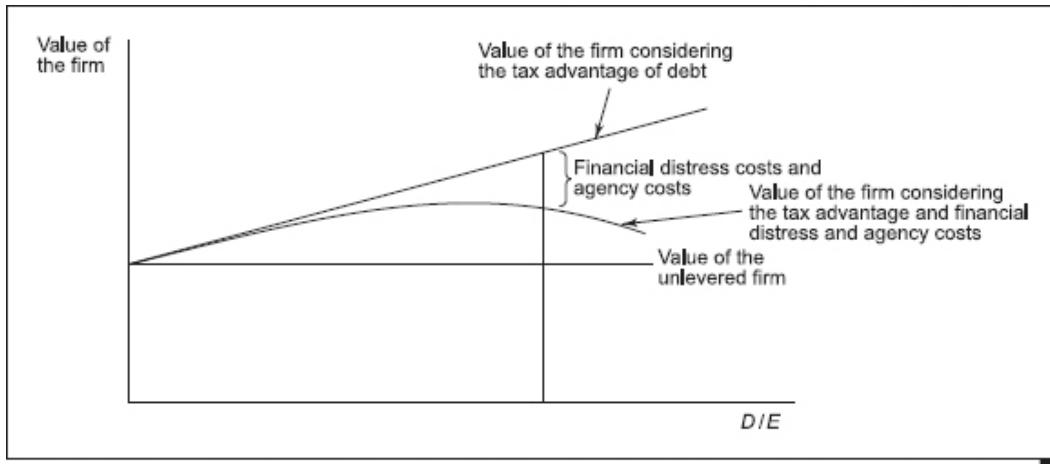
$$\begin{array}{lcl} V_L & = & V_U + t_c D \\ \text{Value of the} & = & \text{Value of the} + \text{Tax advantage} \\ \text{levered firm} & \text{unlevered firm} & \text{of debt} \end{array} \quad (19.14)$$

This implies that  $V_L$  rises as debt ( $D$ ) increases. However, as debt increases, financial distress and agency costs would cause  $V_L$  to decline. Considering the tax effect and financial distress and agency costs, the value of a levered firm may be expressed as:

$$\begin{aligned} \text{Value of the levered firm} &= \text{Value of the unlevered firm} + \text{Tax advantage of debt} \\ &\quad - \text{Present value of expected} - \text{Present value of agency costs} \\ &\quad \text{costs of financial distress} \end{aligned}$$

This relationship is graphed in [Exhibit 19.13](#).

**Exhibit 19.13 Trade off Model**



According to the tradeoff theory, every firm has an optimal debt-equity ratio that maximises its value. The optimal debt-equity ratio of a profitable firm that has stable, tangible assets would be higher than the optimal debt-equity ratio of an unprofitable firm with risky, intangible assets. Why? The answer is simple. A profitable firm can avail of tax shelter associated with debt fully. Further, when assets are stable and tangible, financial distress costs and agency costs tend to be lower.

How well does the tradeoff theory explain corporate financing behaviour? It explains reasonably well some industry differences in capital structures. For example, power companies and refineries use more debt as

their assets are tangible and safe. Software companies, on the other hand, borrow less because their assets are mostly intangible and somewhat risky.

The tradeoff theory, however, cannot explain why some profitable companies depend so little on debt. For example, Hindustan Unilever Limited and Colgate Palmolive India Limited, two highly profitable companies, use very little debt. They pay large amounts by way of income tax which they can possibly save to some extent by using debt without causing any concern about their solvency.

There is an alternative theory, the signaling theory, which explains why profitable firms use little debt. We discuss this theory next.

## 19.8 ■ SIGNALING THEORY

In a pioneering study published in 1961, Gordon Donaldson examined how companies actually establish their capital structure. The findings of his study are summarised below:

1. Firms prefer to rely on internal accruals, that is, on retained earnings and depreciation cash flow.
2. Expected future investment opportunities and expected future cash flows influence target dividend payout ratios. Firms set the target payout ratios at such a level that capital expenditures, under normal circumstances, are covered by internal accruals.
3. Dividends tend to be sticky in the short run. Dividends are raised only when the firm is confident that the higher dividend can be maintained; dividends are not lowered unless things are very bad.
4. If a firm's internal accruals exceed its capital expenditure requirements, it will invest in marketable securities, retire debt, raise dividends, resort to acquisitions, or buyback its shares.
5. If a firm's internal accruals are less than its non-postponable capital expenditures, it will first draw down its marketable securities portfolio and then seek external finance. When it resorts to external finance, it will first issue debt, then convertible debt, and finally equity stock.

Put differently, 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 it. Further, the capital market ordinarily does not view the use of retained earnings negatively.

When the financing needs of the firm exceed 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.

Noting the inconsistency between the trade-off theory and the pecking order of financing, Myers proposed a new theory, called the **signaling**, or **asymmetric information**, theory of capital structure.

A critical premise of the trade-off theory is that all parties have the same information and homogeneous expectations. Myers argued that if there is asymmetric information and divergent expectations then Donaldson's findings can be explained logically.

## Combined Picture

By combining the tradeoff and asymmetric information theories, we get the following picture:

- Debt financing provides tax savings, so firms should employ some debt in their capital structure. However, financial distress and agency costs put a limit on debt that can be beneficially employed. The costs of financial distress are especially severe for firms that have valuable intangible growth options. Such firms should employ lesser debt in comparison to firms whose assets are mostly in the form of tangible assets.
- Due to problems of asymmetric information and floatation costs, low growth firms should follow a pecking order in which retained earnings are followed by debt and then by external equity. High growth firms depending mainly on tangible assets should also follow the same pecking order but they will have to rely on external equity along with debt. However, high growth firms depending mainly on intangible growth options, should rely on external equity rather than debt because financial distress can impose severe penalties on them.
- Because of the problem of asymmetric information, firms would do well to maintain reserve borrowing capacity which will enable them to exploit profitable investment opportunities without issuing equity shares at a low price. The need to maintain reserve borrowing power implies that the actual debt ratio will be lower compared to what is suggested by the trade-off theory.

## SUMMARY

- Several positions have been taken on the relationship between capital structure and firm value. The **net income approach** says that the average cost of funds declines as the leverage ratio increases. The **net operating income approach** holds that the cost of capital remains unchanged when the leverage ratio varies. The **traditional approach** argues that the cost of capital decreases as the leverage ratio increases, up to a point, but thereafter the cost of capital increases with the leverage ratio. The **Modigliani and Miller position (MM)** is similar to the net operating income approach.
- The **MM position** is stated in terms of two basic propositions. MM's first proposition is that the value of a firm is equal to its expected operating income divided by the discount rate appropriate to its risk class:  $V = D + E = O/r$ . MM's

second proposition says that the expected return on equity is equal to the expected return on assets, plus a premium:  $r_E = r_A + (r_A - r_D) (D/E)$ .

- The **leverage irrelevance hypothesis** of MM is valid if the perfect market assumptions underlying their analysis are satisfied. The real world, however, is characterised by imperfections such as taxes (corporate and personal), bankruptcy costs, agency costs, and informational asymmetry.
- The value of a firm, when **corporate tax** is considered, is:  $V = O (1 - t_c)/r + t_c D$ .
- When **personal taxes** are considered, along with corporate taxes, the gain in value per rupee of debt is equal to:

$$\left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right]$$

- The issue of optimal debt policy was answered in a novel, though controversial, manner by Merton Miller. He argued that while there is an optimal debt-equity ratio for the economy as a whole, no single firm can benefit by varying its own debt-equity ratio.
- The greater the level of debt, the higher the probability of financial distress. There are **direct** and **indirect costs** associated with **financial distress**.
- There is an **agency relationship** between shareholders and creditors of firms that have substantial sums of debt.
- According to the **tradeoff theory**, the optimal debt-equity ratio of a firm depends on the tradeoff between the tax advantage of debt on the one hand and the financial distress and agency costs on the other hand.
- In the real world firms seem to follow a **pecking order of financing** which goes as follows: internal finance (retained earnings), debt finance, and external equity finance.
- Myers proposed a new theory called the **signaling**, or **asymmetric information** theory to explain the pecking order of financing.
- Because of the problem of asymmetric information, firms would do well to maintain **reserve borrowing power**.

## QUESTIONS

1. What simplifying assumptions are commonly made to study the relationship between capital structure and firm value?
2. What is the relationship between leverage and cost of capital as per the net income approach?
3. Discuss the relationship between leverage and cost of capital as per the net operating income approach?
4. What are the main propositions of the traditional approach?

5. State MM's proposition I. Illustrate how the arbitrage mechanism works with the help of an example.
6. State MM's proposition II. Show graphically the general implications of MM's proposition II.
7. Why are shareholders indifferent to increased leverage when it enhances expected return?
8. What imperfections characterise the real world?
9. Discuss the implications of corporate taxes for firm valuation?
10. What happens when personal taxes are considered along with corporate taxes?
11. Explain the argument of Merton Miller which says that leverage does not matter, even in a world of taxes.
12. What are the costs of financial distress?
13. Discuss the agency costs that arise when firms employ substantial amounts of debt.
14. What is the relationship between leverage and firm value according to the tradeoff theory?
15. How well does the tradeoff theory explain corporate financing behaviour?
16. What were the findings of Gordon Donaldson's study on how companies actually establish their capital structure?
17. Discuss the pecking order of financing.
18. What are the implications of asymmetric information, or signaling, theory for corporate financial policy?
19. Summarise the picture that emerges when you combine the tradeoff and asymmetric information theories.

## SOLVED PROBLEMS

19.1 The following information is available for Avinash Metals.

■ Net operating income	₹ 40 million
■ Interest on debt	₹ 10 million
■ Cost of equity	18 percent
■ Cost of debt	12 percent

- (a) What is the average cost of capital of Avinash?
- (b) What happens to the average cost of capital of Avinash, if it employs ₹ 100 million of debt to finance a project which earns an operating income of ₹ 20 million? Assume that the net operating income (NOI) method applies and there are no taxes.

*Solution*

- (a) The market value of debt and equity are as follows:

$$\text{Market value of debt} = (\text{₹ } 10 \text{ million}/0.12) = \text{₹ } 83.33 \text{ million}$$

Market value of equity = ( $\text{₹ } 30 \text{ million}/0.18$ ) =  $\text{₹ } 166.67 \text{ million}$

Hence, the average cost of capital for Avinash is:

$$12 \times \frac{83.33}{250.00} + 18 \times \frac{166.67}{250.00} = 16 \text{ percent}$$

- (b) If Avinash employs  $\text{₹ } 100 \text{ million}$  of debt to finance a project which earns an operating income of  $\text{₹ } 20 \text{ million}$ , the following financial picture emerges.

Net operating income	: ₹ 60 million
Interest on debt	: ₹ 22 million
Equity earnings	: ₹ 38 million
Market value of equity	: ₹ 211.11 million
Market value of debt	: ₹ 183.33 million
Market value of the firm	: ₹ 394.44 million

Hence, the average cost of capital for Avinash changes to:

$$12 \times \frac{183.33}{394.44} + 18 \times \frac{211.11}{394.44} = 15.21 \text{ percent}$$

- 19.2 The management of Vibgyor Fabrics subscribes to the NOI approach and believes that its cost of debt and overall cost of capital will remain at 9 percent and 12 percent respectively. If the debt-equity ratio is 0.8, what is the cost of equity?

*Solution*

As per the NOI approach, the cost of equity is:

$$\begin{aligned} r_E &= r_A + (r_A - r_D) D/E \\ &= 12 + (12 - 9) 0.8 = 14.4 \text{ percent} \end{aligned}$$

- 19.3 Ram Limited and Shyam Limited belong to the same risk class – these companies are identical in all respects except that Ram Limited has no debt in its capital structure, whereas Shyam Limited employs debt in its capital structure. The relevant financial particulars of the two companies are given below:

	Ram Limited	Shyam Limited
Net operating income	₹ 1,000,000	₹ 1,000,000
Debt interest	---	₹ 300,000
Equity earnings	₹ 1,000,000	₹ 700,000
Debt capitalisation rate	--	10%
Equity capitalisation rate	14%	18%
Market value of debt	--	₹ 3,000,000
Market value of equity	₹ 7,142,857	₹ 3,888,888
Total market value of the firm	₹ 7,142,857	₹ 6,888,888
Average cost of capital	14%	14.52%

Praveen owns ₹ 100,000 worth of Ram Limited equity. What arbitrage will he resort to?

*Solution*

As a rational investor, Praveen would do well to:

1. Sell his equity holding of ₹ 100,000 in Ram Limited.
2. Buy 1.452 percent of equity as well as debt of Shyam Limited (This is what Praveen can buy with ₹ 1,000,000).

If he does so he sacrifices an income of ₹ 14,000 (the income from ₹ 100,000 investment in the equity of Ram Limited) but gains an income of ₹ 14,520 (₹ 4,356 from debt and ₹ 10,164 from equity of Shyam Limited).

19.4 Consider the following information for Optima Limited

■ Net operating income	₹ 210 million
■ Corporate tax rate	30 percent
■ Market (as well as book) value	₹ 300 million
■ Capitalisation rate applicable to a debt free firm in the risk class to which Optima belongs	16 percent

What will be the value of Optima Limited according to the Modigliani and Miller approach?

*Solution*

According to the Modigliani and Miller approach:

$$\begin{aligned}V &= O \frac{(1-t_c)}{K} + t_c B \\&= 210 \frac{(1-0.3)}{0.16} + (0.3 \times 300) \\&= 918.75 + 90 = ₹ 1008.75 \text{ million}\end{aligned}$$

19.5 If  $t_c = 30$  percent,  $t_{pe} = 10$  percent and  $t_{pd} = 15$  percent, what is the tax advantage of a rupee of debt?

*Solution*

The tax advantage of a rupee of debt is equal to:

$$\begin{aligned}1 - \frac{(1-t_c)(1-t_{ps})}{(1-t_{pd})} &= 1 - \frac{(1-0.3)(1-0.1)}{(1-0.15)} \\&= 0.26 \text{ or } 26 \text{ paise}\end{aligned}$$

## PROBLEMS

**19.1 Net Income Approach** Mahima Limited has a net operating income of ₹ 30 million. Mahima employs ₹ 100 million of debt capital carrying 10 percent

interest charge. The equity capitalisation rate applicable to Mahima is 15 percent. What is the market value of Mahima under the net income method? Assume there is no tax.

**19.2 Net Income Approach** The following information is available for two firms, Box Corporation and Cox Corporation.

	Box	Cox
Net operating income	₹ 2,000,000	₹ 2,000,000
Interest on debt	Nil	500,000
Cost of equity	15%	15%
Cost of debt	10%	10%

Calculate the market value of equity, market value of debt, and market value of the firm for Box Corporation and Cox Corporation.

- (a) What is the average cost of capital for each of the firms?
- (b) What happens to the average cost of capital of Box Corporation if it employs ₹ 30 million of debt to finance a project that yields an operating income of ₹ 4 million?
- (c) What happens to the average cost of capital of Cox Corporation if it sells ₹ 5 million of additional equity (at par) to retire ₹ 5 million of outstanding debt?

In answering the above questions assume that the net income approach applies and there are no taxes.

**19.3 Net Operating Income Approach** The management of Samata Company, subscribing to the net operating income approach, believes that its cost of debt and overall cost of capital will remain at 8 percent and 12 percent, respectively. If the equity shareholders of the firm demand a return of 20 percent, what should be the proportion of debt and equity in the firm's capital structure? Assume that there are no taxes.

**19.4 Arbitrage** The Bharat Company and The Charat Company belong to the same risk class-these companies are identical in all respects except that The Bharat Company has no debt in its capital structure, whereas The Charat Company employs debt in its capital structure. Relevant financial particulars of the two companies are given below.

	<i>Bharat</i>	<i>Charat</i>
Net operating income	₹ 500,000	₹ 500,000
Debt interest	–	₹ 200,000
Equity earnings	₹ 500,000	₹ 300,000
Equity capitalisation rate	12%	14%
Market value of equity	₹ 4,166,667	₹ 2,142,857
Market value of debt	–	₹ 2,500,000

(Debt capitalisation rate is 8%)	₹ 4,166,667	₹ 4,642,857
Total market value of the firm		
Average cost of capital	12%	10.77%

- (a) You own ₹ 10,000 worth of Charat's equity. Show what arbitrage you would resort to.  
 (b) When will, according to Modigliani and Miller, this arbitrage cease?

**19.5 Modigliani and Miller Approach** The following information is available about Ashwini Limited.

Net operating income	= ₹ 15 million
Tax rate	= 60 percent
Debt capital	= ₹ 20 million
Interest rate on debt capital	= ₹ 10 percent
Capitalisation rate applicable to debt-free firm in the risk class to which Ashwini Limited belongs	= 12 percent

What should be the value of Ashwini Limited according to Modigliani and Miller?

**19.6 Tax Advantage of Debt** If  $t_c = 50$  percent,  $t_{ps} = 5$  percent, and  $t_{pd} = 25$  percent, what is the tax advantage per rupee of debt?

<sup>1</sup> Operating income is nothing but earnings before interest and tax (EBIT). It is also referred to as profit before interest and tax (PBIT).

<sup>2</sup> Starting with Eq. (19.1), Eq. (19.2) is derived as follows:

$$r_A = r_D \left[ \frac{D}{D+E} \right] + r_E \left[ \frac{E}{D+E} \right] \quad (1)$$

$$r_E \left[ \frac{E}{D+E} \right] = r_A - r_D \left[ \frac{D}{D+E} \right] \quad (2)$$

$$r_E \left[ \frac{E}{D+E} \right] \left[ \frac{D+E}{E} \right] = r_A \left[ \frac{D+E}{E} \right] - r_D \left[ \frac{D}{D+E} \right] \left[ \frac{D+E}{E} \right] \quad (3)$$

$$r_E = r_A + (D/E) (r_A - r_D) \quad (4)$$

<sup>3</sup> F. Modigliani and M.H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, vol. 48 (June 1958).

<sup>4</sup> This was the view taken by Franco Modigliani and Merton Miller in their paper "Taxes and the Cost of Capital: A Correction," *American Economic Review*, vol. 53, June 1963.

<sup>5</sup> This expression is derived as follows:

Let  $O$  = earning before interest and taxes  
 $D$  = face value of debt  
 $r$  = coupon rate (as well the cost of debt)  
 $t_c$  = corporate tax rate  
 $t_{pd}$  = personal tax rate on debt income  
 $t_{pe}$  = personal tax rate on equity income

The total post-tax income to all investors is:

$$\begin{aligned}
 &= rD(1-t_{pd}) + (O - rD)(1-t_c)(1-t_{pe}) \\
 &= \underbrace{O(1-t_c)(1-t_{pe})}_{\text{First term}} + \underbrace{rD(1-t_{pd}) \left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right]}_{\text{Second term}}
 \end{aligned} \tag{1}$$

The first term represents the post-tax income to the shareholders of the unlevered firm. If it is capitalised using the discount rate applicable to the unlevered firm, its capitalised value is  $V_U$  (Value of the unlevered firm) The second term is the product of  $rD (1-t_{pd})$ , the post-tax income of debtholders, and a constant term.

$$\left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right] \tag{2}$$

Hence, its capitalised value, using the discount rate applicable to debt capital, is:

$$D \left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right] \tag{3}$$

The value additivity principle implies that:

$$V_L = V_U + D \left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right] \tag{4}$$

Value of levered firm = Value of unlevered firm + Gain from employing debt equal to  $D$

From the second term in the above equation it is clear that the gain from using one rupee of debt is:

$$\left[ 1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \right] \tag{5}$$

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter19/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter19/index.html)

- Additional Solved Problems
- Chapters Excel
- Excel on Solved Problems
- Mini Cases



## Capital Structure Decision

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Understand the sensitivity of EPS to PBIT under different capital structures.
- ✓ Discuss the relationship between ROI and ROE under different capital structures.
- ✓ Broadly assess the debt capacity of a firm.
- ✓ List the factors that have a bearing on the capital structure decision.

In the [previous chapter](#) we learnt that in theory there is an optimal capital structure which depends on the tax advantage of debt, the financial distress costs and agency costs associated with debt, and the degree of informational asymmetry.

How can the optimal capital structure be determined in practice? There does not seem to be any single method or technique that enables a firm to 'hit' the optimal capital structure. As you explore the capital structure decision, you will realise that it is not amenable to a neat, structured solution.

A variety of analyses are done in practice to get a handle over the capital structure decision. One analysis looks at how alternative capital structures influence the earnings per share. A second analysis assesses the impact of alternative capital structures on return on equity. A third analysis examines the operating, financial, and total leverage and their effects. A fourth analysis relies on certain leverage ratios. A fifth analysis determines the level of debt that can be serviced by the expected cash flows of the firm. A sixth analysis relies on what comparable firms are doing.

Admittedly, each of these analyses is incomplete and provides a partial answer to the question: "What capital structure maximises the value of the firm?" Nevertheless, in practice firms commonly use one or more of these

kinds of analyses along with qualitative guidelines to address the capital structure issue.

This chapter discusses different kinds of analyses helpful in choosing the capital structure, explores certain guidelines relevant for capital structure decision, and examines capital structure policies in practice.

## 20.1 ■ PBIT – EPS ANALYSIS

In our search for an appropriate capital structure, we need, *inter alia*, to understand how sensitive is earnings per share (EPS) to changes in profit before interest and tax (PBIT) under different financing alternatives.

**Basic Relationship** To illustrate the relationship between PBIT and EPS under alternative financing plans, let us consider the following data for Falcon Limited.

- Existing Capital Structure : 1 million equity shares of ₹ 10 each
- Tax Rate : 50 percent

Falcon Limited plans to raise additional capital of ₹ 10 million for financing an expansion project. In this context, it is evaluating two alternative financing plans: (i) issue of equity shares (1 million equity shares at ₹ 10 per share), and (ii) issue of debentures carrying 14 percent interest.

What will be the EPS under the two alternative financing plans for two levels of PBIT, say ₹ 4 million and ₹ 2 million? [Exhibit 20.1](#) shows the value of EPS for these two levels of PBIT under the alternative financing plans.

### Exhibit 20.1 Earnings Per Share under Alternative Financing Plans

	Equity Financing		Debt Financing	
	PBIT : 2,000,000	PBIT : 4,000,000	PBIT : 2,000,000	PBIT : 4,000,000
Interest	–	–	1,400,000	1,400,000
Profit before taxes	2,000,000	4,000,000	600,000	2,600,000
Taxes	1,000,000	2,000,000	300,000	1,300,000
Profit after tax	1,000,000	2,000,000	300,000	1,300,000
Number of equity shares	2,000,000	2,000,000	1,000,000	1,000,000
Earnings per share	0.50	1.00	0.30	1.30

In general, the relationship between PBIT and EPS is as follows:

$$\text{EPS} = \frac{(PBIT - I)(1 - t)}{n} \quad (20.1)_1$$

where EPS is the earnings per share, PBIT is the profit before interest and taxes,  $I$  is the interest burden,  $t$  is the tax rate, and  $n$  is the number of equity shares.

**Break-even PBIT Level** The break-even PBIT for two alternative financing plans is the level of PBIT for which the EPS is the same under both the financing plans. It can be graphically obtained by plotting the relationship between PBIT and EPS under the two alternatives and noting the point of intersection. This is shown in [Exhibit 20.2](#) for the example of Falcon Limited. From this exhibit we find that the breakeven level of PBIT is ₹ 2.8 million. If PBIT is below ₹ 2.8 million, equity financing is preferable to debenture financing; if PBIT is higher than ₹ 2.8 million, the opposite holds.

The PBIT indifference point between the two alternative plans can be obtained mathematically by solving the following equation for PBIT\*

$$\frac{(PBIT^* - I_1)(1-t)}{n_1} = \frac{(PBIT^* - I_2)(1-t)}{n_2} \quad (20.2)$$

where PBIT\* is the PBIT indifference point between the two alternative financing plans,  $I_1$  and  $I_2$  are the interest expenses before taxes under financing plans 1 and 2,  $t$  is the income-tax rate, and  $n_1$  and  $n_2$  are the number of equity shares outstanding under financing plans 1 and 2.

Applying the above equation to Falcon Limited example, we have:

$$\frac{(PBIT^* - 0)(0.5)}{2,000,000} = \frac{(PBIT^* - 1,400,000)(0.5)}{1,000,000}$$

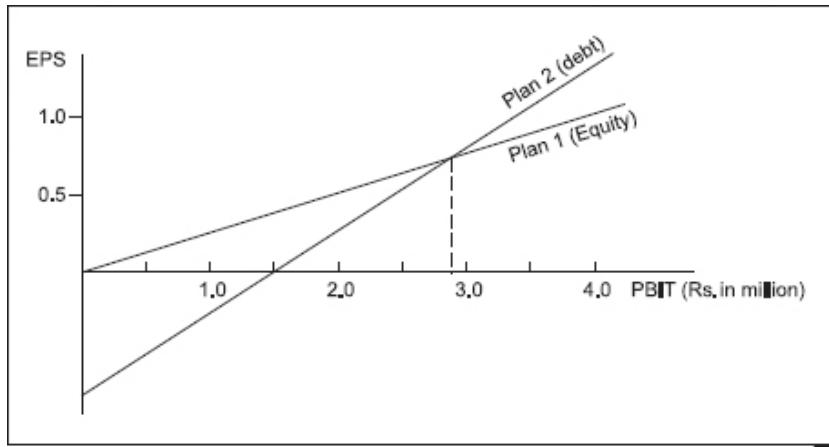
Juggling a bit, we get:

$$\begin{aligned} 0.5 (PBIT^*) (1,000,000) &= 0.5 (PBIT^*) (2,000,000) - 0.5 (1,400,000) (2,000,000) \\ 500,000 PBIT^* &= 0.5 (1,400,000) (2,000,000) \\ PBIT^* &= 2,800,000 \end{aligned}$$

Thus, the indifference PBIT level, as anticipated, is the same as obtained graphically.

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## Exhibit 20.2 | PBIT – EPS Chart



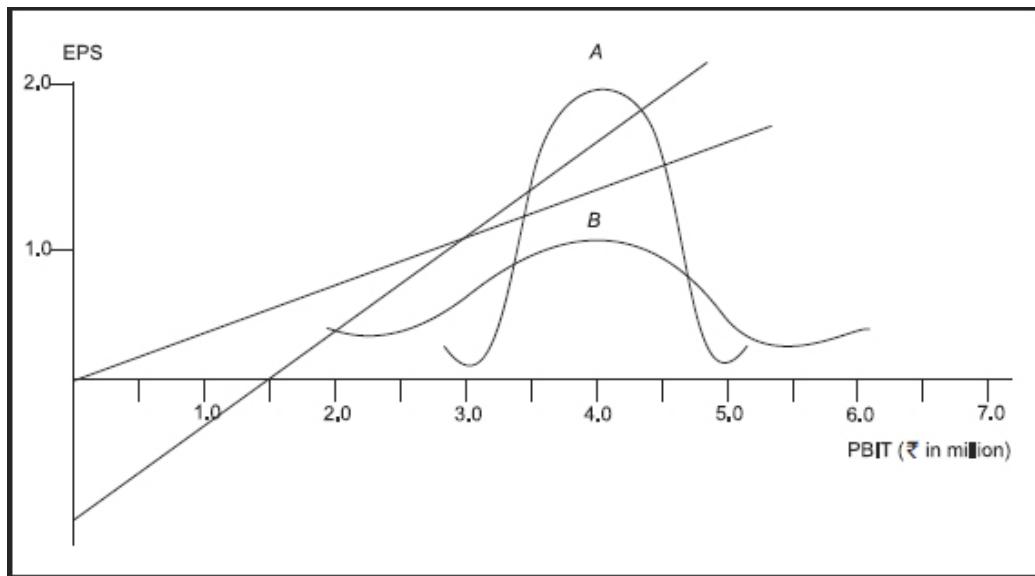
**Risk Considerations** So far we looked at the impact of alternative financing plans on EPS. What is the effect of leverage on risk? A precise answer to this question is not possible with the help of PBIT – EPS analysis. However, a broad indication may be obtained with reference to it.

The financial manager may do two things: (i) compare the expected value of PBIT with its indifference value and (ii) assess the probability of PBIT falling below its indifference value. If the most likely value of PBIT exceeds the indifference value of PBIT, the debt financing option, *prima facie*, may be advantageous. The larger the difference between the expected value of PBIT and its indifference value, the stronger the case for debt financing, other things being equal.

Given the variability of PBIT, arising out of the business risk of the company, the probability of PBIT falling below the indifference level of PBIT may be assessed. If such probability is negligible, the debt financing option is advantageous. On the other hand, if such probability is high, the debt financing alternative is risky.

This notion may be illustrated graphically as shown in [Exhibit 20.3](#) where two probability distributions of PBIT (A and B) are superimposed on the PBIT – EPS chart. Distribution A is relatively safe, as there is hardly any probability that PBIT will fall below its indifference level. With such a distribution, the debt alternative appears to be advantageous. Distribution B, on the other hand, is clearly risky because there is a significant probability that PBIT will decline below its indifference value. In this case, the debt alternative may not be regarded as desirable.

### Exhibit 20.3 | Probability Distributions of PBIT



## 20.2 ■ ROI – ROE ANALYSIS

In the preceding section we looked at the relationship between PBIT and EPS under alternative financing plans. Pursuing a similar line of analysis, we may look at the relationship between the return on investment (ROI) and the return on equity (ROE) for different levels of financial leverage.

Suppose a firm, Korex Limited, which requires an investment outlay of ₹ 100 million, is considering two capital structures:

	Capital Structure A (₹ in million)		Capital Structure B (₹ in million)	
Equity	100	Equity	50	
Debt	0	Debt	50	

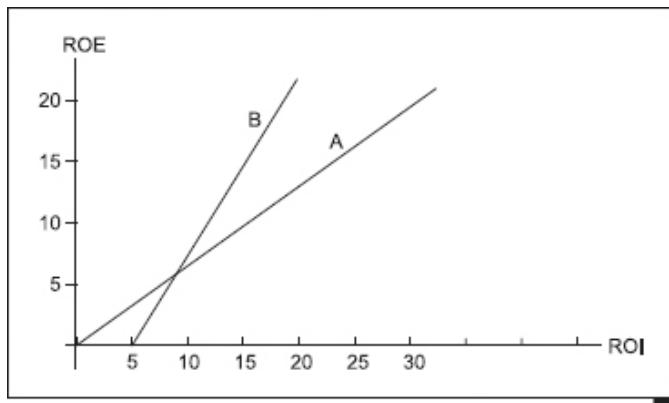
While the average cost of debt is fixed at 12 percent, the ROI (defined as PBIT divided by total assets) may vary widely. The tax rate of the firm is 50 percent.

Based on the above information, the relationship between ROI and ROE (defined as equity earnings divided by net worth) under the two capital structures, A and B, would be as shown in [Exhibit 20.4](#). Graphically the relationship is shown in [Exhibit 20.5](#).

### Exhibit 20.4 Relationship between ROI and ROE under Capital Structures A and B

	Capital Structure A					Capital Structure B				
ROI	5%	10%	15%	20%	25%	5%	10%	15%	20%	25%
PBIT (₹ in million)	5	10	15	20	25	5	10	15	20	25
Interest	0	0	0	0	0	5	5	5	5	5
Profit before tax	5	10	15	20	25	0	5	10	15	20
Tax	2.5	5	7.5	10	12.5	0	2.5	5	7.5	10
Profit after tax	2.5	5	7.5	10	12.5	0	2.5	5	7.5	10
Return on equity	2.5%	5%	7.5%	10%	12.5%	0%	5%	10%	15%	20%

## Exhibit 20.5 | Relationship between ROI and ROE under Alternative Capital Structures



Looking at the relationship between ROI and ROE we find that:

- The ROE under capital structure A is higher than the ROE under capital structure B when ROI is less than the cost of debt.
- The ROE under the two capital structures is the same when ROI is equal to the cost of debt. Hence the indifference (or breakeven) value of ROI is equal to the cost of debt.
- The ROE under capital structure B is higher than the ROE under capital structure A when ROI is more than the cost of debt.

The influence of ROI and financial leverage on ROE is mathematically as follows:

$$\text{ROE} = [\text{ROI} + (\text{ROI} - r) D/E] (1 - t) \quad (20.3)2$$

where ROE is the return on equity, ROI is the return on investment,  $r$  is the cost of debt,  $D/E$  is the debt-equity ratio, and  $t$  is the tax rate.

Applying the above equation to Korex Limited when its  $D/E$  ratio is 1, we may calculate the value of ROE for two values of ROI, namely, 15 percent and 20 percent.

$$\text{ROI} = 15\%$$

$$\text{ROE} = [15 + (15 - 10) 1] (0.5) = 10.0\%$$

$$\text{ROI} = 20 \text{ percent}$$

$$\text{ROE} = [20 + (20 - 10) 1] (0.5) = 15.0\%$$

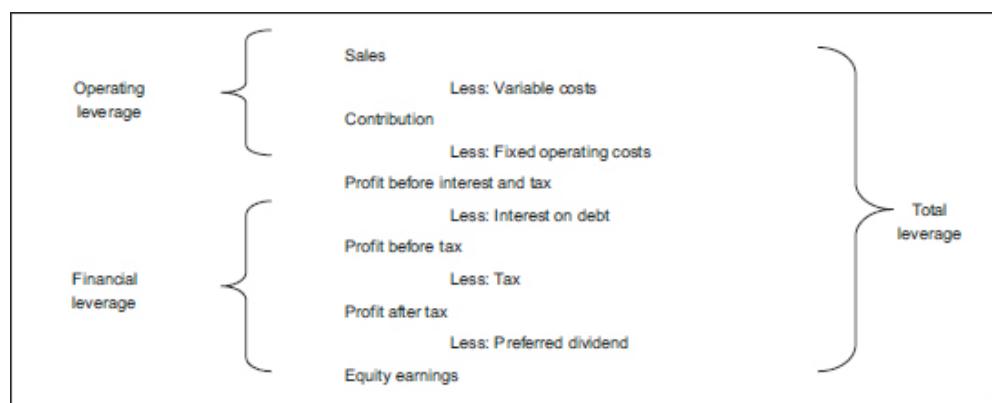
These results, as expected, are in conformity with our earlier analysis.

## 20.3 LEVERAGE ANALYSIS

Leverage arises from the existence of fixed costs. There are two kinds of leverage, viz, operating leverage and financial leverage. **Operating leverage** arises from the firm's fixed operating costs such as salaries, rent, depreciation, insurance, property taxes, and advertising outlays. **Financial leverage** arises from the firm's fixed financing costs such as interest on debt.

To understand the two basic types of leverage and the total (or combined) leverage and their effects, it is helpful to look at the structure of the firm's income statement shown in [Exhibit 20.6](#).

**Exhibit 20.6** Income Statement Format



To define the relationship between certain income statement items we will use the following notations:  $S$  = sales,  $Q$  = quantity produced and sold,  $P$  = selling price per unit,  $V$  = variable cost per unit,  $F$  = fixed operating costs,  $\text{PBIT}$  = profit before interest and tax (or operating income),  $I$  = interest cost on debt,  $\text{PBT}$  = profit before tax,  $T$  = corporate income tax rate,  $\text{PAT}$  = profit after tax,  $D_p$  = preferred dividend,  $E_e$  = equity earnings,  $N$  = number of outstanding equity shares, and  $\text{EPS}$  = earnings per share.

Given these notations, let us now state certain relationships based on the income statement.

$$\text{PBIT} = Q(P - V) - F \quad (20.4)$$

$$\text{PAT} = (\text{PBIT} - I)(1 - T) \quad (20.5)$$

$$\text{EPS} = \frac{(\text{PBIT} - I)(1 - T) - D_p}{N}$$

$$= \frac{[Q(P-V) - F - I](1-T) - D_p}{N} \quad (20.6)$$

**Operating Leverage** Operating leverage arises from the existence of fixed operating expenses. When a firm has fixed operating expenses, 1 percent change in sales leads to more than 1 percent change in PBIT. To illustrate this point, consider the case of a firm, which is currently selling a product at ₹ 1000 per unit. Its variable costs are ₹ 500 per unit and its fixed operating costs are ₹ 200,000. The profit before interest and taxes at two levels of sales, viz., 500 units and 600 units, is shown below:

	Sales	Sales
	500 units	600 units
Revenues	500,000	600,000
Variable operating costs	250,000	300,000
Fixed operating costs	200,000	200,000
Profit before interest and taxes	50,000	100,000

In the above example a 20 percent increase in revenues leads to a 100 percent increase in profit before interest and taxes, thanks to the existence of fixed operating costs. Put differently, fixed operating costs magnify the impact of changes in revenues. Note that the magnification works in the reverse direction as well. For example, in the above case a 20 percent decline in sales (from ₹ 500,000 to ₹ 400,000) will lead to a 100 percent fall in profit before income and tax (from ₹ 50,000 to ₹ 0). You may verify this yourself.

The sensitivity of profit before interest and taxes to changes in sales is referred to as the degree of operating leverage (DOL). Formally it is defined as:

$$\begin{aligned}
 DOL &= \frac{\% \text{change in PBIT}}{\% \text{change in } Q} = \frac{\Delta \text{PBIT} / \text{PBIT}}{\Delta Q / Q} \\
 &= \frac{\Delta [Q(P-V)] / [Q(P-V)-F]}{\Delta Q / Q} = \frac{\Delta Q(P-V) / [Q(P-V)-F]}{\Delta Q / Q} \\
 &= \frac{Q(P-V)}{Q(P-V)-F} = \frac{\text{Contribution}}{\text{PBIT}} \quad (20.7)
 \end{aligned}$$

To illustrate the calculation of DOL, consider the data for Finex Limited:  $P = ₹ 1,500$ ,  $V = ₹ 1,000$ , and  $F = ₹ 200,000$ . DOL, which is a function of the level of output ( $Q$ ) at which it is calculated, may be computed for  $Q = 500$  units and  $Q = 600$  units.

$$DOL (Q = 500) = \frac{500(1500 - 1000)}{500(1500 - 1000) - 200,000} = \frac{250,000}{50,000} = 5.0$$

$$DOL (Q = 600) = \frac{600(1500 - 1000)}{600(1500 - 1000) - 200,000} = \frac{300,000}{100,000} = 3.0$$

**Financial Leverage** While operating leverage arises from the existence of fixed operating costs, financial leverage emanates from the existence of fixed interest expenses. When a firm has fixed interest expenses, 1 percent change in profit before interest and taxes (PBIT) leads to more than 1 percent change in profit before tax (or profit after tax or earnings per share). To illustrate this point, consider the case of Finex Limited, which currently has a PBIT of ₹ 50,000. Its fixed interest expenses are ₹ 30,000 and its tax rate is 50 percent. It has 10,000 shares outstanding. The profit before tax, profit after tax, and earnings per share for Finex Limited at two levels of PBIT, viz., ₹ 50,000 and ₹ 60,000 are shown below:

	Case A ₹	Case B ₹
Profit before interest and taxes	50,000	60,000
Interest expense	30,000	30,000
Profit before tax	20,000	30,000
Tax	10,000	15,000
Profit after tax	10,000	15,000
Earnings per share	1	1.50

In the above example a 20 percent increase in profit before interest and taxes leads to a 50 percent increase in profit before taxes (or profit after tax or earnings per share), thanks to the existence of fixed interest expenses. Put differently, fixed interest expense magnifies the impact of changes in PBIT. Note that the magnification works in the reverse direction as well. For example, in the above case a 20 percent decline in PBIT (from ₹ 50,000 to ₹ 40,000) will lead to a 50 percent fall in profit before tax (or profit after tax or earnings per share). You may verify this yourself.

The sensitivity of profit before tax (or profit after tax or earnings per share) to changes in PBIT is referred to as the degree of financial leverage (DFL). Formally, it is defined as:

$$\begin{aligned}
 DFL &= \frac{\% \text{ change in PBT}}{\% \text{ change in PBIT}} = \frac{\Delta \text{PBT}/\text{PBT}}{\Delta \text{PBIT}/\text{PBIT}} \\
 &= \frac{\Delta [Q(P - V) - F - I]/\text{PBT}}{\Delta [Q(P - V) - F]/\text{PBIT}} = \frac{\Delta Q(P - V)/\text{PBT}}{\Delta Q(P - V)/\text{PBIT}} = \frac{\text{PBIT}}{\text{PBT}}
 \end{aligned} \tag{20.8}$$

To illustrate the calculation of DFL let us get back to Finex Limited, which currently has an interest expense of ₹ 30,000. The DFL, which is a function of the level of PBIT at which it is calculated, may be computed for PBIT = ₹ 50,000 and PBIT = ₹ 60,000.

$$DFL (\text{PBIT} = 50,000) = \frac{50,000}{50,000 - 30,000} = 2.5$$

$$DFL (\text{PBIT} = 60,000) = \frac{60,000}{60,000 - 30,000} = 2.0$$

**Combined Leverage or Total Leverage** Combined leverage, or total leverage, arises from the existence of fixed operating costs and interest expenses. Thanks to the existence of these fixed costs, 1 percent change in revenues leads to more than 1 percent change in profit before tax (or profit after tax or earnings per share). To illustrate this point, consider the case of Finex Limited, which currently has revenues of ₹ 500,000. (₹ 500 units are sold at ₹ 1,000 per unit). Its variable costs are ₹ 500 per unit and its fixed operating costs are ₹ 200,000. Its fixed interest expenses are ₹ 30,000 and its tax rate is 50 percent. It has 10,000 shares outstanding. The financial profile of the company at two levels of sales viz. 500 units (the current level) and 600 (a level 20 percent higher than the current level) is shown below.

	Case A	Case B
Sales	600 units	500 units
Revenues	500,000	600,000
Variable operating costs	250,000	300,000
Fixed operating costs	200,000	200,000
Profit before interest and taxes	50,000	100,000
Interest	30,000	30,000
Profit before tax	20,000	70,000
Tax	10,000	35,000
Profit after tax	10,000	35,000
Earnings per share	1	3.5

In the above example, a 20 percent increase in revenues leads to a 250 percent increase in earnings per share, thanks to the existence of fixed operating costs and interest expenses. Put differently, fixed costs magnify the impact of changes in revenues. Note that the magnification of revenues works in the reverse direction as well. For example, in the above case a 20 percent decline in unit sales (from 500 units to 400 units) leads to a 250 percent fall in profit before tax from ₹ 20,000 to – ₹ 30,000. You can readily verify this yourself.

The sensitivity of profit before tax (or profit after tax or earnings per share) to changes in unit sales is referred to as the degree of total (or combined) leverage (DTL). Formally, it is defined as:

$$\begin{aligned} DTL &= \frac{\% \text{ change in PBT}}{\% \text{ change in } Q} = \frac{\Delta \text{PBT} / \text{PBT}}{\Delta Q / Q} = \frac{\Delta [Q(P - V) - F - I] / \text{PBT}}{\Delta Q / Q} \\ &= \frac{\Delta Q(P - V) / \text{PBT}}{\Delta Q / Q} = \frac{Q(P - V)}{\text{PBT}} = \frac{\text{Contribution}}{\text{PBT}} \end{aligned} \quad (20.9)$$

Note that DTL is simply the product of DOL (degree of operating leverage) and DFL (degree of financial leverage).

$$\begin{aligned} DTL &= DOL \times DFL = \frac{\% \text{ change in PBIT}}{\% \text{ change in sales}} \\ &= \frac{\text{Contribution}}{\text{PBIT}} \times \frac{\text{PBIT}}{\text{PBT}} \\ &= \frac{\text{Contribution}}{\text{PBT}} \end{aligned} \quad (20.10)$$

To illustrate the calculation of DTL, consider the data for Finex Limited:  $P$  = ₹ 1,000,  $V$  = ₹ 500,  $F$  = ₹ 200,000, and  $I$  = ₹ 30,000. DTL, which is a function of the level of output ( $Q$ ) at which it is calculated, may be computed for  $Q = 500$  units and  $Q = 600$  units.

$$\begin{aligned} DTL(Q = 500) &= \frac{500(1,000 - 500)}{500(1,000 - 500) - 200,000 - 30,000} \\ &= \frac{250,000}{20,000} = 12.5 \\ DTL(Q = 600) &= \frac{600(1,000 - 500)}{600(1,000 - 500) - 200,000 - 30,000} \\ &= \frac{300,000}{70,000} = 4.29 \end{aligned}$$

## 20.4 ■ RATIO ANALYSIS

Traditionally, firms have looked at certain ratios to assess whether they have a satisfactory capital structure. The commonly used ratios are: interest coverage ratio, cash flow coverage ratio, debt service coverage ratio, and fixed asset coverage ratio.

**Interest Coverage Ratio** The interest coverage ratio (also referred to as the times interest earned ratio) is defined as:

$$\frac{\text{Profit before interest and taxes}}{\text{Interest on debt}}$$

To illustrate, suppose the most recent profit before interest and taxes (PBIT) for Vitrex Company were ₹ 120 million and the interest burden on all debt obligations were ₹ 20 million. The interest coverage ratio, therefore, would be ₹ 120 million/₹ 20 million = 6. What does it imply? It means that even if PBIT drops by 83⅓ percent, the earnings of Vitrex Company will cover its interest payment.

Though somewhat commonly used, the interest coverage ratio has several deficiencies: (i) It concerns itself only with the interest burden, ignoring the principal repayment obligation. (ii) It is based on a measure of earnings, not a measure of cash flow. (iii) It is difficult to establish a norm for this ratio. How can we say that an interest coverage ratio of 2, 3, 4, or any other is adequate?

**Cash Flow Coverage Ratio** The cash flow coverage ratio may be defined as:

$$\frac{\text{PBIT} + \text{Depreciation} + \text{Other non cash charges}}{\text{Interest on debt} + \frac{\text{Loan repayment instalments}}{(1 - \text{Tax rate})}}$$

To illustrate, consider the following data for Vivek Limited

Depreciation	₹ 20 million
PBIT	₹ 120 million
Interest on debt	₹ 20 million
Tax rate	50%
Loan repayment instalment	₹ 20 million

The cash flow coverage ratio for Vivek is:

$$\frac{\frac{120+20}{20}}{1-0.5} = 2.33$$

Note that while calculating the cash flow coverage ratio the loan repayment amount in the denominator is adjusted upward for the tax factor because the loan repayment amount, unlike the interest, is not a tax-deductible payment.

The cash flow coverage ratio is a distinct improvement over the interest coverage ratio in measuring the debt capacity; it covers the debt service burden fully and it focuses on cash flows. However, it too is characterised by the problem of establishing a suitable norm for judging its adequacy.

**Debt Service Coverage Ratio** Financial institutions which provide the bulk of long-term debt finance judge the debt capacity of a firm in terms of its debt service coverage ratio. This is defined as:

$$DSCR = \frac{\sum_{i=1}^n (PAT_i + DEP_i + INT_i + L_i)}{\sum_{i=1}^n (INT_i + LRI_i + L_i)} \quad (20.11)$$

where DSCR is the debt service coverage ratio,  $PAT_i$  is the profit after tax for year  $i$ ,  $DEP_i$  is the depreciation for year  $i$ ,  $INT_i$  is the interest on long-term loan for year  $i$ ,  $LRI_i$  is the loan repayment instalment for year  $i$ ,  $L_i$  is the lease rental for year  $i$ , and  $n$  is the period of the loan.

To illustrate the calculation of debt service coverage ratio, consider a project with the following financial characteristics:

Year	1	2	3	4	5	6	7	8	9	10	₹ in million
Profit after tax	-2.0	10.0	20.0	25.0	30.0	40.0	40.0	50.0	55.0	55.0	
Depreciation	12.0	10.8	9.72	8.75	7.87	7.09	6.38	5.74	5.17	4.65	
Interest on long-term loan	17.6	17.6	17.05	14.85	12.65	10.45	8.25	6.05	3.85	1.65	
Loan repayment instalment	-	-	20	20	20	20	20	20	20	20	

The DSCR for this project is:  $511.17 / 270.00 = 1.89$

Normally, financial institutions regard a debt service coverage ratio of 2 as satisfactory. If this ratio is significantly less than 2 and the project is otherwise desirable, a term loan of a longer maturity may be provided. By the same token, if this ratio is significantly more than 2, the maturity period of the loan may be shortened.

**Fixed Assets Coverage Ratio** Another ratio that is considered seriously by financial institutions is the fixed assets coverage ratio. It is defined as:

$$\frac{\text{Fixed assets}}{\text{Term loans}}$$

To illustrate, suppose that a firm has fixed assets (net) of ₹ 500 million and term loans of ₹ 400 million. Its fixed asset coverage ratio will be 1.25 (500/400).

Financial institutions feel comfortable if the fixed asset coverage ratio is at least 1.25.

## 20.5 ■ CASH FLOW ANALYSIS

The key question in assessing the debt capacity of a firm is whether the probability of default associated with a certain level of debt is acceptable to the management. The cash flow approach establishes the debt capacity by examining the probability of default. The cash flow approach to assessing debt capacity involves the following steps:

1. Specify the *tolerance limit* on the probability of default. This reflects the risk attitude of management. Is it willing to accept a 0 percent, 5 percent, 10 percent, or whatever, probability of default on its debt commitment?
2. Estimate the *probability distribution of cash flows*, taking into account the projected performance of the firm.
3. Calculate the *fixed charges* by way of interest payment and principal repayment associated with various levels of debt.
4. Estimate the *debt capacity* of the firm as the highest level of debt which is acceptable, given the tolerance limit, the probability distribution, and the fixed charges defined above.

**Illustration** The cash flow approach may be illustrated with the help of information for Phoenix Limited which is as follows:

*Tolerance Limit* The management of the company does not want the likelihood of cash insolvency to exceed 5 percent.

*Probability Distribution of Cash Flow* Based on current conditions and projected performance, the management believes that the expected cash flow will be ₹ 50 million with a standard deviation of ₹ 30 million. The cash flow would be normally distributed. The initial cash balance of the company is ₹ 1.26 million.

*Fixed Charges* The annual fixed charges associated with various levels of debt would be as follows:

<i>Level of Debt</i>	<i>Annual Fixed Charges</i>
Up to ₹ 5 million	₹ 0.25 million for every ₹ 1 million of debt
Between ₹ 5 million and ₹ 10 million	₹ 0.26 million for every ₹ 1 million of debt

Between ₹ 10 million and ₹ 15 million	₹ 0.27 million for every ₹ 1 million of debt
---------------------------------------	--

**Debt Capacity** Given the above information the debt capacity may be established as follows:

1. Since the cash flow is normally distributed the following variable has a standard normal distribution (Z distribution):

$$\frac{\text{Cash inflow} - \text{Mean value of cash inflow}}{\text{Standard deviation of cash inflow}}$$

2. The Z value corresponding to 5 percent cumulative probability (which reflects the risk tolerance of the management) is – 1.645.
3. Since  $\mu = ₹ 50$  million,  $\sigma = ₹ 30$  million, and the Z value corresponding to the risk tolerance limit is – 1.645, the cash available from the operations of the firm to service the debt is equal to X which is defined as:

$$\frac{X - 50}{30} = -1.645$$

This means  $X = ₹ 0.65$  million.

4. The total cash available for servicing the debt will be equal to:

$$\begin{aligned} & ₹ 0.65 \text{ million (cash available from operations)} \\ & + ₹ 1.26 \text{ million (initial cash balance)} \\ & = ₹ 1.91 \text{ million.} \end{aligned}$$

5. The level of debt that can be serviced with ₹ 1.91 million is as follows:

Amount	Annual fixed charges
₹ 5.00 million	$0.25 \times 5.00 = ₹ 1.25$ million
₹ 2.54 million	$0.26 \times 2.54 = ₹ 0.66$ million
₹ 7.54 million	₹ 1.91 million

**Limitations of Cash Flow Analysis** While the cash flow analysis is simple and intuitively appealing, it suffers from several limitations. First, estimating the distribution of the operating cash inflow is difficult, especially for firms in industries that are changing and volatile. Second, this approach appears to be very conservative as it assumes that the firm will depend only on its cash balance and operating cash inflows, and not rely on external financing, to service its debt. Third, the tolerance limit expresses the subjective preference of management and may not reflect the interest of shareholders. Management may borrow very little because it wants to have a negligible probability of default but this may not be in the interest of shareholders.

**Inventory of Resources** It would be helpful to supplement cash flow analysis by estimating potential sources of liquidity available to the firm to meet possible cash drains. These sources, as suggested by Gordon Donaldson, may be divided into three categories:

- *Uncommitted Reserves* These are reserves maintained primarily as an insurance against adverse developments and not earmarked for any specific purpose. Usually these reserves can be tapped at a relatively short notice.
- *Reduction of Planned Outlays* Resources may be made available by effecting reductions and cuts in proposed outlays and disbursements. Typically such reductions and cuts, while they release resources, tend to impair the profitability of the firm in the long-run.
- *Liquidation of Assets* In order to tide over an unmanageable drain of cash, the firm may raise resources by liquidating some of its assets.

## 20.6 ■ COMPARATIVE ANALYSIS

A common approach to analysing the capital structure of a firm is to compare its debt ratio with that of other firms. Perhaps the simplest way to do is to compare a firm's debt ratio to the average debt ratio of the industry to which the firm belongs. Such analysis assumes that firms belonging to the same industry are comparable and, on average, they are more or less operating at their optimal capital structure. However, both the assumptions are questionable. Firms within the same industry may not be comparable because of differences in size, capital intensity, product mix, operating risks, tax status, and so on. Further, because firms try to follow the industry average, the average debt ratio of the industry may not represent what is optimal for it.

**Controlling for Differences** Since the firms in an industry may differ on factors like operating risk, profitability, and tax status, it makes sense to control for differences in these variables. Indeed when you control for differences in these variables, you should maximise the information available from a cross-section of firms drawn from different industries. A common way to do this is to run a cross-section regression like the following:

$$\begin{aligned}\text{Debt-equity ratio} = & a + b \text{ Variance of operating income} \\ & + c \text{ Operating profitability} + d \text{ Tax rate}\end{aligned}\quad (20.12)$$

Once the intercept and coefficients of the regression analysis relation have been estimated, the recommended debt-equity ratio of a firm can be established by plugging in the values of the independent variables of that firm.

Cross-section regression analysis captures significantly more information than what a naïve comparison of a firm's debt ratio to the industry average does. However, it has its own limitations which can be quite severe. First, the coefficients of the regression relation tend to be unstable and vary over time. Second, the regression relation often explains only a small portion of the differences in debt ratios across firms.

## 20.7 ■ GUIDELINES FOR CAPITAL STRUCTURE PLANNING

The capital structure decision is a difficult decision that involves a complex tradeoff among several considerations like income, risk, flexibility, control, timing, and so on. Given the over-riding objective of maximising the market value of a firm, bear in mind the following guidelines while hammering out the capital structure of the firm.

**Avail of the Tax Advantage of Debt** From the point of view of the company, interest on debt is a tax-deductible expense, whereas equity dividend is not. But for the investors, debt returns (which are mainly in the form of interest income) are typically taxed at a higher rate compared to equity returns (which come in the form of dividend and capital gains). Taking all this into account, the contribution of a rupee of debt to firm value is captured in the following formula:

$$1 - \frac{(1-t_c)(1-t_{pe})}{(1-t_{pd})} \quad (20.13)$$

where  $t_c$  is the corporate tax rate, and  $t_{pe}$  and  $t_{pd}$  are personal tax rates on equity and debt returns.

Empirical evidence suggests that a rupee of debt enhances company value by 10 to 15 paise. So, it makes sense to avail of the tax advantage of debt.

**Preserve Flexibility** The tax advantage of debt should not persuade one to believe that a company should exploit its debt capacity fully. By doing so, it loses flexibility. And loss of flexibility can erode shareholder value.

Flexibility implies that the firm maintains reserve borrowing power to enable it to raise debt capital to respond to unforeseen changes in government policies, recessionary conditions in the market place, disruption in supplies, decline in production caused by power shortage or labour unrest, intensification in competition, and, perhaps most importantly, emergence of profitable investment opportunities. The timing and magnitude of such developments cannot often be forecast easily. Hence the firm must maintain some unused debt capacity as an insurance against adverse future developments.

Flexibility is a powerful defence against financial distress and its consequences which may include bankruptcy. Of course, in most cases, bankruptcy costs are fairly small. What is likely to be more important, however, is that the loss of flexibility and the accompanying liquidity crisis may adversely affect product market strategies and operating policies and impair the value of the firm.

Note that flexibility or financial slack is more valuable to a firm with abundant growth opportunities. Likewise, it is more important to firms which have more intangible assets. Hence such firms would do well to have more conservative capital structures.

**Ensure that the Total Risk Exposure is Reasonable** While examining risk from the point of view of the investor, a distinction is made between systematic risk (also referred to as the market risk or non-diversifiable risk) and unsystematic risk (also referred to as the non-market risk or diversifiable risk). We now dwell on the distinction between business risk and financial risk.

**Business risk** refers to the variability of profit before interest and taxes. It is influenced, *inter alia*, by the following factors: demand variability, price variability, variability of input costs, and proportion of fixed costs.

**Financial risk** represents the risk emanating from financial leverage. When a firm employs a high proportion of debt in its capital structure, i.e., when it has a high degree of financial leverage, it carries a high burden of fixed financial commitment. Equity shareholders, who have a residual interest in the income and wealth of the firm, are naturally exposed to the risk arising from such fixed commitments. Equity shareholders face this risk, also referred to as financial risk, in addition to business risk.

Generally, the affairs of the firm are, or should be, managed in such a way that the total risk borne by equity shareholders, which consists of business risk plus financial risk, is not unduly high. If the firm has a low business risk it can assume a high degree of financial risk; otherwise not.

### Determinants of Business Risk

The key determinants of business risk are as follows:

**Operating Leverage** Operating leverage arises from the firm's fixed operating costs such as salaries, rent, depreciation, insurance, property taxes, and so on. For example, a petrochemical project has higher operating leverage compared to a service project which is not capital-intensive.

**Cyclical Variations** Other things being equal, cyclical variations and business risk go hand in hand. Automobile firms are subject to greater cyclical variations as compared to pharmaceutical firms.

**Competition** Heightened competition enhances business risk. For example, the intensely competitive personal computer industry is exposed to greater business risk, compared to utilities.

**Relative Price Fluctuations** Firms which experience a lot of price fluctuations tend to have more business risk. For example, producers of basic commodities are characterised by greater business risk, compared to producers of manufactured goods.

**Firm Size and Diversification** Small, undiversified firms are subject to greater business risk, compared to large, diversified firms.

**Stage in the Industry Life Cycle** The major stages in the industry life cycle are incipient stage, growth stage, maturity stage, and decline stage. Business risk tends to be more in the first two stages, compared to the last two stages.

**Subordinate Financial Policy to Corporate Strategy** Financial policy and corporate strategy are often not integrated well. This may be because financial policies originate in the capital market and corporate strategy in the product market.

To facilitate an integration of financial policies with corporate strategy, Ellsworth argues that the chief executive of the company should:

- Critically examine the assumptions underlying the firm's financial policies.
- Persuade finance officers to ensure that financial policies subserve corporate strategy.
- Involve operating managers in financial policy discussions.
- Prevent financial policies from becoming corporate goals.

**Resort to Timing Judiciously** Suppose a firm has determined that it should have debt and equity in equal proportions in its capital structure. Does it mean that every time it raises finance, it will tap debt and equity in equal proportions? This does not happen. One reason is that financing is often a 'lumpy' process—so it is difficult for the firm to maintain strict proportions each time it raises finance.

There is yet another, and perhaps a more potent, reason. The management of a firm may perceive that the capital market may not always be favourable for raising finances from both the sources, viz. debt and equity. On some occasions it may like to raise debt capital because it

believes that the company's equity stock is depressed; on other occasions it may want to raise equity capital because it thinks that the company's equity stock is buoyant. Put differently the management may want to resort to 'timing' based on its assessment of the conditions in the capital market.

Is timing a profitable proposition? The proponents of efficient market theory believe that it is not. They argue that the market has no memory and an attempt to catch the market when it is high or avoid it when it is low is futile exercise. Practitioners, however, believe that market aberrations occur and hence timing matters.

While it is very difficult, almost impossible, to achieve perfect timing, thanks to market uncertainties, the following guidelines may be helpful in improving the performance of a firm with respect to timing.

- *Never Be Greedy* If present conditions are favourable for a certain type of financing, take advantage of it. Driven by greed, do not wait for an even better possible tomorrow.
- *Rely on Long-term Market Relationships* Financial markets seem to follow certain patterns of behaviour which tend to recur. Even though these patterns may not be perfectly regular, they have sufficient persistence. They can profitably be used as general signals, if not as precise markers, of turning points.

**Finance Proactively not Reactively** Opportunities for smart moves on investment and financing sides of the business often do not synchronise. Hence financing decisions should be decoupled from investment decisions. Adi Godrej says: "Raising money at a time of adversity is infinitely more difficult than in times of prosperity. So raise money when you can, not when you need it." Put differently, finance proactively, rather than reactively.

### **Know the Norms of Lenders and Credit Rating Agencies**

Financial institutions and banks are often the principal providers of debt capital. They are more comfortable in lending against stable, tangible assets like plant and machinery, but not inclined to support intangible items like outlays on research and development or market development. Hence, if your firm has stable, tangible assets you may be able to borrow more. On the other hand, if your firm has risky, intangible assets you may not be able to borrow more much.

As a financial manager, keep an eye on the implications of financing decisions on the rating of your firm's debt instruments. The financial factors that rating agencies commonly consider important are: (i) earning power, (ii)

business and financial risks, (iii) asset protection, (iv) cash flow adequacy, (v) financial flexibility, and (vi) quality of accounting.

While you should be concerned about credit rating, don't be obsessed by it. Sometimes, it makes sense to compromise on credit rating in order to sustain a value – enhancing corporate strategy.

**Issue Innovative Securities** As a potential issuer of securities, you are likely to be barraged by merchant bankers with new ideas. While evaluating these proposals, remember that a security may add to the value of the firm if it reallocates risk from those who are less inclined to bear it to those who are more willing to assume it, or enhances liquidity, or diminishes agency costs emanating from the conflict between shareholders, managers, and creditors, or lowers the combined burden of tax to the issuer and investors, or bypasses ingeniously some regulatory restriction.

**Communicate Intelligently with Investors** To ensure that the intrinsic value of a company is fully reflected in its stock price, the company should communicate intelligently with investors. Stock prices are not determined by a polling process in which all investors have an equal say. Rather, they are influenced by the actions of influential investors or 'lead steers'.

Given the dominant role of 'lead steers', the company should bear in mind the following guidelines while communicating with an efficient market.

*De-emphasise Creative Accounting* Empirical evidence on market efficiency strongly supports the view that the market is very intelligent in penetrating through the veil of accounting reports and seeing a company's underlying economic performance. Hence, efforts to artificially inflate reported earnings or creatively manage the bottom line are futile.

*Cut Lead Steers into Planning Process* Meaningful communication with 'lead steers' calls for cutting them into the planning process of the company. This means that, *inter alia*, they should be informed about average profitability over a business cycle, profitability of new investments, acquisitions and restructuring strategy, target capital structure, distribution policy, international performance, and management compensation. Empirical evidence suggests that greater disclosure lowers the cost of equity capital, more so for smaller firms that are not actively monitored by analysts.

## 20.8 ■ CHECKLIST FOR THE CAPITAL STRUCTURE DECISION

The following factors have a bearing on the capital structure decision.

1. **Asset Structure** Tangible-intensive firms that have more assets which are acceptable as security to lenders have higher financial leverage. Intangible-intensive firms that have fewer assets that are acceptable as security to lenders have lower financial leverage.
2. **Stability of Revenues** Firms whose revenues are relatively stable can assume more debt compared to firms with volatile revenues.
3. **Operating Leverage** Other things being equal, a firm with lower operating leverage can employ more financial leverage and vice versa.
4. **Growth Rate** Rapidly growing firms need more external capital. Since external equity is costly and it entails dilution of promoter stake, such firms tend to rely more on debt.
5. **Profitability** Highly profitable firms tend to use relatively little debt. The reason for this is simple. Thanks to their high profitability, firms like Hindustan Unilever and Infosys have adequate internally generated funds for meeting their investment needs. So, they require very little debt.
6. **Taxes** Interest on debt is a tax-deductible expense. Hence, other things being equal, higher a firm's tax rate, the greater the incentive to use debt.
7. **Control** When management is concerned about the dilution of its equity stake in the firm, it prefers debt to external equity.
8. **Attitude of Management** As there is no precise method for determining the optimal capital structure, managerial attitude plays an important role. Some managements are aggressive and willing to use more debt; others are conservative and use little debt.
9. **Attitude of Lenders and Rating Agencies** Apart from what its own analysis suggests, managements listen to what lenders and rating agencies say. After all, the ability of a firm to raise debt depends on the attitude of lenders and rating agencies.

Rajan and Zingales Study\*

In a widely cited study of capital structure choices by large firms in Canada, France, Germany, Italy, Japan, the U.K, and the U.S, Raghuram Rajan and Luigi Zingales found that four principal factors determine the debt ratios of companies.

- 1. Size** Debt ratios tend to increase with the size of the firm.
- 2. Tangible assets** Firms with higher proportions of tangible assets to total assets have higher debt ratios.
- 3. Profitability** Debt ratios decline with firm profitability.
- 4. Market-to-book** Firms with higher market-to-book value ratios tend to have lower debt ratios.

\* R.G. Rajan and L. Zingales, "What Do We Know about Capital Structure? Some Evidence from International Data," *Journal of Finance* (December 1995).

## 20.9 ■ WELL-CRAFTED FINANCING STRATEGY: THE CASE OF RELIANCE INDUSTRIES LIMITED

Reliance Industries Limited (Reliance, hereafter) has arguably been the most successful company in the Indian private sector in raising finances for its ambitious projects from time to time. It seems to have mastered the knack of obtaining finances at attractive terms for supporting its aggressive investment plans. The key ingredients of its financing strategy are briefly discussed below.

*Think Big* Reliance has an all-consuming passion to be the biggest and the best. As someone has remarked: Ambani = Ambition + Money

*Dedicate a Team to Treasury Management* Reliance has a team dedicated to treasury management. It continually assesses the developments in various markets to identify financing opportunities.

*Develop a Steady Relationship with the Merchant Bankers* Reliance's principal merchant banker is Merrill Lynch, a world leader. It has developed a steady relationship with it over time. Remember that the capabilities and support of the merchant banker are essential for raising finances.

*Be in a State of Readiness* Speed is the essence of financing. The treasury team of Reliance keeps a draft prospectus which is updated on a weekly basis. A rating is also kept ready. Once Reliance decides on a financing option it hardly wastes any time, thanks to its perennial readiness.

*Be the First* Reliance has a number of firsts to its credit. It has been the first Indian company to issue Global Depository Receipts, to privately place a large chunk of equity shares with financial institutions at a price close to the prevailing market price, to go for a syndicated eurocurrency loan, to make a eurobond issue, to issue 20-year Yankee bonds, 50-year Yankee bonds, and even 100-year Yankee bonds. (Yankee bonds are dollar denominated bonds issued in the U.S. capital market by foreign borrowers).

*Delink Financing and Investment Decisions* Opportunities for smart moves on investment and financing sides of the business often do not synchronise. Hence it makes sense to decouple investment and financing decisions. Reliance seems to be doing this. It raises finances whenever the market conditions are favourable irrespective of whether it has immediate investment projects on hand or not.

*Think International* Aware of the compulsions of globalisation, Reliance believes in thinking in international terms. It is the first Indian company to appoint an international firm of auditors and to get the ratings from Moody's and S & P. It uses the language of "the dollar" extensively.

*Ensure that the Primary Market Investor is Adequately Rewarded* Reliance is rightly credited as the company which has promoted the equity cult in India. It seems to have followed the motto: "Protect the interest of those who participate in the primary issues of the company." Even though many investors who bought Reliance in the secondary market may have lost money, primary market investors have not.

*Cultivate the Institutional Investors* In 1994 individual investors held more than 50 percent of the equity of Reliance. Anticipating the institutionalisation of the capital market, Reliance has taken initiatives to encourage greater institutional participation in its equity and has succeeded immensely in that endeavor.

*Deepen the Market for its Debt* When a company fragments its debt financing over several issues, the market for its debt may lack depth. In a bid to overcome this problem, Reliance issued ₹ 300 crore worth of zero coupon bonds in August 1999 which were identical to an outstanding issue made a few months earlier. The idea was to avoid fragmentation of issue.

## SUMMARY

- A variety of analyses are done in practice to get a handle over the capital structure decision.
- One analysis looks at how alternative capital structures influence earnings per share (EPS). The relationship between PBIT and EPS is:

$$\text{EPS} = \frac{(PBIT - I)(1 - t)}{n}$$

- The indifference point between two alternative financing plans can be obtained by solving the following equation for PBIT\*.

$$\frac{(PBIT^* - I_1)(1 - t)}{n_1} = \frac{(PBIT^* - I_2)(1 - t)}{n_2}$$

- A second analysis assesses the impact of alternative capital structures on **return on equity** using the following equation:

$$ROE = [ROI + (ROI - r) D/E] (1 - t)$$

- A third analysis relies on certain ratios like the **interest coverage ratio**, **cash flow coverage ratio**, **debt service coverage ratio**, and **fixed assets**

**coverage ratio.**

- A fourth analysis determines the **level of debt that can be serviced** by the expected cash flows of the firm.
- A fifth analysis relies on what **comparable firms** are doing.
- *Inter alia*, while hammering out its capital structure a firm must avail of the tax advantage of debt, preserve flexibility, ensure that the total risk exposure is limited, examine the control implications, subordinate financial policy to corporate strategy, mitigate potential agency costs, and finance proactively rather than reactively.

## **QUESTIONS**

1. Discuss the relationship between PBIT and EPS.
2. Explain how return on equity (ROE) is influenced by certain underlying factors.
3. “The interest coverage ratio does not tell us much about the debt servicing ability of a firm.” Comment.
4. Illustrate how the debt service coverage ratio is calculated by the financial institutions.
5. Discuss the steps involved in assessing the debt capacity of a firm using the cash flow approach.
6. What are the limitations of cash flow analysis?
7. List the inventory of resources of a firm as defined by Gordon Donaldson.
8. How would you employ comparative analysis to establish the recommended debt-equity ratio of a firm.
9. “Loss of flexibility can erode shareholder value.” Comment.
10. Distinguish between business risk and financial risk. What factors influence business risk?
11. Examine the control implications of alternative financing plans.
12. Suggest ways and means of integrating financial policies with corporate strategy.
13. How can agency costs be mitigated?
14. What should be the firm’s stance toward timing? How can a firm improve its performance with respect to timing?
15. “Finance proactively, not reactively”. Comment.
16. What are the signaling implications of financing choices?
17. Discuss the guidelines a firm should follow while communicating with an efficient market.
18. Comment on the financing strategy of Reliance Industries.

## **SOLVED PROBLEMS**

- 20.1 A company's present capital structure consists of 20,000,000 shares of equity stock. It requires ₹ 100,000,000 of external financing for which it is considering three alternatives.

- Alternative A Issue 5,000,000 equity shares of ₹ 10 par at ₹ 20 each
- Alternative B Issue 3,000,000 equity shares of ₹ 10 par at ₹ 20 each and 4,000,000 preference shares of ₹ 10 par carrying 11 percent dividend.
- Alternative C Issue 1,000,000 equity shares of ₹ 10 par at ₹ 20 each and ₹ 80 million of debentures carrying 14 percent interest rate.

The company's tax rate is 40 percent.

- (a) What is the EPS – PBIT equation for the three alternative?
- (b) What is the EPS – PBIT indifference point for alternatives A & B?

*Solution*

- (a) The EPS – PBIT equation for the three alternative are as follows:

$$A: \text{EPS} = [(\text{PBIT} - 0)(1 - .4)]/25,000,000$$

$$B: \text{EPS} = [(\text{PBIT} - 0)(1 - .4) - 4,400,000]/23,000,000$$

$$C: \text{EPS} = [(\text{PBIT} - 11,200,000)(1 - .4)]/21,000,000$$

- (b) The EPS – PBIT indifference point for alternatives A and B is:

$$\frac{(\text{PBIT}^* - 0)(1 - .4)}{25,000,000} = \frac{(\text{PBIT}^* - 0)(1 - .4) - 4,400,000}{23,000,000}$$

This gives us  $\text{PBIT}^* = 91,666,66.7$

- 20.2 Vintex Limited has a target ROE of 20 percent. The debt – equity ratio of the firm is 1.2 and its pre tax cost of debt is 12 percent. What ROI should the company plan to earn if its tax rate is 30 percent?

*Solution*

$$20\% = [\text{ROI} + (\text{ROI} - 12) 1.2] (1 - .3)$$

$$\text{ROI} = 19.53\%$$

- 20.3 Ram Company sells a product for ₹ 800 per unit. The variable cost is ₹ 400 per unit. Fixed operating costs (F) are ₹ 2,000,000. Fixed interest costs (I) is ₹ 300,000. What is the degree of operating leverage (DOL), degree of financial leverage (DFL), and the degree of total leverage (DTL), at quantity (Q) is 6,000.

*Solution:*

$$\begin{aligned}
 DOL &= \frac{Q(P-V)}{Q(P-V)-F} = \frac{6000(800-400)}{6000(800-400)-2,000,000} = 6.0 \\
 DFL &= \frac{PBIT}{PBT} = \frac{Q(P-V)-F}{Q(P-V)-F-I} \\
 &= \frac{6000(800-400)-2,000,000}{6000(800-400)-2,000,000-300,000} \\
 &= 4.0 \\
 DTL &= \frac{Q(P-V)}{Q(P-V)-F-I} = \frac{6000(800-400)}{6000(800-400)-2,000,000-300,000}
 \end{aligned}$$

20.4 The ZBB Ltd. needs ₹ 500,000 for construction of a new plant. The following three financial plans are feasible:

- (i) The company may issue 50,000 equity shares at ₹ 10 per share.
- (ii) The company may issue 25,000 equity shares at ₹ 10 per share and 2,500 debentures of ₹ 100 denomination bearing an 8% rate of interest.
- (iii) The company may issue 25,000 equity shares at ₹ 10 per share and 2,500 preference shares at ₹ 100 per share bearing 8% rate of interest.

If the company's earnings before interest and taxes are ₹ 10,000, ₹ 20,000, ₹ 40,000, ₹ 60,000 and ₹ 1,00,000, what are the earnings per share under each of the three financial plans? Which alternative would you recommend and why? Assume corporate tax rate to be 50%.

*Solution*

$$EPS = \frac{(PBIT - \text{Interest rate})(1 - \text{Tax rate}) - \text{Preference - dividend}}{\text{No. of equity shares}}$$

- (i) If the company issues 50,000 equity shares and no debentures and preference shares

$$EPS = \frac{(PBIT - 0)(1 - \text{Tax rate})}{50,000}$$

The effect of PBIT on EPS will be as follows:

PBIT	10,000	20,000	40,000	60,000	100,000
EPS	0.10	0.20	0.40	0.60	1.00

- (ii) If the company issues 25,000 equity shares and 2500 debentures (₹ 100 denomination) bearing 8 percent interest

$$\frac{(PBIT - 20,000)(1 - \text{Tax rate})}{25,000}$$

The effect of PBIT on EPS will be as follows:

PBIT	10,000	20,000	40,000	60,000	100,000
EPS	-0.20	0	0.40	0.80	1.60

- (iii) If the company issues 25,000 equity shares and 2500 preference shares (₹ 100 denomination) carrying 8 percent dividend.

$$EPS = \frac{(PBIT - 0)(1 - \text{Tax rate}) - 20,000}{25,000}$$

The effect of PBIT on EPS will be as follows:

PBIT	10,000	20,000	40,000	60,000	100,000
EPS	- 0.6	- 0.4	0	0.4	1.20

Alternative (i) is recommended because it appears that an investment of ₹ 500,000 is unlikely to earn an PBIT of less than ₹ 40,000. For an PBIT of ₹ 40,000 or more, alternative (ii) is clearly superior to the remaining alternatives.

## PROBLEMS

**20.1 EPS-PBIT Analysis** A company's present capital structure contains 1,500,000 equity shares and 50,000 preference shares. The firm's current PBIT is ₹ 7.2 million. Tax rate is 50%. Preference shares carry a dividend of ₹ 12 per share. The earnings per share is ₹ 2. The firm is planning to raise ₹ 10 million of external financing. Two financing alternatives are being considered: (i) issuing 1,000,000 equity shares for ₹ 10 each, (ii) issuing debentures for ₹ 10 million carrying 15 percent interest.

*Required* (a) Compute the EPS-PBIT indifference point.

(b) Define the alternative which maximises EPS for various levels of PBIT.

**20.2 EPS-PBIT Analysis** A company's present capital structure consists of 1,000,000 shares of equity stock. It requires ₹ 10 million of external financing for which it is considering three alternatives. Alternative A calls for issuing 1,000,000 equity shares (₹ 10 par); alternative B calls for issuing 600,000 equity shares (₹ 10 par) and 400,000 preference shares (₹ 10 par) carrying 11 percent dividend; alternative C calls for issuing 200,000 equity shares (₹ 10 par) and ₹ 8 million of debentures carrying 15 percent interest. The company's tax rate is 50 percent.

*Required*:

(a) What is the EPS – PBIT equation for alternatives A, B, and C?

(b) Rank the alternatives according to EPS over varying levels of PBIT.

**20.3 Debt versus Equity** Vardhaman Corporation presently has one million outstanding equity shares (₹ 10 par) selling at ₹ 15 per share. It needs ₹ 10 million of additional funds which can be raised in two ways:

(a) issue of 0.8 million equity shares at ₹ 12.50 per share,

(b) issue of debt capital carrying 15 percent interest.

The expected earnings before interest and taxes after the new funds are raised will be ₹ 7 million per year with a standard deviation of ₹ 3 million. Vardhaman Corporation's tax rate is 60 percent. What is the probability that the debt

alternative is better than the equity alternative with respect to earnings per share?

**20.4 ROI-ROE Analysis** Magnovex Company has an average cost of debt of 8 percent and a tax rate of 50 percent. The ROI is 14 percent. What financial leverage ratio should the company adopt, if its target ROE is 15 percent?

**20.5 ROI-ROE Analysis** Shankaran Transport has an average cost of 9 percent for debt financing. The financial leverage ratio is 0.6 and the ROI is 12 percent. What is the ROE for the company, if its tax rate is 60 percent?

**20.6 ROI-ROE Analysis** Nanda Enterprises has a target ROE of 18 percent. The financial leverage ratio for the firm is 0.7 and its tax rate is 50 percent. What ROI should the company plan to earn? The cost of debt is 12 percent.

**20.7 Coverage Ratios** The following information is available about International Paints Company:

Depreciation	₹ 3 million
PBIT	₹ 15 million
Interest on debt	₹ 4 million
Tax rate	50 percent
Loan repayment instalment	₹ 2.5 million

*Required:* Calculate the interest coverage ratio and the cash flow coverage ratio.

**20.8 DSCR** The following projections are available for Pioneer Automobiles Limited:

	₹ in million				
	Year 1	Year 2	Year 3	Year 4	Year 5
Profit after tax	- 4.0	22.0	25.00	40.00	50.00
Depreciation	12.0	10.8	9.72	8.75	7.87
Interest on term loan	21.1	21.2	20.50	17.80	15.20
Term loan repayment instalment	-	-	24.00	24.00	24.00

*Required:* Calculate the debt service coverage ratio (DSCR).

**20.9 Probability of Cash Inadequacy** Alpha Motors Company is embarking on an expansion plan requiring an outlay of ₹ 300 million. The management of the firm is convinced that debt is a cheaper source of finance and is confident that it can raise the entire amount by debt finance (perpetual) at a rate of 15 percent. However, there is some apprehension about the firm's ability to meet interest burden during a recessionary year. The management feels that in a recessionary year, the net cash flows of the company, not taking into account the interest burden on the new debt, would have an expected value of ₹ 80 million with a standard deviation of ₹ 40 million.

*Required:*

- What is the probability of cash inadequacy during a recessionary year, if the entire ₹ 300 million is raised as debt finance?

- (b) If the management is prepared to accept only a 5 percent chance of cash inadequacy, what proportion of ₹ 300 million requirement should be raised as debt finance?

**20.10 Debt versus Equity** ABC Limited provides the following figures to you:

Profit before interest and taxes (PBIT)	₹ 30.million
Interest on debt @ 12 percent	₹ 6 million
Profit before tax	₹ 24 million
Tax @ 50 percent	₹ 12 million
Profit after tax	₹ 12 million
Number of equity shares (₹ 10 each)	4 million
EPS	₹ 3
Current market price per share	₹ 30
PE Ratio	10
ABC's current capital structure is as follow:	
Shareholders' funds	₹ 100 million
• Equity capital ₹ 40 million	
• Reserves and surplus ₹ 60 million	
Debt	₹ 50 million

ABC is considering an investment proposal that requires ₹ 30 million and it is expected to generate a PBIT of ₹ 6 million. ABC is considering two alternative financing plans. Plan A involves issuing 1 million equity shares at ₹ 30 each. Plan B involves issuing ₹ 30 million of debentures carrying an interest rate of 12 percent. If equity capital is used then the PE ratio is expected to rise to 10.2, but if debt capital is used the PE ratio is expected to fall to 9.8 what will be effect of alternative financing plans on share price?

**20.11 DOL, DFL, DTL** Shyam Company sells a product for ₹ 600 and the variable cost per unit is ₹ 250. Fixed operating costs are ₹ 1,200,000 and fixed interest costs is ₹ 300,000. What is the DOL, DFL, and DTL when the quantities are 8000 and 10000.

### MINICASE

Divya Electronics was promoted about twenty years by Dipankar Mitra, who continues to be the Executive Chairman of the firm. Initially, the firm employed a debt-equity ratio of 1.5:1 as the promoter had limited resources. While the firm had a few bad patches, it has performed fairly well and has been reasonably profitable. Over time, the proportion of debt in the capital structure diminished. The firm also issued bonus shares on two occasions once before making its IPO eight years ago and once subsequently.

The financial statements of the firm for the just concluded financial year are given below. The profit and loss account has been cast in the contribution format to facilitate the calculation of leverages.

Balance Sheet		Profit and Loss Account	
Sources of Funds	₹ in crore		₹ in crore
1. Shareholders' Funds		Revenues	800
■ Paid-up equity capital (14 crore shares of ₹ 10 each)	140	Variable costs	480
		Contribution margin	320
■ Reserve and surplus	250	Fixed operating costs	180
2. Loan Funds	200	Profit before interest and taxes	140
	600	Interest	20
<i>Application of Funds</i>		Profit before tax	120
1. Net Fixed Assets	400	Tax	36
2. Net Current Assets	200	Profit after tax	84
	600		

The current market price per share is ₹ 115, giving a retrospective PE ratio of 16.43, the highest in its history.

Dipankar Mitra and his family holds 4.5 crore shares of Divya Electronics. The rest is held more or less equally by institutional investors and retail investors.

The firm has an expansion project on hand that will require an outlay of ₹ 200 crore which will be supported by external financing. The expansion project is expected to generate an annual revenue of ₹ 240 crore. Its variable costs will be 60 percent of revenues and its fixed operating costs would be ₹ 50 crore. The expansion can be completed quickly.

EMAN Consultants, the merchant bankers of Divya Electronics, believe that Divya Electronics can make a public issue of equity shares at ₹ 106. The issue expenses, however, will be ₹ 6 per share. The other option is to privately place debentures carrying an interest rate of 8 percent

The board of directors of Divya Electronics would be meeting shortly to decide on the means of financing to be adopted for the proposed expansion plan.

You have been requested to present an analysis of the two options. In particular, you have been asked to.

- (a) Compute the EPS—PBIT indifference point for the two financing options.
- (b) Calculate the EPS for the following year under the two financing options assuming that the expansion project would be fully operational.
- (c) Show how the degree of total leverage will change under the two financing options.
- (d) Highlight any other issues that you believe are important for taking the decision.

## PRACTICAL ASSIGNMENT

Comment on the capital structure of the company chosen by you.

1 When preference dividend ( $D_p$ ) is payable, the relationship becomes:

$$\text{EPS} = \frac{(\text{PBIT} - I)(1-t) - D_p}{n} \quad (1)$$

2 This may be derived as follows:

$$\text{ROE} = \frac{\text{PAT}}{E} \quad (1)$$

$$\text{ROE} = \frac{(\text{PBIT} - I)(1-t)}{E} \quad (2)$$

$$\text{ROE} = \frac{(\text{TA} \times \text{ROI} - I)(1-t)}{E} \quad (3)$$

$$\text{ROE} = \frac{[(E + D)\text{ROI} - rD](1-t)}{E} \quad (4)$$

$$\text{ROE} = [\text{ROI} + (\text{ROI} - r) D/E] (1 - t) \quad (5)$$

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter20/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter20/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Dividend Policy and Firm Value

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Explain the traditional position on dividend policy and share valuation.
- ✓ Discuss the Walter model and Gordon model and their implications.
- ✓ Discuss the MM dividend irrelevance hypothesis and its implications.
- ✓ Explain the radical position on dividend policy and valuation.

The dividend policy of a firm determines what proportion of earnings is paid to shareholders by way of dividends and what proportion is ploughed back in the firm for reinvestment purposes.

If a firm's capital budgeting decision is independent of its dividend policy, a higher dividend payment will entail a greater dependence on external financing. Thus the dividend policy has a bearing on the choice of financing. On the other hand, if a firm's capital budgeting decision is dependent on its dividend decision, a higher payment will cause shrinkage of its capital budget and vice versa. In such a case, the dividend policy has a bearing on the capital budgeting decision.

A firm's dividend payout ratio obviously depends on how earnings are measured. For the sake of simplicity, we look at the accounting measure of earnings. Of course, we are aware that accounting earnings often diverge from economic earnings and may not truly reflect a firm's capacity to pay dividends.

Since the principal objective of corporate financial management is to maximise the market value of equity shares, the key question of interest to us is: What is the relationship between dividend policy and market price of equity shares? This is one of the most controversial and unresolved questions in corporate finance. This chapter discusses the various positions on the spectrum of views on this issue.

## **21.1 ■ MODELS IN WHICH INVESTMENT AND DIVIDEND DECISIONS ARE RELATED**

Most of the discussion on dividend policy and firm value assumes that the investment decision of a firm is independent of its dividend decision. However, there are some models which assume that investment and dividend decisions are related. Two such models are the Walter model and the Gordon model. Let us examine them.

## Walter Model

James Walter<sup>1</sup> has proposed a model of share valuation which supports the view that the dividend policy of the firm has a bearing on share valuation. His model is based on the following assumptions:

- The firm is an all-equity financed entity. Further, it will rely only on retained earnings to finance its future investments. This means that the investment decision is dependent on the dividend decision.
- The rate of return on investments is constant.
- The firm has an infinite life.

**Valuation Formula** Based on the above assumptions, Walter put forward the following valuation formula:

$$P = \frac{D + (E - D)r/k}{k} \quad (21.1)$$

where  $P$  is the price per equity share,  $D$  is the dividend per share,  $E$  is the earnings per share,  $(E - D)$  is the retained earnings per share,  $r$  is the rate of return on investments, and  $k$  is the cost of equity.

As per Eq. (21.1), the price per share is a sum of two components:

$$\frac{D}{k} + \frac{(E - D)r/k}{k} \quad (21.2)$$

The first component is the present value of an infinite stream of dividends<sup>2</sup>; the second component is the present value of an infinite streams of returns from retained earnings.<sup>3</sup>

Exhibit 21.1 gives numerical examples for the Walter model for three cases: growth firm, normal firm, and declining firm.



## Exhibit 21.1 | Numerical Examples for Walter Model

Growth Firm : $r > k$	Normal Firm : $r = k$	Declining Firm : $r < k$
$r = 20$ percent	$r = 15$ percent	$r = 10$ percent
$k = 15$ percent	$k = 15$ percent	$k = 15$ percent
$E = ₹ 4$	$E = ₹ 4$	$E = ₹ 4$
If $D = ₹ 4$	If $D = ₹ 4$	If $D = ₹ 4$
$P = \frac{4 + (0).20 / .15}{.15}$ = ₹ 26.67	$P = \frac{4 + (0).15 / .15}{.15}$ = ₹ 26.67	$P = \frac{4 + (0).10 / .15}{.15}$ = ₹ 26.67
If $D = ₹ 2$	If $D = ₹ 2$	If $D = ₹ 2$
$P = \frac{2 + (2).20 / .15}{.15}$ = ₹ 31.11	$P = \frac{2 + (2).15 / .15}{.15}$ = ₹ 26.67	$P = \frac{2 + (2).10 / .15}{.15}$ = ₹ 22.22

**Implications** From Exhibit 21.1 we find that as per the Walter model:

- When the rate of return is greater than the cost of capital ( $r > k$ ), the price per share increases as the dividend payout ratio decreases.
- When the rate of return is equal to the cost of capital ( $r = k$ ), the price per share does not vary with changes in dividend payout ratio.
- When the rate of return is less than the cost of capital ( $r < k$ ), the price per share increases as the dividend payout ratio increases.

Thus the Walter model implies that:

- The optimal payout ratio for a growth firm ( $r > k$ ) is nil.
- The optimal payout ratio for a normal firm ( $r = k$ ) is irrelevant.
- The optimal payout ratio for a declining firm ( $r < k$ ) is 100 percent.

Clearly these policy implications lead to very extreme courses of action which make limited sense in the real world. Despite this simplicity or naivete, the Walter model is a useful tool to show the effects of dividend policy under varying profitability assumptions.

## Gordon Model

Myron Gordon<sup>4</sup> proposed a model of stock valuation using the dividend capitalisation approach. His model is based on the following assumptions:

- Retained earnings represent the only source of financing for the firm. Thus, like the Walter model the Gordon model ties investment decision to dividend decision
- The rate of return on the firm's investment is constant.
- The growth rate of the firm is the product of its retention ratio and its rate of return. This assumption follows the first two assumptions.
- The cost of capital for the firm remains constant and it is greater than the growth rate.
- The firm has a perpetual life.
- Tax does not exist.

**Valuation Formula** Gordon's valuation formula is:

$$P_0 = \frac{E_1(1-b)}{k-br} \quad (21.3)5$$

where  $P_0$  is the price per share at the end of year 0,  $E_1$  is the earnings per share at the end of year 1,  $(1 - b)$  is the fraction of earnings the firm distributes by way of dividends,  $b$  is the fraction of earnings the firm retains,  $k$  is the rate of return required by the shareholders,  $r$  is the rate of return earned on investments made by the firm, and  $br$  is the growth rate of earnings and dividends.

[Exhibit 21.2](#) shows numerical examples for the Gordon model.

**Implications** From [Exhibit 21.2](#) we find that as per the basic Gordon model:

1. When the rate of return is greater than the discount rate ( $r > k$ ), the price per share increases as the dividend payout ratio decreases.
2. When the rate of return is equal to the discount rate ( $r = k$ ), the price per share remains unchanged in response to variations in the dividend payout ratio.
3. When the rate of return is less than the discount rate ( $r < k$ ), the price per share increases as the dividend payout ratio increases.

Thus the basic Gordon model leads to dividend policy implications similar to that of Walter model:

- The optimal payout ratio for a growth firm ( $r > k$ ) is nil.
- The payout ratio for a normal firm is irrelevant.

- The optimal payout ratio for a declining firm ( $r < k$ ) is 100 percent.

## **Exhibit 21.2 Numerical Examples for Gordon Model**

<i>Growth Firm : <math>r &gt; k</math></i>	<i>Normal Firm : <math>r = k</math></i>	<i>Declining Firm : <math>r &lt; k</math></i>
$r = 20$ percent	$r = 15$ percent	$r = 10$ percent
$k = 15$ percent	$k = 15$ percent	$k = 15$ percent
$E = ₹ 4.00$	$E = ₹ 4.00$	$E = ₹ 4.00$
If $b = 0.25$	If $b = 0.25$	If $b = 0.25$
$P_0 = \frac{(0.75)4}{0.15 - (0.25)(0.20)}$	$P_0 = \frac{(0.75)4}{0.15 - (0.25)(0.15)}$	$P_0 = \frac{(0.75)4}{0.15 - (0.25)(0.10)}$
$= ₹ 30$	$= ₹ 26.67$	$= ₹ 24.00$
If $b = 0.50$	If $b = 0.50$	If $b = 0.50$
$P_0 = \frac{(0.50)4}{0.15 - (0.5)(0.20)}$	$P_0 = \frac{(0.50)4}{0.15 - (0.5)(0.15)}$	$P_0 = \frac{(0.50)4}{0.15 - (0.5)(0.10)}$
$= ₹ 40.00$	$= ₹ 26.67$	$= ₹ 20.00$

## 21.2 ■ TRADITIONAL POSITION

According to the traditional position expounded eloquently by Benjamin Graham and David Dodd, the stock market places considerably more weight on dividends than on retained earnings. According to them:

“... the considered and continuous verdict of the stock market is overwhelmingly in favour of liberal dividends as against niggardly ones. The common stock investor must take this judgment into account in the valuation of stock for purchase. They added “It is now becoming standard practice to evaluate common stock by applying one multiplier to that portion of the earnings paid out in dividends and a much smaller multiplier to the undistributed balance.”<sup>6</sup>

Their view is expressed quantitatively in the following valuation model advanced by them:

$$P = m (D + E/3) \quad (21.4)$$

where  $P$  is the market price per share,  $D$  is the dividend per share,  $E$  is the earnings per share, and  $m$  is a multiplier.

According to this model, in the valuation of shares the weight attached to dividends is equal to four times the weight attached to retained earnings. This is clear from the following version of Eq. (21.4) in which  $E$  is replaced by  $(D + R)$ .

$$P = m \left[ D + \frac{D+R}{3} \right] \quad (21.5)$$

The weights provided by Graham and Dodd are based on their subjective judgments and not derived from objective, empirical analysis. Notwithstanding the subjectivity of these weights, the major contention of the traditional position is that a liberal payout policy has a favourable impact on stock price.

## Empirical Evidence

Advocates of the traditional position cite the results of cross-section regression analysis like the following:

$$\text{Price} = a + b \text{ Dividends} + c \text{ Retained Earnings} \quad (21.6)$$

Typically, in such a regression analysis the dividend coefficient,  $b$ , is much higher than the retained earnings coefficient,  $c$ . So the advocates of traditional position claim that their hypothesis is empirically vindicated.

However, a careful look at the above regression suggests that the conclusion reached by the traditionalists is unjustified for the following reasons:

1. Eqn. (21.6) is misspecified because, *inter alia*, it omits risk which is an important determinant of price. A better specified regression equation is:

$$\text{Price} = a + b \text{ Dividends} + c \text{ Retained Earnings} + d \text{ Risk} \quad (21.7)$$

In this equation  $b$  and  $c$  are expected to be positive whereas  $d$  is expected to be negative. Because risk and dividend are inversely correlated – the higher the level of risk the smaller the dividend and vice versa – the dividend variable in Eqn. (21.6) will capture the effect of risk as well. Thus the omission of risk will impart an upward bias to  $b$ , the coefficient of dividend.

2. Measurement error distorts the results. It is well known that the measurement of earnings is almost invariably subject to error. The dividend figure, however, is given precisely. So the measurement error in earnings is fully transmitted to retained earnings which are simply earnings minus dividends. In regression analysis, when a variable (in our case, retained earnings) is subject to measurement error, its coefficient is biased downward.

To sum up, the omission of risk imparts an upward bias to  $b$ , the coefficient of dividend, and the measurement error characterising retained earnings imparts a downward bias to  $c$ , the coefficient of retained earnings. Hence the claim of traditionalists that  $b>c$  implies that a higher dividend payout ratio increases stock value cannot be vindicated.

## 21.3 MILLER AND MODIGLIANI POSITION

Merton Miller and Franco Modigliani (MM, hereafter) have advanced the view 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. This view, referred to as the MM “dividend irrelevance” theorem, is presented in their celebrated 1961 article<sup>7</sup>.

In this article, MM constructed their argument assuming 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 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 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.

To prove their argument, MM begin with the simple valuation model:

$$P_0 = \frac{1}{(1 + \rho)} (D_1 + P_1) \quad (21.8)$$

where  $P_0$  is the market price per share at time 0,  $D_1$  is the dividend per share at time 1,  $P_1$  is the market price per share at time 1, and  $\rho$  is the discount rate applicable to the risk class to which the firm belongs (this rate is assumed to remain unchanged).

From Eq. (21.8) the expression for the value of outstanding equity shares of the firm at time 0 is obtained:

$$nP_0 = \frac{1}{(1+\rho)} \{nD_1 + (n+m)P_1 - mP_1\} \quad (21.9)$$

where  $n$  is the number of outstanding equity shares at time 0,  $nP_0$  is the total market value of outstanding equity shares at time 0,  $nD_1$  is the total dividends in year 1 payable on equity shares outstanding at time 0,  $m$  is the number of equity shares issued at time 1 at price  $P_1$  (the prevailing market price at time 1),  $(n+m)P_1$  is the total market value of all outstanding equity shares at time 1,  $mP_1$  is the market value of shares issued at time 1, and  $\rho$  is the discount rate.

What is the total amount of new equity stock issued at time 1,  $mP_1$ , equal to? It is equal to the total investment at time 1 less the amount of retained earnings. In symbols:

$$mP_1 = I - (X - nD_1) \quad (21.10)$$

where  $I$  is the total investment at the end of year 1, and  $X$  is the total net profit of the firm for year 1.

Substituting the above value for  $mP_1$  in Eq. (21.9), MM get

$$nP_0 = \frac{1}{(1+\rho)} \{(n+m)P_1 - I_1 - X_1\} \quad (21.11)$$

As  $D_1$  is not found in this equation and as  $(n+m)P_1$ ,  $I_1$ ,  $X_1$  and  $\rho$  are independent of  $D_1$ , MM reach the conclusion that the value of the firm does not depend on its dividend decision.

Note that  $(n+m)P_1$ , the value of the equity of the firm at the end of year 1 is in no way affected by the dividend paid at the end of the year ( $D_1$ ). Why? The reason is simple:  $D_1$  influences  $P_1$  and  $m$  in a mutually offsetting manner. If the firm pays more  $D_1$ ,  $P_1$  decreases but  $m$  increases; on the other hand, if the firm pays less  $D_1$ ,  $P_1$  increases but  $m$  decreases. A numerical example may be given to demonstrate this point. Suppose Zeta Company currently has 1,000 equity shares outstanding selling at ₹ 10 a share ( $n = 1,000$  and  $P_0 = ₹ 10$ ). Zeta's expected earnings and investment need for the next year are ₹ 1,000 and ₹ 1,110 respectively ( $X_1 = ₹ 1000$  and  $I_1 = ₹ 1110$ ). If Zeta pays a dividend of ₹ 1 per share next year ( $D_1 = ₹ 1$ ), its  $P_1$  will be ₹ 10 and it will have to issue 111 shares at ₹ 10 per share to finance its investment need of ₹ 1110. This means

$$(n+m) P_1 = (1,000+111) ₹ 10 = ₹ 11,110$$

On the other hand, if Zeta does not pay any dividend next year ( $D_1 = 0$ ), its  $P_1$  will be ₹ 11 and it will have to issue just 10 shares at ₹ 11 each to supplement its retained earnings of ₹ 1000 to support an investment of ₹ 1110. This means:

$$(n + m) P_1 = (1,000 + 10) \text{ ₹ } 11 = \text{₹ } 11,110$$

Thus irrespective of what  $D_1$  is,  $(n + m)P_1$  will be ₹ 11,110.

Two points may be emphasised here:

- MM “dividend irrelevance” theorem rests on their “leverage irrelevance” theorem. In our above analysis we assumed that external finance is raised by issuing additional equity. Since the real cost of debt and equity as per MM “leverage irrelevance” theorem is the same, the above analysis is not vitiated if the firm raises external finance by issuing debt or a combination of equity and debt.
- There is no conflict between the dividend capitalisation approach to valuation advocated earlier and the MM “dividend irrelevance” theorem. MM “dividend irrelevance” theorem does not imply that the value of an equity share is not equal to the present value of future stream of dividends expected from its ownership. It merely says that even though the dividend policy of the firm may influence the timing and magnitude of dividend payments it cannot change the present value of the total stream of dividends.

## Criticisms of MM Position

The critics of MM agree that under the assumptions made by MM dividends are irrelevant. They, however, dispute the validity of the “dividend irrelevance” theorem by challenging the assumptions used by MM. According to them, dividends matter because of the uncertainty characterising the future, the imperfections in the capital market, and the existence of taxes. The implications of these features are discussed below. For this discussion we consider one feature at a time.

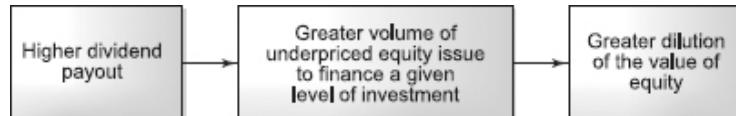
**Information about Prospects** In a world of uncertainty the dividends paid by the company, based as they are on the judgment of the management about future, convey information about the prospects of the company. A higher dividend payout ratio may suggest that the future of the company, as judged by management, is promising. A lower dividend payout ratio may suggest that the future of the company as considered by management is uncertain. This view has been eloquently expressed by Myron J. Gordon. An allied argument is that dividends reduce uncertainty perceived by investors. Hence investors prefer dividends to capital gains. So, shares with higher current dividends, other things being equal, command a higher price in the market.

MM do not dispute the information content of dividends. They maintain that dividends merely serve as proxy for the expected future earnings which really determine value. Hence, they argue, dividend policy *per se* is irrelevant.

**Uncertainty and Fluctuations** Due to uncertainty, share prices tend to fluctuate, sometimes rather widely. When share prices fluctuate, conditions for conversion of current income into capital value and *vice versa* may not be regarded as satisfactory by investors. Some investors who wish to enjoy more current income may be reluctant to sell a portion of their shareholding in a fluctuating market. Such investors would naturally prefer, and value more, a higher payout ratio. Some investors who wish to get less current income may be hesitant to buy shares in a fluctuating market. Such investors would prefer, and value more, a lower payout ratio.

**Offering of Additional Equity at Lower Prices** MM assume that a firm can sell additional equity at the current market price. In practice, firms, guided largely by the advice of merchant bankers, offer additional equity at a price lower than the current market price. This practice of ‘underpricing’

mostly due to market compulsions, *ceteris paribus*, makes a rupee of retained earnings more valuable than a rupee of dividends. This is because of the following chain of causation:



**Issue Cost** The MM irrelevance proposition is based on the premise that a rupee of dividends can be replaced by a rupee of external financing. This is possible when there is no issue cost. In the real world where issue cost is incurred, the amount of external financing has to be greater than the amount of dividend paid. Due to this, other things being equal, it is advantageous to retain earnings rather than pay dividends and resort to external finance.

**Transaction Costs** In the absence of transaction costs, current income (dividends) and capital gains are alike – a rupee of capital value can be converted into a rupee of current income and vice versa. In such a situation if a shareholder desires current income (from shares) greater than the dividends received, he can sell a portion of his capital equal in value to the additional current income sought. Likewise, if he wishes to enjoy current income less than the dividends paid, he can buy additional shares equal in value to the difference between dividends received and the current income desired.

In the real world, however, transaction costs are incurred. Due to this, capital value cannot be converted into an equal current income and vice versa. For example, a share worth ₹ 100 may fetch a net amount of ₹ 99 after transaction costs and ₹ 101 may be required to buy a share worth ₹ 100. Due to transaction costs, shareholders who have preference for current income, would prefer a higher payout ratio and shareholders who have preference for deferred income would prefer a lower payout ratio.

**Differential Rates of Taxes** MM assume that the investors are indifferent between a rupee of dividends and a rupee of capital appreciation. This assumption is true when the rate of taxation is the same for current income and capital gains. In the real world, the effective tax on capital gains is lower than that for current income. Due to this difference, investors may prefer capital gains to current income.

In India, till 1995-1996 dividend income was taxed in the hands of the recipient on the basis of the marginal rate applicable to him. From 1996-

1997 onwards, the dividend income has been exempted in the hands of the recipient but the company paying the dividend is required to pay a uniform dividend distribution tax which has been around 17 percent. In general, this switch has reduced the effective burden of tax on dividend income in India. (This has perhaps led to a higher dividend payout rate, as revealed by a study of Monica Singhania<sup>8</sup>). Even with this, the tax burden on dividends is higher than 10 percent, which is currently the tax rate on long-term capital gains.

**Rationing: Self-imposed or Market-imposed** MM assume that the investment policy of firms is independent of their financing policy and firms, rational as they are, invest up to the point where the rate of return is equal to the cost of capital. In the real world, however, the investment policy of firms may be subject to certain constraints, self-imposed or market-imposed. Some firms do not, as a general policy, invest more than their retained earnings. In other words their investment policy is linked to their dividend policy.

Many firms are unable to obtain the required finances for their proposed investments because of the unwillingness of investors. Due to these restrictions, dividend policy may become relevant. A firm which has many highly profitable investment opportunities and which is unwilling or unable to obtain finances from outside would promote the interest of its shareholders by lowering the payout ratio.

**Unwise Investments** MM assume that firms, rational as they are, do not invest beyond the point where the rate of return is equal to the cost of capital. In practice, however, many firms invest in sub-marginal projects because of easy availability of internally generated funds. If a firm has such a tendency, its dividend policy matters. Its shareholders would benefit if liberal dividends are paid and would suffer if niggardly dividends are paid.

The thrust of the above criticisms is that the dividend policy of the firm matters. The preference of investors for current income, the difficulty in converting capital value into current income, and the possibility of imprudent investments, suggest that a liberal payout ratio would have a favourable bearing on valuation. On the other hand, the preferential tax treatment of capital gains, the lower cost of retained earnings vis-a-vis external equity financing (because of floatation costs), and unwise capital rationing indicate that a low payout ratio would further the interest of stockholders.

## Informational Content

The MM dividend irrelevance hypothesis is based on the assumption that investors and managers have identical views about future prospects (earnings and dividends) of the firm. In real life, however, different investors hold different views about future prospects and managers are better informed about future prospects than investors.

Empirically it has been observed that an increase in dividend is often accompanied by a rise in the stock price, while a decrease in dividend leads to a fall in the stock price. Some regard this as a clear evidence of investor preference for dividends over retained earnings.

MM, however, have argued differently. Since companies are reluctant to cut dividends, they will not enhance dividends unless they expect higher future earnings. So, an increase in dividend is a signal that the managers perceive the future to be brighter; on the other hand, a decrease in dividend is a signal that managers consider the future to be bleaker. Thus, MM argued that the observed response of stock prices to dividend announcements does not mean that investors prefer dividends to retained earnings. Rather, they reflect the **information, or signaling content** of such dividend announcements.

## **The Rational Expectations Hypothesis: A Way of Reconciliation**

John F. Muth wrote a paper entitled “Rational Expectations and the Theory of Price Movements,” which was published in 1961. This has been recognised as one of the most influential contributions to economics in the last few decades as it challenges the intellectual foundations of the traditional macroeconomic theories propounded by Keynesians as well as monetarists.

What is the central argument of the rational expectations hypothesis? In very simple terms, it says that what matters in economics is not what actually happens but the difference between what actually happens and what was supposed or expected to happen. Hence only the surprises in policy would have the kind of effects the policy maker is striving to achieve.

Let us look at the implications of the rational expectations hypothesis for the dividend policy of a firm. If the dividend announced is equal to what the market had expected, there would be no change in the market price of the share, even if the dividend were higher (or for that matter lower) than the previous dividend. The market, expecting the dividend to be higher, had discounted it. Put differently, the higher expectation was reflected in the market price already. Hence the announcement of the higher dividend would not have any impact on the market price.

What happens if the dividend announced is higher than what was expected by the market? In such a case the market begins to revise its assessment of future earnings. This reappraisal would lead to an upward price movement in the share. Likewise, when the dividend announced is lower than what was expected, the market may revise unfavourably its appraisal of future earnings. And this would mean a downward price movement in the share.

To sum up, in a world of rational expectations, unexpected dividend announcements would transmit messages about changes in earnings potential which were not incorporated in the market price earlier. The reappraisal that occurs as a result of these signals leads to price movements which look like responses to the dividends themselves, though they are actually caused by an underlying revision of the estimate of earnings potential.

The above analysis is helpful in reconciling the practitioners’ view that dividends matter very much and the academic view that dividends do not

matter. As Merton H. Miller said: "Both views are correct in their own ways. The academic is thinking of the *expected* dividend; the practitioner of the *unexpected*."

## 21.4 ■ RADICAL POSITION

Directly or indirectly dividends are generally taxed more heavily than capital gains. So, radicalists argue that firms should pay as little dividend as they can get away with so that investors earn more by way of capital gains and less by way of dividends.

Because capital gains are taxed more lightly than dividends, investors would accept a lower pre-tax rate of return from stocks that provide returns in the form of capital gains rather than dividends. [Exhibit 21.3](#) illustrates this. The stocks of firms A and B are considered to be equally risky. Investors expect the share of firm A- the firm which does not plan to pay dividend next year – to be worth ₹ 120 next year. From a share of firm B, too, investors expect a payoff of ₹ 120 – ₹ 15 by way of dividend and ₹ 105 by way of share price a year from now.

Although both A and B provide the same expected payoff of ₹ 120 per share a year from now, B's stock sells for a lesser price than A's and hence offers a higher pre-tax rate of return. Why? The reason is simple. Investors prefer A as its return is in the form of capital gains which are taxed lightly. [Exhibit 21.3](#) shows that A and B are equally appealing to investors when dividends are taxed at 20 percent and capital gains at 10 percent. Each offers a 15 percent post-tax rate of return.

The tax laws favour capital gains in one more way. Taxes on dividends are payable immediately but taxes on capital gains are payable only when the shares are sold and capital gains realised. The longer the shares are held the smaller would be the present value of capital gains liability. Thus the effective tax rate on capital gains diminishes as the period of holding increases.

According to the radical position, a return premium is associated with high-yield stocks. To test this hypothesis, a number of studies estimated cross-sectional regression of the following general form:

$$\text{Return} = a + b_1 \text{ Beta} + c_1 \text{ Dividend yield} \quad (21.12)$$

### Exhibit 21.3 | Effect of Dividend Policy on Required Return

	<i>Firm A (No Dividend)</i>	<i>Firm B (High Dividend)</i>
1. Next year's price	₹ 120	₹ 105
2. Dividend	0	₹ 15
3. Total pre-tax payoff	₹ 120	₹ 120
4. Current price	₹ 102.86	₹ 101.43
5. Capital gain	₹ 17.14	₹ 3.57
6. Pre-tax rate of return [(2)+(5)]/(4)	16.67%	18.31%
7. Tax on dividend at 20 percent	—	₹ 3
8. Tax on capital gains at 10 percent	₹ 1.714	₹ 0.357
9. Total post-tax income [(2)+(5)]-[(7)+(8)]	₹ 15.426	₹ 15.213
10. Post-tax rate of return	<u>15.426 = 15%</u> 102.86	<u>15.213 = 15%</u> 101.43

The hypothesis is that  $b_1$ , the coefficient of beta, is positive, reflecting the effect of systematic risk on returns and  $c_1$ , the coefficient of dividend yield, is positive, reflecting the tax disadvantage of dividend payments. Most of the studies found that  $c_1$ , the coefficient of expected dividend yield, was positive suggesting that there is a tax effect and hence evidence in favour of the radical hypothesis.

## 21.5 ■ OVERALL PICTURE

We have examined several points of view on the relationship between dividend policy and share valuation. These points of view may be divided into two broad schools of thought. The first school, the **perfect market** school to which MM belong, maintains that the dividend policy of the firm is irrelevant because investment and financing decisions are independent, the costs of internal and external financing are equal, and investors and firms are rational.

The second school, the **imperfect market** school, subsuming the other four points of view discussed above, argues that the dividend policy of the firm influences the value of its shares though there are sharp differences within this school as to how the dividend decision influences valuation – recall that the traditionalists believe that ‘dividends are good’ and the radicalists argue that ‘dividends are bad’. This school harps on the imperfections obtaining in the real world: investor preference for current dividends, interdependency between dividend and investment decisions, existence of floatation and transaction costs, irrational behaviour of investors and firms, differential taxation of dividends and capital gains, informational asymmetry, and underpricing of equity issues. The relationship between dividend policy and firm value depends on the combined effect of these factors.

### SUMMARY

- There are several views on the relationship between dividend policy and share valuation.
- **Walter model** and **Gordon model** argue that a higher dividend payout hurts (benefits) shareholders when the return on invested capital is greater (lesser) than the cost of capital.
- According to the **traditional position** a generous dividend policy enhances stock prices.
- Miller and Modigliani (MM) have advanced the **dividend irrelevance hypothesis** that says that the value of the firm is independent of its dividend policy.
- The critics of MM agree that, under the assumptions made by MM, dividends are irrelevant. They, however, dispute the validity of the ‘dividend irrelevance’ theorem by challenging the assumptions of MM.

- The **radical position** argues that a low dividend payout ratio increases share value.

## QUESTIONS

- State the valuation formula put forward by James Walter. What is the logic behind this formula?
- What are the implications of the Walter model?
- State Gordon's basic valuation formula. How is it derived?
- What are the implications of Gordon's basic model?
- State the traditional position on the relationship between dividend policy and share valuation.
- Critically evaluate the evidence trotted by the traditionalists in support of their position.
- What is the substance of Miller and Modigliani 'dividend irrelevance' theorem?
- Prove the 'dividend irrelevance' theorem.
- Discuss the criticisms of the Miller and Modigliani position.
- "A low dividend payout ratio promotes the welfare of stockholders because long-term capital gains are treated more favourably than dividend income from the tax point of view." Discuss.
- What is the central argument of the rational expectations hypothesis?
- Discuss the implications of the rational expectations hypothesis for the dividend policy of a firm.

## SOLVED PROBLEMS

21.1 The following information is available for Avanti Corporation.

- Earnings per share : ₹ 4.00
- Rate of return on investments : 18 percent
- Rate of return required by shareholders : 15 percent

What will be the price per share as per the Walter model if the payout ratio is 40 percent? 50 percent? 60 percent?

*Solution*

According to the Walter model,

$$P = \frac{D + (E - D)r/k}{k}$$

Given  $E = ₹ 4$ ,  $r = 0.18$ , and  $k = 0.15$ , the value of  $P$  for the three different payout ratios is as follows:

<i>Payout ratio</i>	<i>P</i>
40 percent	$\frac{1.60 + (2.40)0.18 / .15}{0.15} = ₹ 29.87$
50 percent	$\frac{2.00 + (2.00)0.18 / .15}{0.15} = ₹ 29.33$
60 percent	$\frac{2.40 + (1.60)0.18 / .15}{0.15} = ₹ 28.80$

21.2 The following information is available for Kavita Musicals.

- Earnings per share : ₹ 5.00
- Rate of return required by shareholders : 16 percent

Assuming that the Gordon valuation model holds, what rate of return should be earned on investments to ensure that the market price is ₹ 50 when the dividend payout is 40 percent?

*Solution*

According to the Gordon model

$$P_0 = \frac{E_1(1-b)}{k-br}$$

Plugging in the various values given, we get

$$50 = \frac{5.0(1-0.6)}{0.16 - 0.6r}$$

Solving this for  $r$ , we get

$$r = 0.20 = 20 \text{ percent}$$

Hence, Kavita Musicals must earn a rate of return of 20 percent on its investments.

21.3 The stocks of firms  $X$  and  $Y$  are considered to be equally risky. Investors expect the share of firm  $X$  – the firm which does not plan to pay dividend to be worth ₹ 180 next year. From a share of firm  $Y$ , too, investors expect a payoff of ₹ 180 – ₹ 15 by way of dividend and ₹ 165 by way of share price a year from now.

Dividends are taxed at 20 percent and capital gains at 10 percent. What will be the current price of the shares of  $X$  and  $Y$ , if each of them offers an expected post-tax rate of return of 15 percent. Assume that the radical position applies.

*Solution*

$P_X$ , the current price per share of  $X$  and  $P_Y$ , the current price per share of  $Y$  are calculated below:

	<i>Firm X</i>	<i>Firm Y</i>
1. Next year's price	₹ 180	₹ 165
2. Dividend	–	₹ 15
3. Total pre-tax payoff	₹ 180	₹ 180
4. Current price	$P_X$	$P_Y$
5. Capital gain	$180 - P_X$	$165 - P_Y$
6. Tax on dividend at 20%	–	₹ 3
7. Post-tax dividend	0	₹ 12
8. Tax on capital gains at 10%	$.10(180 - P_X)$	$.10(165 - P_Y)$
9. Post-tax capital gains	$.90(180 - P_X)$	$.90(165 - P_Y)$
10. Total post-tax return (7)+(9)	$.90(180 - P_X)$	$12 + .90(165 - P_Y)$
11. Post-tax rate of return (10)/(4)	$\frac{.90(180 - P_X)}{P_X}$	$\frac{12 + .90(165 - P_Y)}{P_Y}$

Since

$$\frac{.90(180 - P_X)}{P_X} = 0.15 \quad \text{So, } P_X = ₹ 154.29$$

Since

$$\frac{12 + .90(165 - P_Y)}{P_Y} = 0.15 \quad \text{So, } P_Y = ₹ 152.85$$

## PROBLEMS

**21.1 Walter and Gordon Model** The following data is available for Parkson Company:

Earnings per share	= ₹ 3.00
Internal rate of return	= 15 percent
Cost of capital	= 12 percent

If Walter's valuation formula holds, what will be the price per share when the dividend payout ratio is 50 percent? 75 percent? 100 percent?

If Gordon's basic valuation formula holds, what will be the price per share when the dividend payout is 25 percent, 50 percent, and 75 percent?

**21.2 Radical Position** The stocks of firms *P* and *Q* are considered to be equally risky. Investors expect the share of firm *P* – the firm which does not plan to pay dividend to be worth ₹ 80 next year. From the share of firm *Q*, too, investors expect a pay off of ₹ 80 – ₹ 6 by way of dividend and ₹ 74 by way of share price a year from now. Dividends are taxed at 20 percent and capital gains at 10 percent. What will be the current price of the shares of *P* and *Q*, if each of them offers an expected post-tax rate of 14 percent? Assume that the radical position applies.

<sup>1</sup> James Walter, "Dividend Policy: Its Influence on the Value of the Firm," *Journal of Finance* (May, 1963).

<sup>2</sup> The present value of an infinite stream of  $D$  is:

$$\frac{D}{(1+k)} + \frac{D}{(1+k)^2} + \dots = D/k \quad (1)$$

<sup>3</sup> The second component is derived as follows:

The return from the first retained earnings,  $(E - D)$ , would be:

Time	0	1	2	3	4	
			$(E - D) r$	$(E - D) r$	$(E - D) r$	

(2)

(Note that the retained earnings at time 1 earns return from time 2 onwards)

The present value of this stream of returns is:

$$\frac{(E - D)r}{(1+k)^2} + \frac{(E - D)r}{(1+k)^3} + \dots = \frac{(E - D)r}{k(1+k)} \quad (3)$$

The return from the second retained earnings,  $(E - D)$ , would be:

Time	0	1	2	3	4	5	
			$(E - D) r$				

(4)

The present value of this stream of returns is:

$$\frac{(E - D)r}{(1+k)^3} + \frac{(E - D)r}{(1+k)^4} + \dots = \frac{(E - D)r}{k(1+k)^2} \quad (5)$$

Likewise the present value of the stream of returns from the third retained earnings would be:

$$\frac{(E - D)r}{k(1+k)^3} \quad (6)$$

So and so forth.

Adding the present value of the stream of returns from all retained earnings, we get:

$$\frac{(E - D)r}{k(1+k)} + \frac{(E - D)r}{k(1+k)^2} + \frac{(E - D)r}{k(1+k)^3} + \dots \quad (7)$$

This sum is equal to:

$$\frac{(E - D)r}{k} \quad (8)$$

<sup>4</sup> M.J. Gordon, *The Investment, Financing and Valuation of the Corporation*, Homewood, Ill, Richard Irwin, 1962.

<sup>5</sup> This formula may be derived as follows:

Using the divided capitalisation approach, the price per share is:

$$P_0 = \frac{D}{(1+k)} + \frac{D}{(1+k)^2} + \dots \quad (1)$$

This may be rewritten as:

$$P_0 = \frac{E_1(1-b)}{(1+k)} + \frac{E_2(1-b)}{(1+k)^2} + \frac{E_3(1-b)}{(1+k)^3} + \dots \quad (2)$$

Since the growth rate of earnings and dividends is  $br$ , we get:

$$P_0 = \frac{E_1(1-b)}{(1+k)} + \frac{E_1(1+br)(1-b)}{(1+k)^2} + \frac{E_1(1+br)^2(1-b)}{(1+k)^3} + \dots \quad (3)$$

This on simplification becomes:

$$P_0 = \frac{E_1(1-b)}{k - br} \quad (4)$$

- <sup>6</sup> B. Graham and D.L. Dodd, *Security Analysis: Principles and Techniques*, 3<sup>rd</sup> edn, McGraw-Hill Book Company, New York, 1951.
- <sup>7</sup> M.H. Miller and F. Modigliani, "Dividend Policy, Growth and the Valuation of Shares," *Journal of Business*, Vol. 34 (October 1961).
- <sup>8</sup> Monica Singhania, "Taxation and Corporate Payout Policy," *Vikalpa*, October-December 2006.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter21/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter21/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Dividend Decision

### Learning Objectives

After studying this chapter you should be able to:

- ✓ Understand the considerations relevant for determining the dividend policy.
- ✓ Explain the Lintner model for corporate dividend behaviour.
- ✓ Compare a bonus issue with a stock split.
- ✓ Suggest the reasons for share buybacks.
- ✓ Understand the mechanics of dividend payment.

While several theories have been suggested on how imperfections (market frictions) may have a bearing on dividend policy, empirical work resists providing definitive answers. This may be due to the difficulties in quantitatively measuring frictions and the statistical problems in dealing with interactive imperfections.

Since each firm faces a combination of potentially different market frictions, each firm has a uniquely optimal dividend policy. It must carefully evaluate its circumstances and the environment in which it operates while hammering out its dividend policy. Indeed, in practice, most companies seem to accord a great deal of importance to their dividend decisions. The dividend policy and the bonus policy—more so the latter—are debated at great length. Of course, one does come across companies that make a short shrift of their dividend policy. As one commentator said: “Shareholders bother a great deal about the dividend policy, financial economists consider the dividend policy as irrelevant, and corporate managements treat the dividend policy as a mere after thought.”

Recognising the importance of dividend policy, this chapter looks at why firms pay dividends, delineates the key dimensions of dividend policy, discusses the factors and considerations relevant for formulating the dividend policy (as well as the policy relating to bonus shares and stock

splits), describes corporate dividend behaviour, dwells on legal and procedural aspects of dividends, and examines the issue of share buyback.

## **22.1 ■ WHY FIRMS PAY DIVIDENDS**

Despite the tax disadvantage of dividends and the costs associated with external equity issue, firms pay dividends and investors generally regard such payments positively. Why? There are several reasons for paying dividends, some plausible and some dubious.

## **Plausible Reasons for Paying Dividends**

The plausible reasons for paying dividends are investor preference for dividends, information signaling, and clientele effects.

**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 Signaling** 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 signaling 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 steal money in some way or 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.

## Dubious Reasons for Paying Dividends

Some reasons why firms pay dividends do not appear plausible. Two commonly found dubious reasons are the bird in hand fallacy and the existence of temporary excess cash.

**Bird-in-hand Fallacy** Myron Gordon argued that a high dividend policy is beneficial to shareholders because it reduces uncertainty. Investors value a security by forecasting and discounting future dividends. Since there is greater uncertainty characterising distant dividends investors will discount them at a higher rate. So, Gordon said that stock prices would be lower for companies that pay low dividends now in order to pay higher dividends later.

While it may be easier to predict dividends than capital gains, it is fallacious to conclude that increased dividends can make a firm less risky. As long as capital spending and borrowing remain unchanged, the dividend policy cannot change the firm's overall cash flows and its risks, which truly determine the firm's value. Remember, the choice is not between dividend today and uncertain capital gain at some point of time in future. Rather, it is between dividend today and an identical amount of capital gain today.

**Temporary Excess Cash** Sometimes firms tend to pay more dividends when they have excess cash. While it is quite reasonable to return excess cash to shareholders, firms should not ignore their long-term investment needs. If the excess cash is on account of non-recurring factors like a windfall gain or sale of assets and the firm is likely to have cash shortfalls in future, it may be worthwhile to retain the surplus cash to meet future needs. If the firm pays excess cash as dividends, it would have to issue new equity in future which is likely to be more costly than retained earnings because of issue and floatation costs.

## **22.2 ■ DIMENSIONS OF DIVIDEND POLICY**

There are two important dimensions of a firm's dividend policy: What should be the average payout ratio? How stable should the dividends be over time? These two dimensions are conceptually distinct from one another. The average payout ratio can be high or low regardless of whether the dividend stream is steady or fluctuating.

## Payout Ratio

The considerations relevant for determining the dividend payout ratio are described below:

**Funds Requirement** A key factor influencing the payout ratio of a firm is its requirement for funds in the foreseeable future. This may be assessed with the help of financial forecasts prepared in the context of long range planning. Generally, firms which have substantial investment opportunities and consequently considerable funding needs tend to keep their payout ratio rather low to conserve resources for growth. Reliance Industries Limited, for example, has kept its payout ratio fairly low, as it has been expanding rapidly. On the other hand, firms which have rather limited investment avenues usually pursue a more generous payout policy.

**Liquidity** Dividends entail cash payment. Hence, the liquidity position of the firm has a bearing on its dividend decision. A firm may be unable to distribute more than a small fraction of its earnings, despite its desire to do so, because of insufficient liquidity. This is typically the case of highly profitable but rapidly expanding firms which, thanks to their substantial investment and other commitments, do not have abundant liquidity.

**Access to External Sources of Financing** Generally, a firm which has easy access to external sources of financing may feel less constrained in its dividend decision. On the other hand, a firm which has difficulty in raising finances externally, or disinclination to do so, is likely to lean heavily on internally generated funds. Given its investment and other commitments and a lesser degree of financing latitude, such a firm is likely to pursue a somewhat conservative dividend payout policy.

**Shareholder Preference** The preference of shareholders may influence the dividend payout ratio of the firm. When equity shareholders have greater interest in current dividend vis-à-vis capital gains, the firm may be inclined to follow a liberal dividend payout policy. On the other hand, if equity shareholders have a strong preference for capital gains, the firm may plough back a larger proportion of its earnings.

While the preference of equity shareholders has some influence over the dividend policy of the firm, it appears that the dividend policy of the firm tends to have a greater impact over the kinds of shareholders that are attracted towards it. Each firm is likely to draw to itself a “clientele” which finds its payout policy attractive.

**Difference in the Cost of External Equity and Retained Earnings** The cost of external equity, excepting that which is raised by way of rights issue, is higher than the cost of retained earnings. Two factors cause this difference: issue cost and under-pricing. The magnitude of cost differential between external equity and retained earnings has a bearing on the relative proportions of external equity and retained earnings used by the firm and hence on its dividend policy.

**Control** External financing, unless it is through a rights issue, involves dilution of control. If external finances are raised through a public issue or private placement of equity capital, the existing shareholders will have to share control with the new shareholders. Internal financing by way of retained earnings, on the other hand, leads to no dilution of control. Hence, if the shareholders and management of the firm are averse to dilution of control, the firm should rely more on retained earnings.

**Taxes** Presently dividend income is tax-exempt in the hands of investors. However, the firm distributing the dividend has to pay a dividend distribution tax of 16.995 percent (15.0 percent + surcharge + cess). Thus, there is an effective indirect tax of 16.995 percent on dividend income. As against this, the long-term capital gains are tax exempt. Given this differential tax treatment, the tax factor *per se* favours a niggardly payout ratio.

## Dividend Life Cycle

The dividend payout policy depends largely on the market imperfections and firm's position in its life cycle. The key market imperfections are: taxes, floatation costs, agency costs, and informational asymmetry. The major stages in a firm's life cycle are: infancy, rapid growth, maturity, and decline.

Ignoring taxes for the time being, [Exhibit 22.1](#) shows the nature of market imperfections at different stages of a firm's life cycle and the implications of the same for dividend policy.

**Exhibit 22.1** Dividend Life Cycle

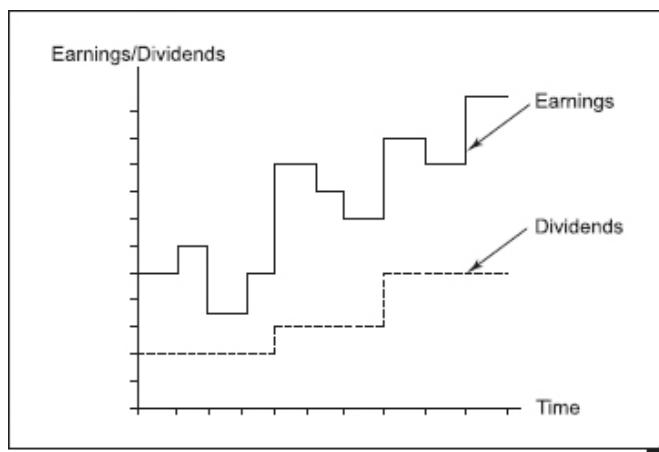
<i>Imperfections → Stage</i>	<i>Floatation Costs</i>	<i>Agency Costs</i>	<i>Informational Asymmetry</i>	<i>Implied Dividend Policy</i>
<i>Infancy</i>	Very high	Low	Very high	Nil or Negligible dividends
<i>Rapid Growth</i>	Moderate	Moderate	Moderate	Low dividend payout policy
<i>Maturity</i>	Low	High	Falling	Increasing dividend payout policy
<i>Decline</i>	Low	Very high	Low	Generous dividend payout policy

## Stability

Irrespective of the long-term payout ratio followed, the fluctuations in the year-to-year dividends may be determined mainly by one of the following guidelines:

- **Stable dividend payout ratio** According to this policy, the percentage of earnings paid out as dividends remains constant. As a result, dividends fluctuate in line with earnings. It is clear that such a policy results in transmitting the variability of earnings directly to dividends. Hence such a policy is rarely adopted by business firms.
- **Stable dividends or steadily changing dividends** As per this policy, the rupee level of dividends remains stable or gradually increases (mostly) or decreases (rarely). [Exhibit 22.2](#) shows the behaviour of dividends per share in response to changes in earnings per share when such a policy is followed. Such a policy seems to be followed widely by business firms.

### Exhibit 22.2 | Stable Dividends or Steadily Changing Dividends



**Rationale for Dividend Stability** Why do firms follow a policy of stable dividends or gradually rising dividends? Several explanations may be offered:

- Many individual investors depend on dividend income to meet a portion of their living expenses. Since these expenses remain stable or increase gradually over time they prefer a similar behavioural pattern in dividends. Sharp changes in dividend income may entail selling of some shares, if dividends fall steeply, or reinvestment of a portion of dividend income if dividends rise substantially. In both the

cases investors have to incur transaction costs and put up with some inconvenience. These are avoided if the dividend stream is stable and predictable.

- The dividend decision of the firm has come to be regarded as an important means by which the management conveys information about the prospects of the firm: an increase in dividends indicates improved earnings prospects, a decrease in dividends implies lowered earnings expectation, and a lack of change in dividends means unchanged prospects. Put differently, the dividend decision of the firm resolves uncertainty in the minds of stockholders. If a firm varies dividends widely in response to certain transient influences, its dividend decision would lack the uncertainty-resolving power. Hence firms vary dividend only gradually in response to certain long-term changes in prospects.
- Institutional investors often view a record of steady dividend payment as a highly desirable feature—they may even regard this as a precondition before considering equity or debt investment in the firm.

## 22.3 ■ DIVIDEND POLICY FORMULATION

Our knowledge in finance is not uniform across different topics. For example, capital budgeting techniques are precise and powerful. The net present value analysis provides a clear indication of the contribution that a project makes to shareholder wealth. Likewise, the capital asset pricing model and the arbitrage pricing model provide a useful relationship between risk and expected return.

Conversely, our knowledge of capital structure is somewhat deficient. Although there are elegant theories about capital structure and firm value, we do not have a neat formula to establish the optimal capital structure. The profession has to usually rely on broad guidelines, partial analyses, and rules of thumb. Our knowledge of dividend policy is somewhat similar to our knowledge of capital structure policy. We do not have a precise technique to establish the dividend policy that maximises the value of the firm. We have to rely on certain broad considerations, general guidelines, and managerial judgment.

While formulating its dividend policy a firm should bear in mind the following considerations:

- Investment decisions have the greatest impact on value creation.
- External equity is more expensive than internal equity (retained earnings) because of issue costs and under-pricing.
- Most promoters are averse to the dilution of their stake in equity and hence are reluctant to issue external equity.
- There is a limit beyond which a firm would have real difficulty in raising debt financing.
- The dividend decision of the firm is an important means by which the management conveys information about the prospects of the firm.

The following guidelines emerge from the above considerations:

- Don't pay dividends at the expense of positive NPV projects.
- Minimise the need to sell external equity.
- Define a target dividend payout ratio along with a target debt-equity ratio, taking into account the investment needs, managerial preferences, capital market norms, and tax code.
- Accept temporary departures from the target dividend payout ratio and the target debt-equity ratio.
- Avoid dividend cuts.

Notwithstanding these guidelines, dividend decision remains one of the most judgmental decisions that firms make.

In essence the above guidelines imply that a firm should pursue a smoothed residual dividend policy and not a pure residual dividend policy or a fixed dividend payout policy.

To understand the differences between these policies we will employ the following symbols:

$E_t$  = earnings in year  $t$

$I_t^e$  = equity support required for financing the investment in year  $t$ , given the debt-equity target of the firm

$D_t$  = dividends paid in year  $t$

$p_t$  = dividend payout ratio for year  $t$  ( $D_t/E_t$ )

According to the **pure residual dividend policy** the dividends paid in year  $t$ ,  $D_t$ , will be:

$$D_t = 0 \text{ if } I_t^e > E_t \quad (22.1)$$

$$D_t = E_t - I_t^e \text{ if } E_t > I_t^e \quad (22.2)$$

According to the **fixed dividend payout policy** the dividends paid in year  $t$  will be:

$$D_t = p_t \cdot E_t \quad (22.3)$$

The proportion  $p_t$  is set in such a manner that in the long run dividends are equal to equity earnings minus retained earnings required to support investments.

According to the **smoothed residual dividend policy**, dividends are varied (typically raised) gradually over time. The level of dividends is so set that in the long run the total dividends paid are equal to total earnings less retained earnings required to support investments.

[Exhibit 22.3](#) shows dividends for a period of six years under each of the above policies.

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### Exhibit 22.3 | Dividend Stream Under Different Policies

	1	2	3	4	5	6	Total
Earnings, $E_t$	150.0	190.0	140.0	220.0	280.0	250.0	1230.0
Investment budget	137.0	160.0	180.0	200.0	210.0	220.0	1107.0
Equity investment, $I_t^e$	68.5	80.0	90.0	100.0	105.0	110.0	553.5
Pure residual dividends, $D_t$	81.5	110.0	50.0	120.0	175.0	140.0	676.5
Fixed dividend payout ratio ( $p_t = 0.55$ ), $D_t$	82.5	104.5	77.0	121.0	154.0	137.5	676.5
Smoothed residual dividends	105.0	105.0	105.5	120.0	120.0	120.0	676.5

The pure residual dividend policy tends to produce highly fluctuating dividends because the variability of equity earnings and investment budget (given a certain debt-equity ratio) is transmitted to dividends. (Of course, when the fluctuations in equity earnings and investment budget are identical in nature, dividends are stabilised. This, indeed, is a very rare possibility.) Likewise, the fixed dividend payout policy generates a fluctuating dividend stream because the variability of earnings is transmitted to dividends.

Since investors are generally averse to fluctuating dividends for various reasons, the pure residual dividend policy and the fixed dividend payout ratio policy are often not advisable in practice. The smoothed residual dividend policy, which produces a stable and steadily growing stream of dividends, often appears to be the most sensible approach in practice.

#### Key Considerations in Dividend Decision

A survey of dividend policies and practices, conducted by the Conference Board in the U.S., revealed that five considerations or guidelines were dominant in the minds of dividend decision makers:

- The company's earnings record and its future prospects.
- The company's record of continuity or regularity of dividend payments.
- The need to maintain a stable rate of dividends per share of stock.
- The company's cash flow, present cash position, and the anticipated need for funds.
- The needs and expectation of the owners of the common stock.

## 22.4 ■ CORPORATE DIVIDEND BEHAVIOUR

Is there a pattern to corporate dividend behaviour? The classic answer to this question was provided by John Lintner<sup>1</sup> in 1956. Lintner's survey of corporate dividend behaviour is captured in 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.
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:

$$D_t = cr \text{EPS}_t + (1 - c) D_{t-1} \quad (22.4)$$

where  $D_t$  is the dividend per share for year  $t$ ,  $c$  is the adjustment rate,  $r$  is the target payout ratio,  $\text{EPS}_t$  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 Limited 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 Limited 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 dividend for 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.<sup>2</sup>

From Eq. (22.4) we may obtain the following equation which seeks to explain the change in dividend from year  $t - 1$  to year  $t$ .

$$D_t - D_{t-1} = c(r\text{EPS}_t - D_{t-1}) \quad (22.5)$$

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.

How valid is the Lintner model? Lintner's empirical work<sup>3</sup> provided substantial support for his model. On the basis of extensive empirical testing of the adequacy and reliability of his model, Lintner concluded: "On the evidence so far available, it appears that our basic model incorporates the dominant determinants of corporate dividend decisions, that these have been introduced properly, and that the resulting parameters are reasonably stable over long periods involving substantial changes in many external conditions." A very careful and thorough study by Fama and Babaiak<sup>4</sup> too supported the Lintner model.

John Britain<sup>5</sup> who conducted an extensive study of corporate dividend behaviour tested Lintner's basic model along with two modifications. In his first modification (called the 'cash flow model') Britain substituted cash flow for profits<sup>6</sup>; in his second modification (called the 'explicit depreciation model'), Britain divided cash flow into its two components, profit and depreciation<sup>7</sup>. Britain found substantial support for the Lintner argument, particularly in the modified forms.

On the Indian scene, too, empirical studies seem to endorse the Lintner model. Purnanandam<sup>8</sup>, in an extensive study, found the Lintner model adequate in explaining corporate dividend behaviour in India. Other studies likewise testify to the appropriateness of the basic Lintner model.

While the Lintner survey was done over a half century back, CFOs still seem to follow the heuristics identified by him. A recent survey done 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.”

Even after five decades, Lintner’s work remains the most definitive study of managerial dividend behaviour. It is a finance “classic.” Based on his work, along with confirmation by other researchers, we can conclude that financial managers consider dividend decision as an important part of their job. The typical firm does not choose its dividend payout randomly or follow a residual policy. Rather, it manages its dividend policy as suggested by the Lintner model.

Although managers view dividend decisions seriously, we cannot convincingly conclude that a carefully managed dividend policy leads to a higher share price. As Merton Miller suggested with respect to the capital structure decisions, dividend policy decisions may reflect a “neutral mutation.” This means that they are policies that may neither create value nor erode value.

## **22.5 ■ LEGAL AND PROCEDURAL ASPECTS<sup>9</sup>**

### **Legal Aspects**

According to Section 123 of the Companies Act, 2013, no dividend shall be declared or paid by a company for any financial year except (a) out of the profits of the company for that year arrived at after providing depreciation in accordance with the provisions of Schedule II, or out of the profits of the company for any previous financial year or years arrived at after providing for depreciation in accordance Schedule II and remaining undistributed, or out of both; or (b) out of the money provided by the Central Government or a State Government for the payment of dividend by the company in pursuance of a guarantee given by that Government.

The Board of Directors of a company may declare interim dividend during any financial year out of the surplus in the profit and loss account and out of profits of the financial year in which such interim dividend is sought to be declared. Provided that in case the company has incurred loss during the current financial year up to the end of the quarter immediately preceding the date of declaration of interim dividend, such interim dividend shall not be declared at a rate higher than the average dividends declared by the company during the immediately preceding three financial years.

Shareholders have the right to declare the dividend at the annual general meeting but they can only approve the rate of dividend recommended by the directors or lower it but not increase it. As per the Companies Act, interim dividend is declared by directors, unlike the annual dividend, which is declared by the members in the annual general meeting.

## Procedural Aspects

The important events and dates in the dividend payment procedure are:

- **Board resolution** The dividend decision is the prerogative of the board of directors. Hence the board of directors should in a formal meeting resolve to pay the dividend.
- **Shareholders' approval** The resolution of the board of directors to pay the dividend has to be approved by the shareholders in the annual general meeting.
- **Record date** The dividend is payable to shareholders whose names appear in the Register of Members as on the record date.
- **Dividend payment** Once a dividend declaration has been made, dividend warrants must be posted within 30 days. Within a period of 7 days, after the expiry of 30 days, unpaid dividends must be transferred to a special account opened with a scheduled bank.<sup>10</sup>

## 22.6 ■ BONUS SHARES AND STOCK SPLITS

### Bonus Shares

Bonus shares can be issued only out of free reserves, securities premium account, and capital redemption reserve account. [Exhibit 22.4](#) illustrates the nature of this capitalisation. Part A of the exhibit shows the equity portion of the balance sheet before the bonus issue and Part B of the exhibit shows the equity portion of the balance sheet after the bonus issue.

#### Exhibit 22.4 Effects of a Bonus Issue on the Equity Portion of the Balance Sheet

Part A : Equity Portion Before Bonus Issue	
Paid-up Share Capital	₹ 10,000,000
1,000,000 Shares of ₹ 10 Each Fully Paid	
Reserves and Surplus	₹ 30,000,000
Part B : Equity Portion After Bonus Issue in the Ratio 1: 1	
Paid-up Share Capital	₹ 20,000,000
2,000,000 Shares of ₹ 10 Each Fully Paid	
Reserves and Surplus	₹ 20,000,000

In the wake of a bonus issue:

- The shareholders' proportional ownership remains unchanged.
- The book value per share, the earnings per share, and the market price per share decrease, but the number of shares increases.

**Reasons for Issuing Bonus Shares** From the foregoing it seems that the issue of bonus shares is more or less a financial gimmick without any real impact on the welfare of equity shareholders. Still firms issue bonus shares and shareholders look forward to issue of bonus shares. Why? The important reasons are:

- The bonus issue tends to bring the market price per share within a more popular range.
- It increases the number of outstanding shares. This promotes more active trading.
- The nominal rate of dividend tends to decline. This may dispel the impression of profiteering.

- The share capital base increases and the company may achieve a more respectable size in the eyes of the investing community.
- Shareholders regard a bonus issue as a firm indication that the prospects of the company have brightened and they can reasonably look for an increase in total dividends.
- It improves the prospects of raising additional funds. In recent years many firms have issued bonus shares prior to the issue of convertible debentures or other financing instruments.

**Regulation of Bonus Issues** The regulations governing a bonus issue are as follows:

- The bonus issue is made out of free reserves built out of genuine profits or share premium collected in cash only.
- Pending conversion into shares, fully convertible debentures (FCDs) and partly convertible debentures (PCDs) are included for determining the eligibility to receive bonus shares. The bonus entitlements of such shares should be kept separately and allotted at the time of conversion of such FCDs / PCDs.
- A bonus issue cannot be made in lieu of dividend payment.
- A bonus issue cannot be made on partly paid up shares.
- A company should not be in default of servicing fixed deposits, debentures, and statutory dues if it wants to issue bonus shares.
- The articles of association of the company should authorise a bonus issue.

### Bonus Debentures

A company which is not in a position to pay a special dividend can issue bonus debentures which can be sold by shareholders. This way the company preserves its liquidity, whereas the shareholders can get more cash if they choose to sell the bonus debentures. Hindustan Lever, now Hindustan Unilever, was the first company in India to issue such debentures.

## Stock Splits

In a stock split the par value per share is reduced and the number of shares is increased proportionately. [Exhibit 22.5](#) illustrates the nature of this change. For example, Tata Tea split its shares into par value of ₹ 1 from the earlier par value of ₹ 10.

### Exhibit 22.5 Effects of a Stock Split on the Equity Portion of the Balance Sheet

Part A : Equity Portion Before Stock Split	
Paid-up Share Capital	₹ 5,000,000
500,000 Shares of ₹ 10 Each Fully Paid	
Reserves and Surplus	
	₹ 10,000,000
Part B : Equity Portion After Stock Split in the Ratio 5 : 1	
Paid-up Share Capital	₹ 5,000,000
2,500,000 Shares of ₹ 2 Each Fully Paid	
Reserves and Surplus	₹ 10,000,000

**Comparison between Bonus Issue and Stock Split** A comparison between a bonus issue and a stock split is given below:

Bonus Issue	Stock Split
■ The par value of the share is unchanged	■ The par value of the share is reduced
■ A part of reserves is capitalised	■ There is no capitalisation of reserves
■ The shareholders' proportional ownership remains unchanged	■ The shareholders' proportional ownership remains unchanged
■ The book value per share, the earnings per share, and the market price per share decline	■ The book value per share, the earnings per share, and the market price per share decline
■ The market price per share is brought within a more popular trading range	■ The market price per share is brought within a more popular trading range

In a nutshell, a stock split is similar to a bonus issue from the economic point of view, though there are some differences from the accounting point of view.

**Reverse Stock Split** A reverse stock split is the opposite of a stock split. It involves increasing the par value and decreasing the number of shares proportionately. For example, LG Balakrishnan and Bros did a reverse stock split in 2010 by increasing the face value from ₹ 1 to ₹ 10. Typically, a reverse stock split is done when the stock is quoting too low say less than ₹ 10.

## 22.7 ■ SHARE BUYBACKS

Share buybacks, referred to as equity repurchases or stock repurchases in the U.S., are now feasible in India – till 1998 the law in India did not permit share buybacks. Several companies including Reliance Industries Limited, Bajaj Auto Limited, and Ashok Leyland Limited have initiated share buyback programmes. Many more are likely to follow suit. Indeed if one goes by the experience of U.S. where hundreds of companies have an active and vigorous equity repurchases programme, India too is likely to witness heightened activity in this area in the years to come.

In India, the buyback of shares is generally done by the tender method or the open market purchase method. In the **tender method**, a company offers to buy back shares at a fixed price which is usually higher than the prevailing price. It determines the maximum number of shares it is willing to buy and specifies an outer time limit for accepting the offer. In the **open market purchase method**, a company buys from stock market through brokers. The company fixes the maximum price for the open market purchase, stipulates the number of shares it plans to buy, and specifies the closing date of the offer. A company in India, unlike its counterpart in the U.S., cannot buy back shares in negotiated deals.

A company that chooses to buyback has to appoint a merchant banker and make a public announcement of the offer seven days before the commencement of the buyback. The buyback has to be completed in a period of 12 months from the date of passing the special resolution.

## Rationale for Buybacks

There are several motivations or justifications for share buybacks. They are discussed briefly below:

**Efficient Allocation of Resources** A repurchase or buyback often represents a worth while investment proposition for the company. As Warren Buffett said: "When companies purchase their own stock, they often find it easy to get \$2 of present value for \$1. Corporate acquisition programs almost never do as well and, in a discouragingly large number of cases, fail to get anything close to \$1 of value for each \$1 expended."

An opportunity to repurchase can check profligate managerial tendencies. Companies having surplus cash may expand or diversify uneconomically. As Louis Lowenstein said: "Cash sitting around for any length of time can be unbearable, even if it's your own. We all would like to create a notable business or product; we would all like to head a large company rather than a small." Good managements recognise this and check their propensities to squander cash. Exxon Mobil, for example, has a plan not to 'stockpile' dollars. Instead it pays dividends and repurchases stock to discipline itself.

**Positive Signal** A buyback decision is usually motivated by management's belief that the shares of the firm are undervalued. So, the stock market greets corporate decisions to repurchase their stock. Several empirical works in the U.S. have shown that repurchases enhance shareholder value. Through buybacks, managements demonstrate their commitment to enhance shareholder value rather than to expand their empires.

**Price Stability** Stock prices seem to fluctuate a great deal in response to changing market sentiment (which seems to alternate between fear and greed) and periodic bull and bear raids. If a company buys back its shares when the price looks depressed to the management (which presumably is better equipped to assess its value), the repurchase action of the management tends to have a buoying effect in an otherwise bearish market. On the contrary, if the price appears inflated, the management can re-issue the *treasury stock*<sup>11</sup> (shares bought back by a company are referred to as the treasury stock). This will have a sobering impact on prices. Thus, the facility to repurchase and reissue, on the whole, has a moderating effect on price fluctuations which can, at times, be excessive.

**Tax Advantage** In general, the effective tax burden on dividends (this includes the tax paid by the company on dividend distribution and the tax paid by shareholders on dividend receipt) is higher than the effective tax burden on long term capital gains. So a share buyback which produces long-term capital gains is tax-advantageous compared to a dividend payment.

**Control** Share buybacks can be used as an instrument to increase the insider control in firms. Typically insiders do not tender their shares when a firm resorts to share buyback. Hence, they end up holding a larger proportion of the reduced equity of the firm and thereby have greater control.

**Voluntary Character** When a firm distributes dividends investors do not have any option. However, when a firm announces a share buyback programme, investors have the option to sell or not to sell. Given its voluntary character, a share buyback programme is much more focused in paying cash only to those investors who want it.

**No Implied Commitment** While regular dividends carry an implicit commitment to continue payment in future, share buybacks are normally viewed as one-time exercises.

**Capital Structure Changes** A share buyback shrinks the equity (net worth) of the company in relation to its debt, thereby increasing the debt-equity ratio. Hence it can be used to effect changes in the capital structure.

## Objections to Buybacks

There are several objections to buybacks: unfair advantage, manipulation, and excessive payment. Let us examine these objections.

**Unfair Advantage** Critics of buyback argue that when a company buys back its shares it may make a bargain purchase that gives an unfair advantage to the continuing, non-selling, shareholders (which typically includes corporate insiders). The underlying premise is that a buyback programme represents a zero-sum game, a game in which one group (the non-selling group) benefits at the expense of another group (the selling group). This argument assumes that all the shareholders of a company have identical goals and horizons. In reality, however, shareholders have varying goals and horizons. At one extreme, shareholders are interested in speculative gains in the short run; at the other extreme, shareholders are concerned about investment returns in the long run. Thanks to the diversity in shareholder orientations, a buyback programme is not a zero-sum game, but an exercise that can benefit all, depending on individual goals.

**Manipulation** Many believe that if companies are allowed to repurchase and reissue shares, managers may resort to manipulation. They may, through collusive trading, depress prices, create anxiety among investors, and tempt them to sell the shares to the company by making apparently attractive offers. Corporate energies may be diverted from the main business of the company to stock market games that may hurt the more gullible shareholders.

**Excessive Payment** A company may pay too much for the shares bought back. Such action may be motivated by the desire of promoters to raise their stake in the company, even though it hurts the interest of remaining non-promoter shareholders. In essence, corporate resources are used for personal entrenchment.

**Lack of Regularity** Given the irregularity of repurchases, investors can scarcely rely on the cash they will receive from repurchases.

### Reasons for Equity Repurchases

A survey of equity repurchases in the U.S., conducted by S.G. Badrinath and Nikhil Varaiya, suggested five basic reasons for equity repurchases:

- To boost stock price.

- To rationalise the company's capital structure.
- To substitute for cash dividends.
- To prevent dilution from stock market grants.
- To give excessive cash back to shareholders.

## **Regulation of Buybacks**

**Companies Act** The key provisions relating to the regulation of buybacks under the Companies Act are as follows:

- A company can buy back 10 percent of its shares annually with board resolution. For a buy back exceeding 10 percent in a year, a special resolution of shareholders is required.
- The post-buyback debt-equity ratio of the company should not exceed 2:1.
- The buyback should not exceed 25 percent of the total paid-up capital and free reserves of the company.
- After completing a buyback programme, a company should not make a further issue of equity securities within a period of 2 years except by way of a bonus issue or in discharge of a subsisting obligation (like conversion of warrants, debentures or preference shares into equity shares, stock option scheme, and sweat equity scheme).
- The buyback may be funded by the following means: (a) free reserves and share premium, (b) cash generated from the disposal of capital assets, (c) a public equity issue made exclusively for the purpose of buyback, and (d) a debenture issue.
- The company has to file a declaration of solvency with SEBI and Registrar of Companies.

**SEBI Guidelines** The important SEBI guidelines applicable to buybacks are:

- The buyback can be done through the **open market route** or the **tender route**. If the proposed buyback exceeds 25 percent of the company's net worth, it is mandatory to use the tender route. In the open market route, promoters cannot participate but in the tender route they can.
- In the tender route, shareholders interested in the buyback have to tender their shares and the buyback is done on a proportional basis.
- The company must set aside 50 percent of the buyback amount in an escrow account and complete the buyback within six months.

## **Tax Considerations Relating to Distribution Decisions**

When a company decides to pay dividend or buyback shares, it should bear in mind the following tax aspects:

1. Dividends are tax-exempt in the hands of the recipients. However, the company that pays dividend has to pay the dividend distribution tax (DDT). Currently, the effective DDT (basic rate + surcharge + cess) works out to 16.995 percent. The DDT is payable on the gross dividend. This means.

$$\text{Net dividend} = \text{Gross dividend} (1 - 0.16995).$$

Thus, if a company decides to pay a net dividend of ₹ 10 per share, its gross dividend burden will be ₹ 10/(1-0.16995) = ₹ 12.05.

2. Shares in companies and other listed securities held for more than 12 months are long-term capital assets. Long-term capital gains arising from the sale of equity shares are taxed at 10 percent, provided the securities transaction tax (STT) is paid. STT is payable for transactions on stock exchanges. Currently, the STT is 0.1 percent. Short-term capital gains on equity shares is 15 percent, provided STT is paid on them.
3. Share buyback transactions, as they do not take place on a recognised stock exchange, are not recognised as transactions on which STT is applicable. Further, according to the Income Tax Act, a share buyback by a company does not tantamount to dividend payment. So the normal capital gains tax rates are applicable to such transactions. If the holding period is more than one year, the capital gains are taxed at 10 percent for individual investors, 0 percent for FIIs investing from favourable treaty jurisdictions like Mauritius or Cyprus, and 10 percent for other FIIs.

## 22.8 ■ SHARE BUYBACKS AND VALUATION

Many executives and market players believe that since a share buyback reduces the number of outstanding shares and increases EPS, it also raises a company's share price. As one respected market analyst said, "Share buybacks improve EPS, return on equity, return on capital employed, economic profit, and fundamental intrinsic value." This reasoning, however, is flawed.

If taxes are ignored, a buyback does not create value because any increase in EPS is offset by a decline in the P/E ratio. To illustrate this let us look at a hypothetical example. Soltech Limited's financials are shown in [Exhibit 22.6](#). Its operations earn ₹ 180 crore and are worth ₹ 1800 crore. It has ₹ 200 crores of cash on which it earns interest of ₹ 10 crore.

### Exhibit 22.6 Share Buyback, Hypothetical Example

Balance Sheet	₹ in crore		Income Statement	₹ in crore	
	Before	After		Before	After
Operating assets	800	800	EBIT	180	180
Cash	200	–	Interest	10	–
Total assets	1000	800	Net income	190	180
Equity	1000	800	Other Information		
		Shares outstanding		10 crore	9 crore
Value		Share price		₹ 200	₹ 200
Value of operations	1800	1800	EPS	₹ 19.0	₹ 20.0
Cash	200	0	P/E	10.53	10.0
Total equity value	2000	1800	ROIC(EBIT/operating assets)	22.5%	22.5%

If the company decides to use its excess cash of ₹ 200 crore to buy back one crore shares at the prevailing price of ₹ 200 per share, the following happen:

- Since the company's operations remain unchanged, its return on operating capital remains the same after the buyback.
- Its equity will be worth ₹ 1800 crore – exactly the value of operations as there is no surplus cash with the company.
- While the net income falls because of a loss of interest income, EPS rises because the number of shares decline more than the net income.

- The price per share remains the same, however, as the total company value falls in line with the number of shares.
- The P/E ratio, which depends on price per share and EPS, declines from 10.53 to 10.0. The impact would be the same if the company increases debt to buy back shares.

Note that the P/E ratio declines because the buyback effectively **deconsolidates** the company into two distinct entities: an operating entity and a cash-holding entity. The former has a P/E of 10.0 and latter has a P/E of 20.0 (since cash holding of ₹ 200 crores generates an interest income of ₹ 10 crore, the P/E corresponding to the cash holding is 20). The P/E ratio of 10.53 for the consolidated entity represents a weighted average of the P/Es of the operating entity (which has a P/E of 10 and an income of ₹ 180 crore) and the cash-holding entity (which has a P/E of 20 and income of ₹ 10 crore):

$$10 \times \frac{180}{190} + 20 \times \frac{10}{190} = 10.53$$

## 22.9 ■ DIVIDEND POLICIES IN PRACTICE

To learn about the dividend policies of business firms, the author asked the chief finance officers of twenty large-sized business undertakings, representing a wide cross-section of industries, the following question: What is your dividend policy? The responses obtained are reproduced below:

*Chemicals* “Dividend policy is concerned primarily with the welfare of shareholders. When earnings position permits we declare good dividends. Otherwise, we don’t. We don’t think of accumulating surplus and declaring bonus shares.”

*Fertilizer* “Though we are a joint sector project, our dividend policy is governed by commercial considerations. Of course, we are a bit conservative.”

*FMCG* “We believe in rewarding shareholders generously – both in dividends and bonus shares. Our payout has been very high.”

*Aluminium* “We pay dividend whenever we can afford it. When performance is poor or liquidity unsatisfactory we skip dividend to preserve our financial strength.”

*Automobile* “We like to maintain a dividend rate of 15 percent. This seems to be a fair return to investors.”

*Leasing* “We would like to declare as high a dividend as we can. If share prices rise due to that, we can raise relatively easily more funds by issuing convertible debentures.”

*Diversified* “We regard shareholders as partners. They deserve handsome returns. We give good dividends and periodic bonus issues.”

*Pharmaceuticals* “We distribute about 30 percent of our earnings. We maintain our dividend around 18 percent. When the reserves position permits, we issue bonus shares.”

*Textiles* “Due to drop in profits we have skipped dividends. We will try to restore it – when I don’t know.”

*Storage Batteries* “We have been paying steadily about 20 percent as dividends. Of course, our bonus record is poor. In the foreseeable future there may be very little change.”

*Consumer Electronics* “We paid good dividends as profits were high. We will try to maintain the same. Of course, profitability will be the key factor.”

*Electrical* “We try to maintain a ten percent dividend rate. That is what the government expects from us.”(This was a public sector undertaking).

*Tea* “In the last ten years the parent company has not been insisting on any dividend rate. Whatever has been paid out is accepted. Our payout has been 30 to 50 percent.”

*Chemical* “Our dividend policy is to pay a fixed rate of dividend and issue bonus shares when we are eligible to. The purpose is to ensure that shareholders retain shares to enjoy capital gains.”

*Shipping* “In the past when the going was good, we paid good dividends and issued bonus shares periodically. The last few years were rough. We had to suspend dividend for some time. We are now recovering. We will try to follow the past policies, provided business conditions are good.”

*Diversified* “We have a very conservative dividend policy. Our dividend rate which used to be 10 percent four years ago has now been raised to 15 percent.”

*Diversified* “We don’t have a specific dividend policy. When the profits are good and liquidity satisfactory we give 12 percent to 15 percent as dividends.”

*Diversified* “The investor is the king. Unless he is rewarded, we can’t get the funds for our growth. So, we try to benefit him by dividends, bonus issues, and rights issue.”

*Diversified* “We have, if you permit me to say, an obsession with 20 percent dividend rate. We don’t want to raise it to 25 or 30 percent as this connotes super profits – but we would like to declare bonus shares. Our planning revolves around this compelling goal – dominant goal.”

*Information Technology* “We distribute about 25 percent of our profits, as we need the balance to support our growing business.”

## SUMMARY

- The plausible reasons for paying dividends are investor preference, information signaling, and clientele effects.

- Dividend policy involves two issues: (i) what should be the long-term **payout ratio?** (ii) How stable should the dividends be over time?
- The dividend payout ratio depends on factors such as funds requirements, liquidity, shareholder preferences, control, and taxes.
- Most firms use the **residual dividend policy** that sets the long-run payout ratio in such a way that equity requirements are met with retained earnings.
- According to the **Lintner model**, firms try to reach the target payout ratio gradually over a period of time because shareholders prefer a steady progression in dividends.
- **Bonus shares** are shares issued to existing shareholders when a portion of reserves and surplus is capitalised.
- In a **stock split**, the par value per share is reduced and the number of shares is increased.
- Under a **share buyback** plan, a firm buys back some of its outstanding shares.
- There are several motivations or justifications for share buybacks: efficient allocation of resources, price stability, tax advantage, voluntary character, and no implied commitments.
- A share buyback effectively *deconsolidates* the company.

## QUESTIONS

1. Why do investors have a strong preference for dividends?
2. What are the dubious reasons for paying dividends?
3. Discuss the factors which are relevant for determining the payout ratio.
4. What is the difference between a policy of stable dividend payout ratio and a policy of stable dividends or steadily changing dividends?
5. Why do firms follow a policy of stable dividends or gradually rising dividends?
6. What is the difference between the following approaches: (i) pure residual dividend policy approach, (ii) fixed dividend payout ratio approach, and (iii) smoothed residual dividend approach.
7. What did Lintner's survey of corporate dividend behaviour reveal?
8. How valid is the Lintner model?
9. Discuss the important provisions of company law pertaining to dividends.
10. Describe briefly the procedural aspects of dividends.
11. What are the motives for declaring a bonus issue?
12. What are the key regulatory provisions governing the issue of bonus shares in India?
13. Discuss the consequences of a bonus issue.
14. Compare a bonus issue with a stock split.
15. A share buyback effectively deconsolidates a company. Explain.
16. Discuss the rationale for share buybacks.
17. What are the common objections to share buybacks?

18. Discuss the key regulations applicable to share buybacks.

## SOLVED PROBLEMS

- 22.1 What will be the dividend per share of Rohtas Industries for year 20X1 given the following information about the company?

EPS for 20X1 = ₹ 3  
 DPS for 20X0 = ₹ 1.2  
 Target payout ratio = 0.6  
 Adjustment rate = 0.7

Apply the Lintner model.

*Solution*

According to the Lintner model

$$D_t = cr \text{EPS}_t + (1-c) D_{t-1}$$

where  $D_t$  is the dividend per share for year  $t$ ,  $c$  is the adjustment rate,  $r$  is the target payout ratio,  $\text{EPS}_t$  is the earnings per share for year  $t$ , and  $D_{t-1}$  is the dividend per share for year  $t-1$ .

Hence, the dividend per share will be:

$$\begin{aligned}
 D_t &= 0.7 \times 0.6 \times 3 + (1 - 0.7) 1.2 \\
 &= 1.62
 \end{aligned}$$

## PROBLEMS

- 22.1 **Dividend Per Share** Akshay Ltd expects that its net income and capital expenditures over the next four years will be as follows:

Year	Net Income (₹)	Capital Expenditures (₹)
1	10,000	8,000
2	12,000	7,000
3	9,000	10,000
4	15,000	8,000

The company has 5,000 outstanding shares currently on which it pays a dividend of one rupee per share.

*Required:*

- (a) What will be the dividend per share if the company follows a pure residual policy?
- (b) What external financing is required if the company plans to raise dividends by 10 percent every 2 years?
- (c) What will be the dividend per share and external financing requirement if the company follows a policy of a constant 60 percent payout ratio?

**22.2 Dividend Policy** Bangalore Industries Ltd., on the basis of an informal survey of shareholders, has reached the conclusion that presently the shareholders put a higher weightage on dividends than on retained earnings (the relative weights are 1.2 for dividends and 1.0 for retained earnings). The following financial data about the company are available:

Current earnings per share	₹ 2.00
Last earnings per share	₹ 2.00
Last dividend per share	₹ 1.00
Market price per share	₹ 12.00
Number of outstanding shares	5 million

The management of the firm has put two constraints on dividend payment: (i) it should not be less than the previous level; (ii) the dividend payout ratio should not exceed 80 percent.

The investment requirements of the firm are substantial. So, an increase in dividend per share from the previous level would call for issuing additional equity to the public at large. The finance manager estimates that the net price realised per share would be ₹ 9.50, thanks to underpricing and floatation costs. What should be the dividend payout of the company? Why? Make suitable assumptions, if required.

### MINICASE

Kapil Sugars Limited was set up in 1985 in Uttar Pradesh by Varun Kapil, a sugar technologist. The company had a chequered history for a decade. Thereafter, it achieved a certain degree of stability. It has done particularly well in the last five years.

At present the company is managed by Satish Kapil and Arun Kapil, the two sons of Varun Kapil, who inherited the business from their father about eight years back.

Till recently the company was an unlisted company, wholly owned by the two brothers and their families. Last year, the company went public when the Kapil family offered 25 percent of its equity stake to the general investing public through an 'offer for sale'. The primary motivation for making the IPO was to create the option for raising money from the capital market because the brothers have very ambitious plans for expanding the business through organic growth and acquisitions.

The earnings and net investments (net capital expenditure and net increase in working capital) of Kapil Sugars Limited for the last five years have been as follows:

	₹ in million				
	1	2	3	4	5
Earnings	96	108	84	115	147
Net investments	104	94	90	108	192

At present 21 million shares of ₹ 10 par are outstanding. The reserves and surplus at the end of year 5 stood at ₹ 560 million. The company has declared a dividend of ₹ 2.00 per share for year 5 (the just concluded year).

As long as the company was wholly owned by the Kapil family, it followed a very *ad hoc* dividend policy. Now the board of directors has decided to develop a well thought out dividend policy.

As an executive of MCI Investment Corporation, a merchant banking firm, you were involved in handling the IPO of Kapil Sugars Limited and interacted closely with Satish Kapil and Arun Kapil. Since the brothers have developed confidence in you, they have asked you to make a presentation to the board, covering various facets of dividend policy. In particular, they want you to discuss the following issues:

- a. What are the plausible and dubious reasons for paying dividends?
- b. What considerations are relevant for determining the dividend payout ratio?
- c. If the debt-equity norm of the firm is 1:2, what should have been the dividend payment, year-by-year, for each of the five years under: (i) pure residual dividend policy, (ii) fixed dividend payout policy, and (iii) smoothed residual dividend policy. Assume that the firm has a dividend payout ratio target of 0.3.
- d. The expected EPS for current year is ₹ 9.0. What would be the DPS for the current year as per the Lintner model if the target payout ratio is 0.3 and the adjustment factor 0.6?
- e. What is the difference between a bonus issue and a stock split? What are the pros and cons of bonus issues and stock splits?
- f. What is the rationale for share buybacks?

## Appendix 22A

### The Dividend Puzzle

Why do firms pay dividends? Why do investors pay attention to dividends? As Fisher Black wrote in his famous 1976 article titled “The Dividend Puzzle,” that appeared in the *Journal of Portfolio Management*, “Perhaps the answers to these questions are obvious. Or perhaps the answers are not so obvious.” He further said, “The harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just don’t fit together.”

Even after four decades, despite considerable research, we seem to have not made significant progress. As H. Kent Baker, J. Clay Singleton, and E. Theodore Veit put it, “Financial economists have developed many theories to explain dividend payout decisions in imperfect capital markets. Researchers most often test these theories by observing how firms respond to exogenous changes in their environment. In general, such tests have been inconclusive regarding the competing theories of corporate dividend behaviour.”

Why there has been no theory developed based on the economic paradigm thus far that explains the persistence of corporate dividend policy. Perhaps financial economists have overly focused on developing universally applicable and mathematically tractable models.

### PRACTICAL ASSIGNMENT

Comment on the dividend policy of the company chosen by you.

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<sup>1</sup> John Lintner, “Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes,” *American Economic Review*, Vol. 46 (May 1956).

<sup>2</sup> This may be proved as follows:

$$D_t = cr \text{EPS}_t + (1 - c) D_{t-1} \quad (1)$$

Similarly,

$$D_{t-1} = cr \text{EPS}_{t-1} + (1 - c) D_{t-2} \quad (2)$$

Substituting this value of  $D_{t-1}$  in (1) we get:

$$D_t = cr \text{EPS}_t + cr(1 - c) \text{EPS}_{t-1} + (1 - c)^2 D_{t-2} \quad (3)$$

Making similar substitutions for  $D_{t-2}, D_{t-3}$ , etc., we finally obtain:

$$D_t = cr \text{EPS}_t + cr(1 - c) \text{EPS}_{t-1} + cr(1 - c)^2 \text{EPS}_{t-2} + \dots + cr(1 - c)^n \text{EPS}_{t-n} \quad (4)$$

- 3 To test empirically his theoretical model, Lintner employed the following regression relationship using pooled cross-sectional data:

$$D_{it} = a_{it} + bP_{it} + dD_{i,t-1} + U_{it}$$

In this equation, which represents the econometric version of Lintner's theoretical model, a constant term ( $a_{it}$ ) and an error term ( $U_{it}$ ) have been added. It may be noted that  $b = cr$  and  $d = (1-c)$

- 4 Eugene Fama and H. Babiaik, "Dividend Policy: An Empirical Analysis", *Journal of the American Statistical Association*, vol.63 (December 1968).
- 5 John A. Britain, *Corporate Dividend Policy*, Washington, D.C.: The Brookings Institution, 1966.
- 6 The empirical relation used here was:

$$D_t = Y_0 + Y_1 C_1 + Y_2 D_{t-1} + u_t$$

The difference between this equation and the Lintner's empirical equation is that the cash flow (C) is substituted for profit ( $P$ ).

- 7 The empirical relation used here was:

$$D_t = z_0 + z_1 P_t + z_2 R_t + z_3 D_{t-1} + u_t$$

In this equation, cash flow (C) has been split into profit ( $P$ ) and depreciation ( $R$ ).

- 8 J. Purnanandam, "Dividends in Large Indian Companies: 1946 – 63". Unpublished doctoral dissertation submitted to the Department of Industrial Management, Indian Institute of Science, Bangalore, 1969.
- 9 In addition, the provisions of the Income-tax Act are also relevant. Certain rebates and penalties depend on certain appropriations from profits and the amount of dividend.
- 10 Any money which remains unpaid or unclaimed for three years from the date of transfer shall be transferred to the general revenues of the central government, but claims may be preferred by persons to whom monies are due.
- 11 At present, however the law in India does not permit this.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter22/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter22/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Excel on Solved Problems
- Answer Key



## **PART–VII**

### **Working Capital Management**

**23**

Working Capital Policy

**24**

Cash and Liquidity Management

**25**

Credit Management

**26**

Inventory Management

**27**

Working Capital Financing

**28**

Working Capital Management: Extensions

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## Working Capital Policy

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Understand the factors influencing working capital.
- ✓ Illustrate the strategies for financing working capital.
- ✓ Calculate the operating cycle and cash cycle.
- ✓ Estimate the cash requirements for working capital.

Up to now we discussed topics like capital budgeting, dividend policy, and capital structure which fall in the domain of long-term financial management. This chapter introduces working capital management or short-term financial management which is concerned with decisions relating to current assets and current liabilities.

The key difference between long-term financial management and working capital management is in terms of the timing of cash. While long-term financial decisions like buying capital equipment or issuing debentures involve cash flows over an extended period of time (5 to 15 years or even more), short-term financial decisions typically involve cash flows within a year or within the operating cycle of the firm.

There are two concepts of working capital: gross working capital and net working capital. Gross working capital is the total of all current assets. The constituents of current assets are shown in Part A of [Exhibit 23.1](#). Net working capital is the difference between current assets and current liabilities. The constituents of current liabilities are shown in Part B of [Exhibit 23.1](#). Management of working capital refers to the management of current assets as well as current liabilities. The major thrust, of course, is on the management of current assets. This is understandable because current liabilities arise in the context of current assets.

Working capital management is a significant facet of financial management. Its importance stems from two reasons:

- Investment in current assets represents a substantial portion of total investment.
- Investment in current assets and the level of current liabilities have to be geared quickly to changes in sales. To be sure, fixed asset investment and long-term financing are also responsive to variation in sales. However, this relationship is not as close and direct as it is in the case of working capital components.

The importance of working capital management is reflected in the fact that financial managers spend a great deal of time in managing current assets and current liabilities. Arranging short-term financing, negotiating favourable credit terms, controlling the movement of cash, administering accounts receivable, monitoring the investment in inventories, and investing short-term surpluses consume a great deal of time of financial managers.

### **Exhibit 23.1      Constituents of Current Assets and Current Liabilities**

<i>Part A : Current Assets</i>
Inventories
Raw Materials and Components
Work-in-Process
Finished Goods
Others
Trade Debtors
Loans and Advances
Cash and Bank Balances
<i>Part B: Current Liabilities</i>
Sundry Creditors
Trade Advances
Borrowings (short-term)
Commercial Banks
Others
Provisions

## 23.1 ■ CHARACTERISTICS OF CURRENT ASSETS

While managing working capital, bear in mind two characteristics of current assets: (i) short life span, and (ii) swift transformation into other asset forms.

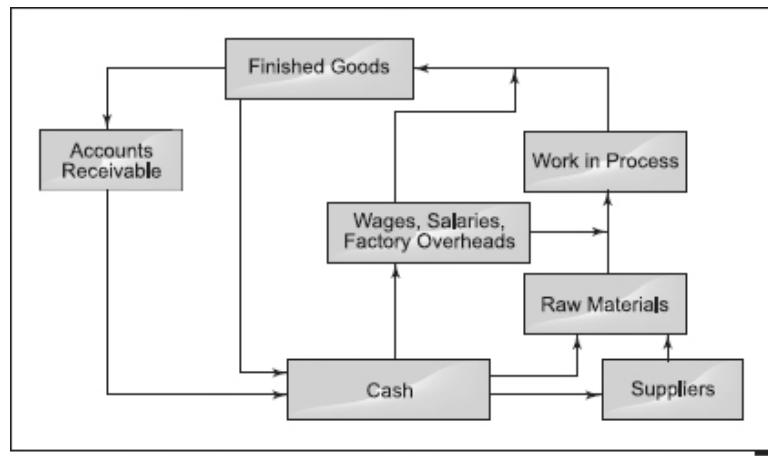
Current assets have a short life span. Cash balances may be held idle for a week or two, accounts receivable may have a life span of 30 to 90 days, and inventories may be held for 1 to 60 days. The life span of current assets depends upon the time required in the activities of procurement, production, sales, and collection and the degree of synchronisation among them.

Each current asset is swiftly transformed into other asset forms: cash is used for acquiring raw materials; raw materials are transformed into finished goods (this transformation may involve several stages of work-in-process); finished goods, generally sold on credit, are converted into accounts receivable (book debt); and, finally, accounts receivable, on realisation, generate cash. [Exhibit 23.2](#) shows the cycle of transformation.

The short life span of working capital components and their swift transformation from one form into another has certain implications.

- Decisions relating to working capital management are repetitive and frequent.
- The difference between profit and present value is insignificant.
- The close interaction among working capital components implies that efficient management of one component cannot be undertaken without simultaneous consideration of other components. For example, if the firm has a large accumulation of finished goods inventory, it may have to provide more liberal credit terms or show laxity in credit collection. Another example: If the firm has a liquidity crunch it may have to offer generous discounts.

## Exhibit 23.2 | Current Assets Cycle



## 23.2 ■ FACTORS INFLUENCING WORKING CAPITAL REQUIREMENTS

The working capital needs of a firm are influenced by numerous factors. The important ones are:

- Nature of business
- Seasonality of operations
- Production policy
- Market conditions
- Conditions of supply

**Nature of Business** The working capital requirements of a firm are closely related to the nature of its business. A service firm, like an electricity undertaking or a transport corporation, which has a short operating cycle and which sells predominantly on cash basis, has modest working capital requirements. On the other hand, a manufacturing concern like a machine tools unit, which has a long operating cycle and which sells largely on credit, has very substantial working capital requirements. [Exhibit 23.3](#) shows the relative proportions of investment in current assets and fixed assets for certain industries.

**Exhibit 23.3 Proportions of Current Assets and Fixed Assets**

<i>Current Assets (%)</i>	<i>Fixed Assets (%)</i>	<i>Industries</i>
10–20	80–90	Hotels and Restaurants
20–30	70–80	Electricity Generation and Distribution
30–40	60–70	Aluminium, Shipping
40–50	50–60	Iron and Steel, Basic Industrial Chemicals
50–60	40–50	Tea Plantation
60–70	30–40	Cotton Textiles, Sugar
70–80	20–30	Edible Oils, Tobacco
80–90	10–20	Trading, Construction

**Seasonality of Operations** Firms which have marked seasonality in their operations usually have highly fluctuating working capital requirements. To illustrate, consider a firm manufacturing ceiling fans. The sale of ceiling fans reaches a peak during the summer months and drops sharply during the winter period. The working capital requirements of such a

firm are likely to increase considerably in summer months and decrease significantly during the winter period. On the other hand, a firm manufacturing a product like lamps, which have fairly even sales round the year, tends to have stable working capital requirements.

**Production Policy** A firm marked by pronounced seasonal fluctuations in its sales may pursue a production policy which may reduce the sharp variations in working capital requirements. For example, a manufacturer of ceiling fans may maintain a steady production throughout the year, rather than intensify the production activity during the peak business season. Such a production policy may dampen the fluctuations in working capital requirements.

**Market Conditions** The degree of competition prevailing in the market place has an important bearing on working capital needs. When competition is keen, a larger inventory of finished goods is required to promptly serve customers who may not be inclined to wait because other manufacturers are ready to meet their needs. Further, generous credit terms may have to be offered to attract customers in a highly competitive market. Thus, working capital requirements tend to be high because of greater investment in finished goods inventory and accounts receivable.

If the market is strong and competition weak, a firm can manage with a smaller inventory of finished goods because customers can be served with some delay. Further, in such a situation the firm can insist on cash payment and avoid lock-up of funds in accounts receivable—it can even ask for advance payment, partial or total.

**Conditions of Supply** The inventory of raw materials, spares, and stores depends on the conditions of supply. If the supply is prompt and adequate, the firm can manage with small inventory. However, if the supply is unpredictable and scant, then the firm, to ensure continuity of production, would have to acquire stocks as and when they are available and carry larger inventory, on an average. A similar policy may have to be followed when the raw material is available only seasonally and production operations are carried out round the year.

### 23.3 ■ LEVEL OF CURRENT ASSETS

An important working capital policy decision is concerned with the level of investment in current assets. Under a flexible policy (also referred to as a ‘conservative policy’), the investment in current assets is high. This means that the firm maintains a huge balance of cash and marketable securities, carries large amounts of inventories, and grants generous terms of credit to customers which leads to a high level of debtors. Under a restrictive policy (also referred to as an ‘aggressive policy’), the investment in current assets is low. This means that the firm keeps a small balance of cash and marketable securities, manages with small amounts of inventories, and offers stiff terms of credit which leads to a low level of debtors.

What are the consequences of flexible and restrictive policies? Very broadly, a flexible policy results in fewer production stoppages (on account of inventory shortages), ensures quick deliveries to customers, and stimulates sales because liberal credit is granted to customers. Of course, these benefits come at the cost of higher investment in current assets. A restrictive current assets policy, on the other hand, may lead to frequent production stoppages, delayed deliveries to customers, and loss of sales. These are the costs that the firm may have to bear to keep its investment in current assets low.

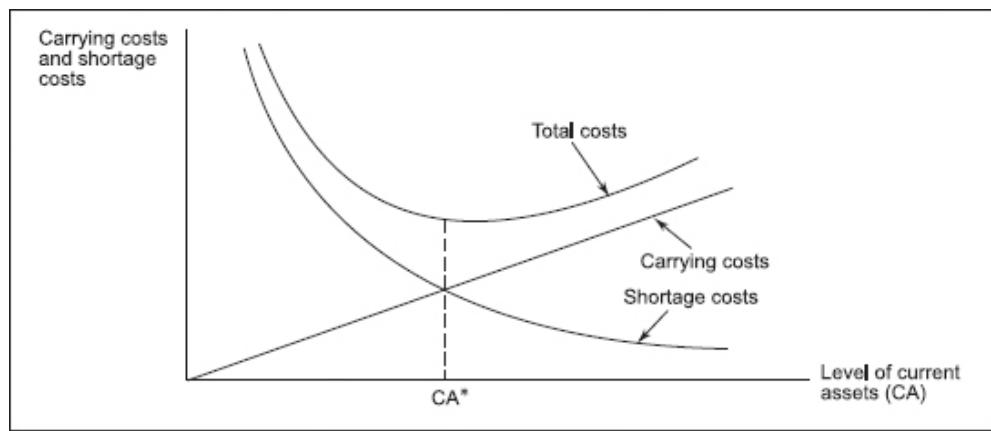
Determining the optimal level of current assets involves a trade off between costs that rise with current assets and costs that fall with current assets. The former are referred to as **carrying costs** and the latter as **shortage costs**. Carrying costs are mainly in the nature of the cost of financing a higher level of current assets. Shortage costs are mainly in the form of disruption in production schedule, loss of sales, and loss of customer goodwill. [Exhibit 23.4](#) shows graphically how these behave in relation to the level of current assets. The optimal level of current assets is denoted by CA, as the total costs (the sum of carrying costs and shortage costs) are minimised at that level. Often, the total cost curve is fairly flat around the optimal level. Hence, it may be difficult to precisely identify the optimal level. The financial manager must be satisfied if the level of current assets is in a range close to the optimal point.

## 23.4 ■ CURRENT ASSETS FINANCING POLICY

After establishing the level of current assets, the firm must determine how these should be financed. What mix of long-term capital and short-term debt should the firm employ to support its current assets?

[Exhibit 23.5](#) depicts how total assets - and hence the capital requirements - change over time for a growing firm. For the sake of simplicity, assets are divided into two classes, viz. **fixed assets** and **current assets**. Fixed assets are assumed to grow at a constant rate which reflects the secular rate of growth in sales. Current assets, too, are expected to display the same long-term rate of growth; however, they exhibit substantial variation around the trend line, thanks to seasonal (or even cyclical) patterns in sales and/or purchases.

### Exhibit 23.4 Carrying Costs and Shortage Costs



The investment in current assets may be broken into two parts: **permanent current assets** and **temporary current assets**. The former represents what the firm requires even at the bottom of its sales cycle; the latter reflects a variable component that moves in line with seasonal fluctuations.

Several strategies are available to a firm for financing its capital requirements. Three strategies are illustrated by lines A, B, and C in [Exhibit 23.5](#).

**Strategy A:** Long-term financing is used to meet fixed asset requirements as well as peak working capital requirements. When the

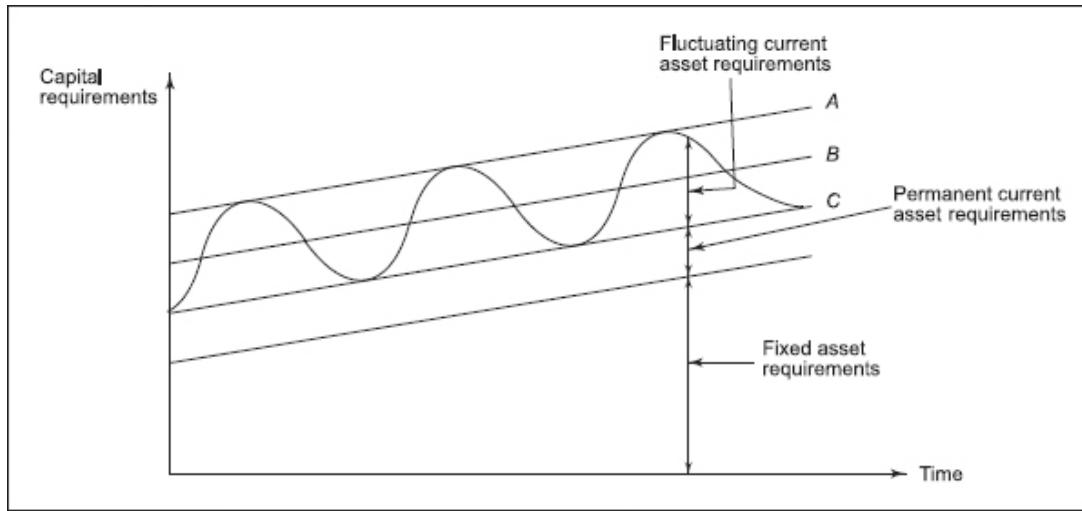
working capital requirement is less than its peak level, the surplus is invested in liquid assets (cash and marketable securities).

**Strategy B:** Long-term financing is used to meet fixed asset requirements, permanent working capital requirements, and a portion of fluctuating working capital requirements. During seasonal upswings, short-term financing is used; during seasonal downswings, surplus is invested in liquid assets.

**Strategy C:** Long-term financing is used to meet fixed asset requirements and permanent working capital requirements. Short-term financing is used to meet fluctuating working capital requirements.

**The Matching Principle** According to this principle, the maturity of the sources of financing should match the maturity of the assets being financed. This means that fixed assets and permanent current assets should be supported by long-term sources of finance, whereas fluctuating current assets must be supported by short-term sources of finance. Strategy C in [Exhibit 23.5](#) reflects the matching principle.

### Exhibit 23.5 Capital Requirements and Their Financing



The rationale for the matching principle is fairly straightforward. If a firm finances a long-term asset (say, machinery) with a short-term debt (say, commercial paper), it will have to periodically re-finance the asset. Whenever the short-term debt falls due, the firm has to re-finance the assets. This is risky as well as inconvenient. Hence, it makes sense to

ensure that the maturity of the assets and the sources of financing are properly matched.

## 23.5 ■ OPERATING CYCLE AND CASH CYCLE

The investment in working capital is influenced by four key events in the production and sales cycle of the firm:

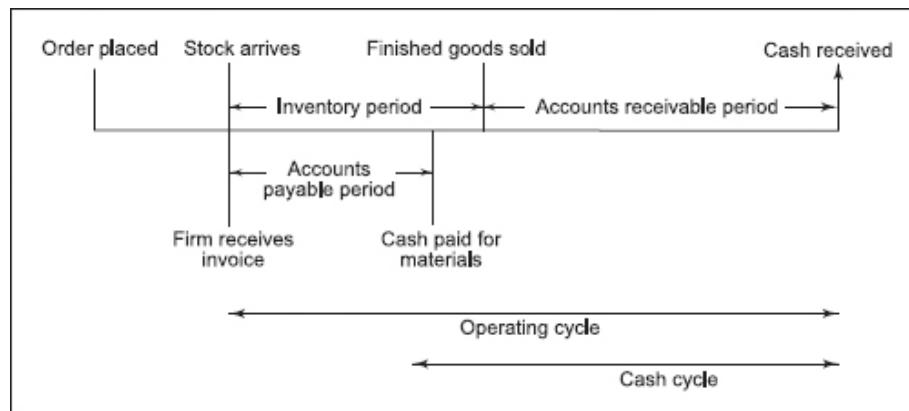
- Purchase of raw materials
- Payment for raw materials
- Sale of finished goods
- Collection of cash for sales

[Exhibit 23.6](#) depicts these events on the cash flow line. The firm begins with the purchase of raw materials which are paid for after a delay which represents the accounts payable period. The firm converts the raw materials into finished goods and then sells the same. The time lag between the purchase of raw materials and the sale of finished goods is the inventory period. Customers pay their bills some time after the sales. The period that elapses between the date of sales and the date of collection of receivables is the accounts payable period (debt period).

The time that elapses between the purchase of raw materials and the collection of cash for sales is referred to as the **operating cycle**, whereas the time length between the payment for raw material purchases and the collection of cash for sales is referred to as the **cash cycle**. The operating cycle is the sum of the inventory period and the accounts receivable period, whereas the cash cycle is equal to the operating cycle less the accounts payable period.

From the financial statements of the firm, we can estimate the inventory period, the accounts receivable period, and the accounts payable period.

### Exhibit 23.6 Operating and Cash Cycle



$$\text{Inventory period} = \frac{\text{Average inventory}}{\text{Annual cost of goods sold}/365}$$

$$\text{Accounts receivable period} = \frac{\text{Average accounts receivable}}{\text{Annual sales}/365}$$

$$\text{Accounts payable period} = \frac{\text{Average accounts payable}}{\text{Annual cost of goods sold}/365}$$

**Exhibit 23.7** provides the relevant information for Horizon Limited. Based on this information, we calculate several things:

$$\text{Inventory period} = \frac{(96+102)/2}{720/365} = 50.1 \text{ days}$$

$$\text{Accounts receivable period} = \frac{(86+90)/2}{800/365} = 40.2 \text{ days}$$

$$\text{Accounts payable period} = \frac{(56+60)/2}{720/365} = 29.4 \text{ days}$$

$$\begin{aligned}\text{Operating cycle} &= 50.1 + 40.2 = 90.3 \text{ days} \\ &\quad \begin{array}{l} \text{Inventory} \\ \text{period} \end{array} \quad \begin{array}{l} \text{Accounts} \\ \text{receivable} \\ \text{period} \end{array}\end{aligned}$$

$$\begin{aligned}\text{Cash cycle} &= 90.3 - 29.4 = 60.9 \text{ days} \\ &\quad \begin{array}{l} \text{Operating} \\ \text{cycle} \end{array} \quad \begin{array}{l} \text{Accounts} \\ \text{payable period} \end{array}\end{aligned}$$

### Exhibit 23.7 Financial Information for Horizon Limited

	Balance Sheet Data		
	Profit & Loss Account Data	Beginning of 20X0	End of 20X0
Sales	800	Inventory	96
Cost of goods sold	720	Trade receivable	86
		Trade payable	56
			102
			90
			60

Thus, Horizon Limited takes about two months to collect payment from its customers from the time it pays for its inventory purchases.

It is helpful to monitor the behaviour of overall operating cycle and its individual components. For this purpose, time-series and cross-section analysis may be done. In time-series analysis, the duration of the operating cycle and its individual components is compared over a period of time for the same firm. In cross-section analysis, the duration of the operating cycle and its individual components is compared with that of other firms of a comparable nature.

### **Negative Cash Cycle**

Internet-based bookseller [Amazon.com](#) manages its cash cycle extremely well. It turns its inventory over 26 times a year, making its inventory period very short. It charges its customer's credit card when it ships a book and it gets paid by the credit card firm usually in a day. Finally, it takes about 46 days to pay the suppliers. All this means that [Amazon.com](#) has a negative cash cycle.

## People Involved in Managing the Operating Cycle

In a large organisation, a number of different financial and nonfinancial managers are involved in managing the various facets of the operating cycle, as illustrated in [Exhibit 23.8](#).

**Exhibit 23.8**

### Managers Who Deal with Short-term Financial Problems

<i>Title of manager</i>	<i>Duties related to short-term financial management</i>	<i>Assets/liabilities influenced</i>
Cash manager	Collection, concentration, and disbursement; short-term investments; short-term borrowing; banking relations	Cash, marketable securities, and short-term loans
Credit manager	Monitoring and control of accounts receivable; credit policy decisions	Trade receivables
Marketing manager	Credit policy decisions	Trade receivables
Purchasing manager	Decisions on purchases, suppliers; may negotiate payment terms	Inventory, trade payables
Production manager	Setting of production schedules and materials requirements	Inventory, trade payables
Payables manager	Decisions on payment policies and on whether to take discounts	Trade payables
Controller	Accounting information on cash flows; reconciliation trade payables application of payments to trade receivables	Trade receivables, trade payables

## 23.6 ■ CASH REQUIREMENT FOR WORKING CAPITAL

As a financial manager you will be interested in figuring out how much cash you should arrange to meet the working capital needs of your firm. To do this, you may follow a two step procedure:

*Step 1: Estimate the cash cost of various current assets required by the firm.* The cash cost of a current asset is:

Value of the current asset

- Profit element, if any, included in the value
- Non-cash charges like depreciation, if any, included in the value.

To illustrate, suppose the value of sundry debtors (receivables) is shown to be ₹ 10 million on the balance sheet. If the profit margin is 25 percent and the depreciation element in the cost of goods sold corresponding to sundry debtors is ₹ 0.5 million, the cash cost of sundry debtors is obtained as follows:

Value in the balance sheet	₹ 10.0 million
Profit margin	₹ 2.5 million
Cost of goods sold	₹ 7.5 million
Depreciation element	₹ 0.5 million
Cash cost of sundry debtors	₹ 7.0 million

*Step 2: Deduct the spontaneous current liabilities from the cash cost of current assets.* A portion of the cash cost of current assets is supported by trade credit and accruals of wages on expenses, which may be referred to as spontaneous current liabilities. The balance left after such deduction has to be arranged from other sources.

**Illustration** The above procedure may be illustrated with the help of an example. Max Limited sells goods at a profit margin of 25 percent, counting depreciation as part of the cost of manufacture. Its annual figures are as follows:

■ Sales (Two months credit is given)	₹ 240 million
■ Material cost (Suppliers give three months credit)	72
■ Wages (Wages are paid one month in arrears)	48
■ Manufacturing expenses outstanding at the end of the	4

year (Cash expenses are paid one month in arrears)	
■ Administrative and sales expenses (These are paid as incurred)	30

Max Limited keeps two months' stock of raw materials and one month's stock of finished goods. It wants to maintain a cash balance of ₹ 5 million. Estimate the requirement of working capital on cash cost basis, assuming a 10 percent safety margin. Ignore work-in-process.

The requirement of working capital on cash cost basis is worked out below:

### A : Current assets

Item	Calculation	Amount (₹ in million)
Debtors	$\frac{\text{Total cash cost}}{12} \times 2 = \frac{198 \times 2}{12}$	33.00
Raw material stock	$\frac{\text{Material cost}}{12} \times 2 = \frac{72 \times 2}{12}$	12.00
Finished goods	$\frac{\text{Cash manufacturing cost}}{12} \times 1 = \frac{168}{12}$	14.0
Cash balance	A predetermined amount	5
		<b>A : Current assets</b>
		64.0

### B: Current Liabilities

Item	Calculation	Amount (₹ in million)
Sundry creditors	$\frac{\text{Material cost}}{12} \times 3 = \frac{72 \times 3}{12}$	18
Manufacturing expenses outstanding	One month's cash manufacturing expenses	4
Wages outstanding	One month's wages	4
		<b>B : Current liabilities</b>
Working capital (A – B)		38.0
Add 10 percent safety margin		3.8
Working capital required		41.8

### Working Notes

	(₹ in million)
1. Sales	240
Less: Gross profit (25%)	60
Total manufacturing cost	180

<i>Less:</i> Materials	72
Wages	<u>48</u>
	120
Manufacturing expenses	60
2. Cash manufacturing expenses	48
(₹ 4 million × 12)	
3. Depreciation: (1) – (2)	12
4. Total cash cost	
Total manufacturing cost	180
<i>Less:</i> Depreciation	12
Cash manufacturing cost	168
<i>Add:</i> Administration and selling expenses	30
Total cash cost	198

### The Concept of Zero Working Capital

Many leading companies seek to have zero (or even negative) working capital. This happens when inventories and receivables are supported by the credit provided by suppliers and the advances given by customers.

On average, working capital to sales ratio is about 0.20. Reducing working capital has two financial benefits: (i) every rupee released by reduced working capital makes a one-time contribution to cash flow, and (ii) periodically, the cost of money locked in working capital is saved. Apart from the financial benefits, reducing working capital forces a company to serve its customers quickly, lessens warehousing needs, and reduces obsolescence costs.

## SUMMARY

- **Gross working capital** is the total of all current assets. **Net working capital** is the difference between current assets and current liabilities.
- In the management of working capital, two characteristics of current assets must be borne in mind: (i) short life span, and (ii) swift transformation into other asset forms.
- The working capital needs of a firm are influenced by several factors: (i) nature of business, (ii) seasonality of operations, (iii) production policy, (iv) market conditions, and (v) conditions of supply.
- An important working capital policy decision is concerned with the level of investment in current assets. Determining the optimal level of current assets involves a tradeoff between costs that rise with current assets and costs that fall

with current assets. The former are referred to as **carrying costs** and the latter as **shortage costs**.

- According to **the maturity principle**, the maturity of the sources of finance should match the maturity of the assets being financed. This means that fixed assets and permanent current assets should be supported by long-term sources of finance, whereas fluctuating current assets must be supported by short-term sources of finance.
- The **operating cycle** of a firm begins with the acquisition of raw materials and ends with the collection of receivables. It may be divided into four stages: (i) raw materials and stores stage, (ii) work-in-process stage, (iii) finished goods inventory stage, and (iv) debtors collection stage.
- To estimate the cash requirement for working capital, you may follow a two step procedure: (i) Estimate the cash cost of various current assets required by the firm. (ii) Deduct the spontaneous current liabilities from the cash cost of current assets.

## QUESTIONS

1. What are the two important characteristics of current assets? What are their implications for working capital management?
2. What factors have an important bearing on working capital needs?
3. What are the consequences of flexible and restrictive policies with respect to the level of current assets?
4. Discuss the kind of tradeoff involved in determining the optimal level of current assets.
5. How do total assets change over time for a growing firm?
6. What strategies are available to a firm for financing its working capital requirement?
7. What is the rationale for the matching principle?
8. What is operating cycle?
9. What is cash cycle?

## SOLVED PROBLEMS

23.1 The following annual figures relate to XYZ Co.

(CA May 1990)

	₹
Sales (at two months' credit)	3,600,000
Materials consumed (suppliers extend two months credit)	900,000
Wages paid (monthly in arrear)	720,000

Manufacturing expenses outstanding at the end of the year (Cash expenses are paid one month in arrear)	80,000
Total administrative expenses, paid as above	240,000
Sales promotion expenses, paid quarterly in advance	120,000

The company sells its products at a gross profit of 25 percent counting depreciation as part of the cost of production. It keeps one month's stock each of raw materials and finished goods, and a cash balance of ₹ 100,000.

Assuming a 20 percent safety margin, calculate the working capital requirements of the company on cash cost basis. Ignore work-in-process.

*Solution*

### A. Current Assets

Item	Calculation	Amount
Debtors	$\frac{\text{Total cash cost}}{12} \times 2 = \frac{2,940,000}{12} \times 2$	490,000
Raw material stock	$\frac{\text{Material cost}}{12} \times 1 = \frac{900,000}{12}$	75,000
Finished good stock	$\frac{\text{Cash manufacturing cost}}{12} \times 1 = \frac{2,580,000}{12}$	215,000
Pre-paid sales promotional expenses	Quarterly sales promotional expenses	30,000
Cash balance	A predetermined amount	100,000
	<i>A : Current Assets</i>	910,000

### B. Current Liabilities

Item	Calculation	Amount
Sundry creditors	$\frac{\text{Material cost}}{12} \times 2 = \frac{900,000}{12} \times 2$	150,000
Manufacturing expenses outstanding	One month's cash manufacturing expenses	80,000
Wages outstanding	One month's wages	60,000
Total administrative expenses outstanding	One month's total administrative expenses	20,000
	<i>B : Current Liabilities</i>	310,000
Working capital (A - B)		600,000
Add 20 percent safety margin		120,000
Working capital required		720,000

### Working Notes

#### 1. Manufacturing expenses

Sales 3,600,000

<i>Less:</i> Gross profit (25%)	900,000
Total manufacturing cost	2,700,000
<i>Less:</i> Materials	900,000
Wages	720,000
	<u>1620,000</u>
Manufacturing expenses	1080,000
2. Cash manufacturing expenses (₹ 80,000 × 12)	960,000
3. Depreciation: (1) –(2)	120,000
4. Total cash cost	
Total manufacturing cost	2,700,000
<i>Less:</i> Depreciation	120,000
Cash manufacturing cost	2,580,000
<i>Add</i> Total administrative expenses	240,000
Sales promotion expenses	<u>120,000</u>
Total cash cost	<u>2,940,000</u>

23.2 The relevant financial information for Xavier Limited for the year ended 20X1 is given below.

Profit and Loss Account Data (₹ million)			Balance Sheet Data Beginning of 20X1 End of 20X1	
Sales	80	Inventory	9	12
Cost of goods sold	56	Accounts receivable	12	16
		Accounts payable	7	10

What is the length of the operating cycle? The cash cycle? Assume 365 days to a year.

*Solution*

Operating cycle : Inventory period + Accounts receivable period

$$\text{Inventory period} : \frac{\text{Average inventory}}{\text{Annual cost of goods sold}/365} = \frac{(9+12)/2}{56/365} = 68.4 \text{ days}$$

$$\text{Accounts receivable period} : \frac{\text{Average accounts receivable}}{\text{Annual sales}/365} = \frac{(12+16)/2}{80/365} = 63.9 \text{ days}$$

$$\text{Accounts payable period} : \frac{\text{Average accounts payable}}{\text{Annual cost of goods sold}/365} = \frac{(7+10)/2}{56/365} = 55.4 \text{ days}$$

$$\text{Operating cycle} = 68.4 + 63.9 = 132.3 \text{ days}$$

$$\begin{aligned}\text{Cash operating cycle} &= \text{Operating cycle} - \text{Accounts payable period} \\ &= 132.3 - 55.4 \\ &= 76.9 \text{ days}\end{aligned}$$

## PROBLEMS

**23.1 Operating Cycle and Cash Cycle** The relevant information for Zenith Limited is given below:

Profit and Loss Account Data		Balance Sheet Data		
		Beginning of 20X0	End of 20X0	
Sales	500	Inventory	60	64
Cost of goods sold	360	Accounts receivable	80	88
		Accounts payable	40	46

What is the length of the operating cycle? The cash cycle?

**23.2 Operating Cycle and Cash Cycle** The relevant information for Apex Limited is given below:

Profit and Loss Account Data		Balance Sheet Data		
		Beginning of 20X0	End of 20X0	
Sales	1000	Inventory	110	120
Cost of goods sold	750	Accounts receivable	140	150
		Accounts payable	60	66

What is the length of the operating cycle? The cash cycle?

**23.3 Working Capital Requirement** The following annual figures relate to XYZ Co.

₹	
Sales (at two months' credit)	300,000
Materials consumed (suppliers extend two months credit)	700,000
Wages paid (monthly in arrear)	600,000
Manufacturing expenses outstanding at the end of the year (Cash expenses are paid one month in arrear)	70,000
Total administrative expenses, paid as incurred	200,000
Sales promotion expenses, paid quarterly in advance	100,000

The company sells its products on gross profit of 20 percent counting depreciation as part of the cost of production. It keeps two months' stock each of raw materials and finished goods, and a cash balance of ₹ 80,000.

Assuming a percent safety margin, work out the working capital requirements of the company on cash cost basis. Ignore work-in-process.

## MINICASE

Naveenbhai, the senior partner of Patel and Co., is furious that his bank has not increased their cash credit limit fixed two years back despite repeated requests for enhancement. He has been waiting only for the estimated financial statements for financial year that ended last week, to make a last and final request to their present bankers for a need based increase in the limit. Today the provisional papers are ready and he has asked the finance manager Malav to make out a strong case for a considerable hike in the cash credit facility.

From his frequent interactions with the credit manager at the bank, Malav knows that as the bank does not have any set norms for a manufacturing firm of their type, they usually rely on the financial statements of the previous year (see below) to decide on the appropriate holding levels for debtors, creditors, inventory etc., and the profitability margin. Based on the orders on hand and expected, he projects enhanced net sales of ₹ 800 million. To earn brownie points in the eyes of the bank, he decides to assume that for the current year there would not be any increase in the sales and administration expenses and depreciation and that the minimum cash holding would be drastically cut to just half of that for the previous year. He also decides to add only a very modest safety margin of just five percent over the amount of working capital to be calculated on total cash cost basis. He remembers in time to provide a hike of ten percent in the salaries and wages figure for the current year to keep up the promise made by Naveenbhai to the workers.

For simplifying the calculations, he assumes that the gross profit margin and the raw material purchases for the current year as a proportion to sales would remain unchanged.

Relevant information on the financial performances of the just completed year are as under:

(Amount in ₹ million)				
Net sales	701	Holding period for raw materials	59 days	
Cost of goods sold	552	Holding period for finished goods	11 days	
Raw materials purchased	449	Average receivable collection period	47 days	
Sales & administrative expenses (paid as and when incurred)	30	Average trade credit period enjoyed	55 days	
Depreciation	30	Average cash holding level	10	
Salaries & wages paid (one month in arrear)	68	Cash manufacturing expenses are paid one month in arrear		

- (1) What would be the total cash cost for the current year?
- (2) What would be the working capital requirement for the current year?

Show his detailed workings.

## PRACTICAL ASSIGNMENT

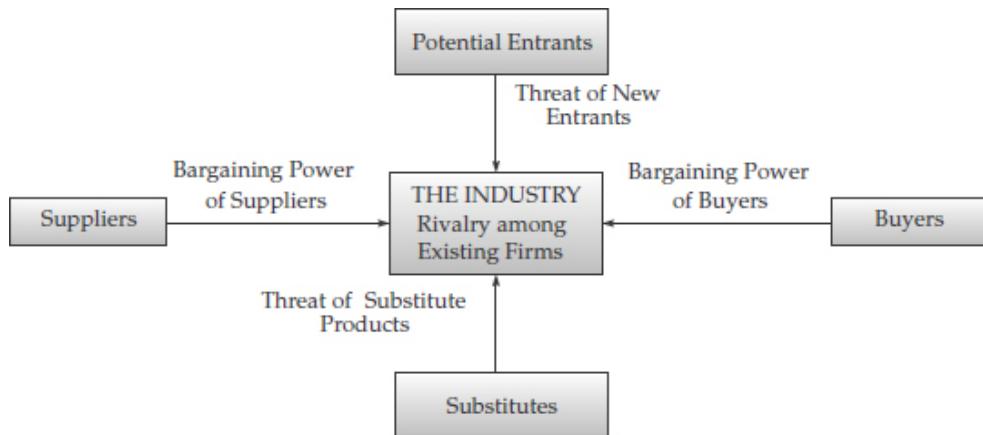
Comment on the current asset policy and current asset financing policy of the company selected by you. Calculate the operating cycle of the firm, making suitable assumptions.

## Appendix 23A

### Corporate Strategy and Working Capital Management

Executives spend a great deal of time in designing and planning their corporate and competitive strategies. However, they do not pay adequate attention to the financial consequences of these strategies, particularly in terms of their impact on balance sheet. No wonder, this lack of balance sheet forecasting often causes financial difficulties.

The ability of a firm to negotiate terms of trade with suppliers and clients depends on its relative strength within the value chain. So, if the management of the firm has a good understanding of the competitive market dynamics of the industry to which it belongs, it can forecast its financing needs of operations (FNO) better. The Porter's five-forces model shown below is a good tool to understand competitive dynamics of the industry.



In addition to market dynamics, the FNO are impacted by managerial decisions. When the sales manager increases sales or changes the firm's commercial credit terms, when the purchase manager sets the level of purchases or changes the number of days taken to pay suppliers, or when the production managers choose a different production schedule, the level of the firm's FNO is impacted. The problem is that often managers may not fully appreciate the impact of their operating decisions on the firm's FNO. It is imperative that they are trained to assess the financial implications of their operating decisions.

#### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter23/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter23/index.html)



- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems

**24**  
**CHAPTER**

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## **Cash and Liquidity Management**

### **Learning Objectives**

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After studying this chapter you should be able to:

- ✓ Describe the possible motives for holding cash.
- ✓ Explain the receipts and payments method for cash budgeting.
- ✓ Suggest methods to enhance the efficiency of cash management.
- ✓ Discuss the options available for deploying short-term surplus funds.

Cash, the most liquid asset, is of vital importance to the daily operations of business firms. While the proportion of corporate assets held in the form of cash is very small, often between 1 and 4 percent, its efficient management is crucial to the solvency of the business because in a very important sense cash is the focal point of fund flows in a business. In view of its importance, it is generally referred to as the “life blood of a business enterprise.”

Why does a firm need cash? As John Maynard Keynes put forth, there are three possible motives for holding cash.

*Transaction Motive* Firms need cash to meet their transaction needs. The collection of cash (from sale of goods and services, sale of assets, and additional financing) is not perfectly synchronised with the disbursement of cash (for purchase of goods and services, acquisition of capital assets, and meeting other obligations). Hence, some cash balance is required as a buffer.

*Precautionary Motive* There may be some uncertainty about the magnitude and timing of cash inflows from sale of goods and services, sale of assets, and issuance of securities. Likewise, there may be uncertainty about cash outflows on account of purchases and other obligations. To protect itself against such uncertainties, a firm may require some cash balance.

**Speculative Motive** Firms would like to tap profit making opportunities arising from fluctuations in commodity prices, security prices, interest rates, and foreign exchange rates. A cash-rich firm is better prepared to exploit such bargains. However, for most firms their reserve borrowing capacity and marketable securities would suffice to meet their speculative needs.

While cash serves these functions, it is an idle resource which has an opportunity cost. The liquidity provided by cash holding is at the expense of profits sacrificed by foregoing alternative investment opportunities. Hence, the financial manager should (i) establish reliable forecasting and reporting systems, (ii) improve cash collections and disbursements, and (iii) achieve optimal conservation and utilisation of funds.

## 24.1 ■ CASH BUDGETING

Cash budgeting or short-term cash forecasting is the principal tool of cash management. Cash budgets, routinely prepared by business firms, are helpful in: (i) estimating cash requirements, (ii) planning short-term financing, (iii) scheduling payments in connection with capital expenditure projects, (iv) planning purchases of materials, (v) developing credit policies, and (vi) checking the accuracy of long-term forecasts.

Firms use multiple short-term forecasts, of varying length and detail, suited to meet different needs. The commonly used designs for short-term cash forecasts are: (i) one year divided into quarters or months, (ii) one quarter divided into months, and (iii) one month divided into weeks. A firm, hard pressed with liquidity crunch, may even prepare a weekly cash forecast divided into days.<sup>1</sup> The point to be emphasised here is that these multiple formats serve differing purposes and should not be regarded as mutually exclusive.

The principal method of short-term cash forecasting is the receipts and payments method. Sometimes the adjusted net income method is used though this method is employed mainly for long-term cash forecasting.

## **Receipts and Payments Method**

The cash budget prepared under this method shows the timing and magnitude of expected cash receipts and payments over the forecast period. It includes all expected receipts and payments irrespective of how they are classified in accounting. The items of cash receipts and cash payments and the bases for estimating them are shown in [Exhibit 24.1](#).

From [Exhibit 24.1](#) it is clear that the receipts and payments method of cash forecasting calls for information about estimated sales, production plan, purchasing plan, financing plan, and capital expenditure budget. The most crucial input in the entire process, of course, is the figure of estimated sales because various business plans are closely related to estimated sales.

**Illustration** The preparation of cash budget may be illustrated with an example. ABC Company manufactures plastic bags. Its estimated sales for the period January 20X0 through June 20X0 are as follows: ₹ 100,000 per month from January through March and ₹ 120,000 per month from April through June. The sales for November and December of the previous year have been ₹ 100,000 each. Cash and credit sales are expected to be 20 percent and 80 percent respectively. The receivables from credit sales are expected to be collected as follows: 50 percent of receivables, on an average, one month from the date of sale and the balance 50 percent, on an average, two months from the date of sale. No bad debt losses are expected to occur. Other anticipated receipts are: (i) ₹ 5,000 from the sale of a machine in March, and (ii) ₹ 2,000 interest on securities in June. Given this information, the forecasted cash receipts have been tabulated in [Exhibit 24.2](#).

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## **Exhibit 24.1 | Items of Cash Receipts and Payments and the Basis of Their Estimation**

<i>Items</i>	<i>Basis of Estimation</i>
Cash sales	Estimated sales and its division between cash and credit sales.
Collection of accounts receivable	Estimated sales, its division between cash and credit sales, and collection pattern.
Interest and dividend receipts	Firm's portfolio of securities and return expected from the portfolio.
Increase in loans/ deposits and issue of securities	Financing plan.
Sale of assets	Proposed disposal of assets.
Cash purchases	Estimated purchases and its division between cash and credit purchases.
Payment for purchases	Estimated purchases, its division between cash purchases and credit purchases, and terms of credit purchases.
Wages and salaries	Manpower employed and wages and salaries structure.
Manufacturing expenses	Production plan.
General, administration and selling expenses	Administration and sales personnel and proposed sales promotion and distribution expenditure
Capital equipment purchases	Capital expenditure budget and payment pattern associated with capital equipment purchases.
Repayment of loans and retirement of securities	Financing plan.

## **Exhibit 24.2 | Forecast of Cash Receipts**

	<i>(₹)</i>	<i>January</i>	<i>February</i>	<i>March</i>	<i>April</i>	<i>May</i>	<i>June</i>
1. Sales		100,000	100,000	100,000	120,000	120,000	120,000
2. Credit sales		80,000	80,000	80,000	96,000	96,000	96,000
3. Collection of accounts receivable		80,000	80,000	80,000	80,000	88,000	96,000
4. Cash sales		20,000	20,000	20,000	24,000	24,000	24,000
5. Receipt from sale of equipment				5,000			
6. Interest						2,000	
Total cash receipts (3 + 4 + 5 + 6)		100,000	100,000	105,000	104,000	112,000	122,000

We now consider the forecast of cash payments. ABC Company plans to purchase materials worth ₹ 40,000 in January and February and materials worth ₹ 48,000 each month from March through June. The payments for these purchases are made approximately a month after the purchase. The purchases for December of the previous year have been ₹

40,000 for which payment will be made in January 20X0. Miscellaneous cash purchases of ₹ 2,000 per month are planned from January through June. Wage payments are expected to be ₹ 15,000 per month; general administrative and selling expenses are expected to be ₹ 10,000 per month. Dividend payment of ₹ 20,000 and tax payment of ₹ 20,000 are scheduled in June 20X0. A machine worth ₹ 50,000 is proposed to be purchased on cash in March 20X0. Given this information, the proposed payments are shown in [Exhibit 24.3](#).

### **Exhibit 24.3 Forecast of Cash Payments**

	January	February	March	April	May	June	₹)
1. Material purchases	40,000	40,000	48,000	48,000	48,000	48,000	
2. Credit material purchases	40,000	40,000	48,000	48,000	48,000	48,000	
3. Payment of accounts payable	40,000	40,000	40,000	48,000	48,000	48,000	
4. Miscellaneous cash purchases	2,000	2,000	2,000	2,000	2,000	2,000	
5. Wages	15,000	15,000	15,000	15,000	15,000	15,000	
6. Manufacturing expenses	20,000	20,000	20,000	20,000	20,000	20,000	
7. General administrative and selling expenses	10,000	10,000	10,000	10,000	10,000	10,000	
8. Dividend	—	—	—	—	—	20,000	
9. Tax	—	—	—	—	—	20,000	
10. Capital expenditure	—	—	50,000	—	—	—	
Total payments	87,000	87,000	137,000	95,000	95,000	135,000	
(3 + 4 + 5 + 6 + 7 + 8 + 9 + 10)							

Assuming that the cash balance on 1st January 20X0 is ₹ 22,000 and the minimum cash balance required by the firm is ₹ 20,000, we can now prepare a summary statement. This statement, shown in [Exhibit 24.4](#), calculates the surplus/deficit in relation to the minimum required. From [Exhibit 24.4](#) it can be seen that a cash shortage is expected to occur during March and it would disappear in April as the business operations result in cash inflows. The shortage expected in March is due to the proposed capital expenditure of ₹ 50,000. The management can avoid this shortage by adopting one or more of the following means:<sup>2</sup> (i) postponement of asset acquisition to April, (ii) deferring a portion of the payment for the capital asset to April, and (iii) resorting to short-term borrowing for the month of March.

## Deviations from Expected Cash Flows

Expressed as it is in numbers, the cash budget often conveys a picture of precision. Hence, a great deal of faith is usually put on it. A moment's reflection, however, would reveal that the figures found in the cash budget merely represent *estimates* of future cash flows. The actual cash flows are likely to deviate from the estimates provided in the cash budget—the extent of deviation depends mainly on how volatile are the cash flows of the business.

Given the uncertainties characterising business operations, estimating the cash flows on the basis of a single set of assumptions, as is done in conventional cash budgeting, often results in an inadequate perspective on the future. Hence, it is advisable to prepare additional cash budgets, based on different sets of assumptions. The least that a firm may do is to look at cash forecasts under three possible scenarios: pessimistic scenario, normal scenario, and optimistic scenario. Such an analysis provides a better perspective on future cash flows and facilitates the formulation of contingency plans.

### Exhibit 24.4 Summary Cash Forecast

	January	February	March	April	May	June	(₹)
1. Opening cash balance	22,000						
2. Receipts	100,000	100,000	105,000	104,000	112,000	122,000	
3. Payments	87,000	87,000	137,000	95,000	95,000	135,000	
4. Net cash flow (2 – 3)	13,000	13,000	(32,000)	9,000	17,000	(13,000)	
5. Cumulative net cash flow	13,000	26,000	(6,000)	3,000	20,000	7,000	
6. Opening cash balance + Cumulative net cash flow (1 + 5)	35,000	48,000	16,000	25,000	42,000	29,000	
7. Minimum cash balance required	20,000	20,000	20,000	20,000	20,000	20,000	
8. Surplus or deficit in relation to the minimum cash balance required (6 – 7)	15,000	28,000	(4,000)	5,000	22,000	9,000	

## **Evaluation**

The receipts and payments method of cash forecasting is used commonly because of two advantages: (i) It provides a complete picture of expected cash flows. (ii) It is a sound vehicle for exercising control over day-to-day transactions. This method, however, has some drawbacks too: (i) Its reliability is impaired by delays in collection or sudden demand for large payments and other similar factors. (ii) It fails to provide a clear picture of important changes in the company's working capital movement, especially those relating to inventories and receivables.

## 24.2 ■ LONG-TERM CASH FORECASTING

The dividing line between short-term cash forecasts and long-term cash forecasts is usually one year, though the distinction is somewhat arbitrary. Long-term cash forecasts are generally prepared for a period ranging from two to five years and serve to provide a broad brush picture of a firm's financing needs and availability of investible surplus in future. Such forecasts are helpful in planning capital investment outlays and long-term financing.

While the receipts and disbursements method can theoretically be used for preparing the long-term cash forecast, the method that is generally used for this purpose is the **adjusted net income method**. This method of cash forecasting, resembling the funds flow statements, seeks to estimate the firm's need for cash at some future date and indicate whether this need can be met from internal sources or not. A format for preparing the adjusted net income forecast is shown in [Exhibit 24.5](#). The information required for preparing the adjusted net income forecast is derived mainly from the budgets prepared by the firm.

### Exhibit 24.5 A Format for the Adjusted Net Income Method

	20X0	20X1	20X2	20X3	20X4
<i>Source</i>					
Net income after taxes					
Non-cash charges (Depreciation, amortisation, etc.)					
Increase in borrowings					
Sale of equity shares					
Miscellaneous					
<i>Uses</i>					
Capital expenditures					
Increase in current assets					
Repayment of borrowings					
Dividend payment					
Miscellaneous					
<i>Surplus/ Deficit</i>					
Opening cash balance					
Closing cash balance					

## 24.3 ■ REPORTS FOR CONTROL

Cash reports, providing a comparison of actual developments with forecast figures, are helpful in controlling and revising cash forecasts on a continual basis. Several types of cash reports may be prepared. The important ones are:

- **Daily Cash Report** The daily cash report shows the opening balance, receipts, payments, and the closing balance on a daily basis.
- **Daily Treasury Report** An amplification of the daily cash report, the daily treasury report provides a comprehensive picture of changes in cash, marketable securities, debtors, and creditors.
- **Monthly Cash Report** This report shows the actual cash receipts and payments on a monthly basis. The actuals are compared with the budgeted figures and variances calculated.

## **24.4 ■ CASH COLLECTION AND DISBURSEMENT**

We talked about a firm's cash balance in general terms. Let us now learn about more precise measures of cash balance and the ways and means of conserving cash. For this purpose we first need to understand what float means.

## Float

The cash balance shown by a firm on its books is called the **book, or ledger, balance** whereas the balance shown in its bank account is called the **available, or collected, balance**. The difference between the available balance and the ledger balance is referred to as the float.

There are two kinds of float viz., **disbursement float** and **collection float**. Cheques issued by a firm create disbursement float. For example, suppose that Bharat Company has a book balance as well as available balance of ₹ 4 million with its bank, State Bank of India, as on March 31. On April 1 it pays ₹ 1 million by cheque to one of its suppliers and hence reduces its book balance by ₹ 1 million.

State Bank of India, however, will not debit Bharat Company account till the cheque has been presented for payment on, say, April 6. Until that happens the firm's available balance is greater than its book balance by ₹ 1 million. Hence, between April 1 and April 6 Bharat Company has a disbursement float of ₹ 1 million.

$$\begin{aligned}\text{Disbursement float} &= \text{Firm's available balance} - \text{Firm's book balance} \\ &= ₹ 4 \text{ million} - ₹ 3 \text{ million} \\ &= ₹ 1 \text{ million}\end{aligned}$$

Cheques received by a firm lead to collection float. For example, suppose that Bharat Company has a book balance as well as available balance of ₹ 5 million as on April 30. On May 1 Bharat Company receives a cheque for ₹ 1.5 million from a customer which it deposits in the bank. It increases its book balance by ₹ 1.5 million. However, this amount is not available to Bharat Company until its bank presents the cheque to the customer's bank and receives payment on, say, May 5. So, between May 1 and May 5 Bharat Company has a collection float of – ₹ 1.5 million.

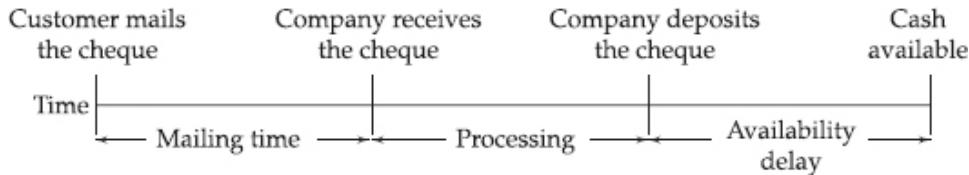
$$\begin{aligned}\text{Collection float} &= \text{Firm's available balance} - \text{Firm's book balance} \\ &= ₹ 5.0 \text{ million} - ₹ 6.5 \text{ million} \\ &= -₹ 1.5 \text{ million}\end{aligned}$$

The **net float** is the sum of disbursement float and collection float. It is simply the difference between the firm's available balance and its book balance. If the net float is positive (negative) it means that the available balance is greater (lesser) than the book balance.

Since what matters is the available balance, as a financial manager you should try to maximise the net float. This means that you should strive to speed up collections and delay disbursements.

## Speeding Up Collections

The collection time comprises mailing time, cheque processing delay, and the bank's availability delay as shown below:



When a company receives payments through cheques that arrive by mail, all the three components of collection time are relevant. To speed up collection, companies often use lockboxes and concentration banking which are essentially systems for expeditious decentralised collection.

**Lock Boxes** Under a lock box system, customers are advised to mail their payments to special post office boxes called lockboxes, which are attended to by local collecting banks, instead of sending them to corporate headquarters.

The local bank collects the cheques from the lock box once or more a day, deposits the cheques directly into the local bank account of the firm, and furnishes details to the firm.

Thus the lock box system (i) cuts down the mailing time, because cheques are received at a nearby post office instead of at corporate headquarters, (ii) reduces the processing time because the company does not have to open the envelopes and deposit the cheques for collection, and (iii) shortens the availability delay because the cheques are typically drawn on local banks.

**Concentration Banking** In this system, the company asks its customers in a particular area to send payments to a local branch office rather than to the corporate headquarters. The cheques received by the local branch office are deposited for collection into a local bank account. Surplus funds from various local bank accounts are transferred regularly (mostly daily) to a concentration account at one of the company's principal banks. For effecting the transfer, several options are available.

With the vast network of branches set up by banks, regional/local collection centres can be easily established. To ensure that the system of collection works according to plan, it is helpful to periodically audit the actual transfers by the collecting banks and see whether they are in conformity with the instructions given.

Concentration banking can be combined with lock box arrangement to ensure that the funds are pooled centrally as quickly as possible.

## **Controlling Payments**

Just as a firm can increase its net float by speeding up collections, it can also do so by slowing down disbursements. A common temptation may be to mail cheques from remote locations to maximise disbursement float.

While maximising disbursement float is a dubious practice, a firm can conserve its cash resources by properly controlling its payments. The following may be done in this respect. (a) Ensure that payments are made only when they fall due and not early. (b) Centralise disbursements. This helps in consolidating funds at the head office, scheduling payments more effectively, reducing unproductive cash balances at regional/local offices, and investing funds more productively. (c) Arrange with suppliers to set the due dates of their bills to match with company's receipts. Synchronisation of cash outflows with cash inflows helps a company to get greater mileage from its cash resources.

## **Electronic Data Interchange and Electronic Funds Transfer**

Electronic data interchange (EDI) refers to direct, electronic exchange of information between various parties. Financial EDI, or FEDI, involves electronic transfer of information and funds between transacting parties. FEDI leads to elimination of paper invoices, paper cheques, mailing, handling, and so on. Under FEDI, the seller sends the bill electronically to the buyer, the buyer electronically authorises its bank to make payment, and the bank transfers funds electronically to the account of the seller at a designated bank. The net effect is that the float has been virtually eliminated.

**Electronic Funds Transfer** While the cheque clearing system still continues, digital money transfer systems are gaining ascendancy, thanks to their speed, safety, and convenience. Real Time Gross Settlement (RTGS) and National Electronic Fund Transfer (NEFT) are in vogue as per the Reserve Bank of India diktats.

RTGS is a funds transfer system under which money is transferred from one bank to another in real time and on a gross basis. ‘Real time’ means that the transfer isn’t subject to any waiting period; ‘gross settlement’ means that the transfer is completed on a one to one basis without being clustered with other transaction. The system is maintained by the RBI and money transfers occur in the books of the RBI. RTGS is applicable only to amounts of ₹ 200,000 or more.

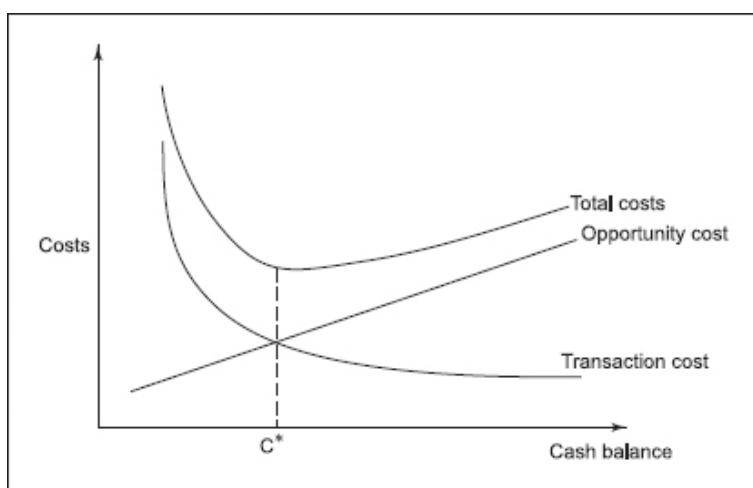
The basic difference between RTGS and NEFT is that while RTGS is based on gross settlement, NEFT is based on net settlement or a deferred net basis where transactions are completed in batches at specific times. NEFT is applicable to any amount below ₹ 200,000.

International digital money transfers happen through SWIFT money transfers. SWIFT originated in 1974, when seven international banks formed the Society for Worldwide Interbank Financial Telecommunication (SWIFT).

## 24.5 ■ OPTIMAL CASH BALANCE

If a firm maintains a small cash balance, it has to sell its marketable securities (and perhaps buy them later) more frequently than if it holds a large cash balance. Hence the trading or transaction costs will tend to diminish if the cash balance becomes larger. However, the opportunity costs of maintaining cash rise as the cash balance increases. [Exhibit 24.6](#) presents graphically the tradeoff between the trading costs and opportunity costs. As shown in this figure, the total costs of holding cash (which consist of trading costs and opportunity costs) are at a minimum when the size of cash balance is  $C^*$ . This represents the optimal cash.

**Exhibit 24.6** Optimal Cash Balance



### Basic Principles of Good Cash Management

- Develop and maintain a good cash forecasting system.
- Expedite the transfer of collections.
- Develop and use sources of short term borrowing that are flexible and readily available.
- Never permit usable funds to stand idle.
- Maintain good relations with the bankers and be sure they are treated fairly.
- Utilise modern electronic payment system fully.

## **24.6 ■ INVESTMENT OF SURPLUS FUNDS**

Companies often have surplus funds for short periods of time before they are required for capital expenditures, loan repayment, or some other purpose. Instead of allowing these surplus funds to accumulate in current account where they earn no interest, companies invest them in a variety of short-term instruments like term deposits with banks, money market mutual funds, and so on. Managing the investment of surplus funds is a very important responsibility of the financial manager. This has become more so in recent years, thanks to higher corporate liquidity and wider range of investment options.

## **Investment Portfolio: Three Segments**

It may be useful to divide a firm's short-term investment portfolio into three (not necessarily equal) segments: ready cash segment, controllable cash segment, and free cash segment.

The **ready cash segment** represents a reserve for the company's cash account. It is meant to augment the cash resources of the company to meet unanticipated operational needs. Investments in this segment must necessarily be highly liquid in nature.

The **controllable cash segment** represents that part of the investment portfolio which is meant to meet the needs of knowable outflows like taxes, dividend, interest payments, and repayments of borrowings. Ideally, investments in this segment must be matched in size and maturity to known future outflows.

The **free cash segment** represents that part of the investment portfolio which is meant neither to augment unforeseen current cash needs nor to meet known future outflows. It essentially represents surplus funds with the firm which has been invested in short-term instruments to generate income, without much concern for liquidity or maturity.

## **Criteria for Evaluating Investment Instruments**

Safety, liquidity, yield, and maturity are the most important criteria for evaluating various investment instruments.

**Safety** Perhaps the most important criterion, safety refers to the probability of getting back the amount invested. Treasury bills may be regarded as the safest of all the instruments as they represent the obligations of the government. The safety of the other instruments depends on the type of the instrument and the issuer. A high degree of safety is essential for an instrument to be considered for inclusion in the short-term investment portfolio of the firm.

**Liquidity** The liquidity of an instrument refers to the ability of the investor to convert it into cash on short notice without incurring a loss. An instrument may be quite safe if it is held till maturity, but it may not be possible to sell it prematurely without suffering a loss. For a traded instrument, a large and active secondary market ensures liquidity. For a non-traded instrument, liquidity is high if the penalty for premature liquidation is negligible.

**Yield** The yield of an instrument is the return earned from it by way of interest, dividend, and capital appreciation. Some instruments like Treasury bills and commercial paper do not pay interest, but they are sold at a discount and redeemed at face value. Yield has to be measured in post-tax terms, taking into account the tax rate applicable to the returns earned by the investment instrument.

**Maturity** Maturity refers to the life of the instrument. While some instruments (like Treasury bills) have fixed original maturities, others (like certificates of deposit) can have tailor-made maturity. Generally, the longer the maturity, the greater the yield.

## **Investment Options**

For deploying their surplus funds, the major options used by corporates in India are term deposits with banks and mutual fund schemes (in particular, money market schemes); the minor options used are Treasury bills, G-secs, commercial paper, certificates of deposit, inter-corporate deposits, and ready forwards. A brief discussion of various options follows.

### **Time Deposits with Banks and Financial Institutions**

Companies keep time deposits with banks and financial institutions. These deposits can be withdrawn by the company at any point without prior notice or penalty on the principal.

**Mutual Fund Schemes** A variety of schemes are offered by mutual funds. Based on the investment policy, the mutual fund schemes may be broadly classified as follows:

*Equity Schemes* The corpus of an equity scheme is invested substantially (80-95 percent) in equity or equity related instruments. The balance may be in debt instruments.

*Balanced schemes* A balanced scheme, as its name suggests, invests its corpus across two broad asset classes, viz., equity and debt in a more or less balanced manner.

*Debt schemes* A debt scheme invests its corpus primarily in debt instruments. Some debt schemes may have a small exposure to equities.

For investing short-term surpluses perhaps the most popular schemes are debt schemes because of their low or nil exposure to equities. Within the category of debt schemes, **money market schemes**, also called **liquid schemes**, seem to be more appropriate. The corpus of a money market schemes is invested in instruments such as Treasury bills, commercial paper, certificates of debt, and call and notice money. Money market instruments have negligible interest risk exposure (thanks to their short maturity) as well as credit risk exposure. The principal value of a unit in a money market scheme remains stable, though the periodic income may vary depending on the conditions in the money market.

Money market schemes are very convenient for firms that do not have in-house expertise for managing short-term surpluses. They offer safety of principal, near-instantaneous liquidity, and a post-tax return that is generally higher than what short term bank deposits provide.

**Treasury Bills** Treasury bills (*T* – bills) are short-term obligations of the Government of India. The RBI which issues *T* – bills on behalf of the Government of India, auctions 14-days and 91-days *T*-bills every Friday and 184-days and 364 days *T*-bills every alternative Wednesday. *T*-bills are sold through a uniform price auction (Dutch auction).

The pre-tax yield on such an instrument is calculated as follows:

$$\frac{\text{Face value} - \text{Market Price}}{\text{Market Price}} \times \frac{360}{\text{Balance maturity period}}$$

To illustrate, a Treasury Bill has a face value of ₹ 100,000 and a balance maturity period of 91 days. Its market price is ₹ 98,500. So, its pre-tax yield works out to:

$$\frac{100,000 - 98,500}{98,500} \times \frac{360}{91} = 6.02 \text{ percent}$$

Since this return is deemed as ordinary income, the post-tax return would be: 6.02 (1 – marginal tax rate).

Though the yield on Treasury bills is somewhat low, they have appeal for the following reasons: (i) They can be transacted readily as they are issued in bearer form. (ii) There is a very active secondary market for Treasury bills and the Discount and Finance House of India is a major market maker. (iii) Treasury bills are virtually risk-free.

**Commercial Paper** Commercial paper represents short-term unsecured promissory notes issued by firms that are generally considered to be financially strong. Commercial paper usually has a maturity period of 90 days to 180 days. It is sold at a discount and redeemed at par. Hence the implicit rate is a function of the size of discount and the period of maturity. Commercial paper is either directly placed with investors or sold through dealers. Commercial paper does not presently have a well developed secondary market in India.

The main attraction of commercial paper is that it offers an interest rate that is typically higher than that offered by Treasury bills or certificates of deposit. However, its disadvantage is that it does not have an active secondary market. Hence, it makes sense for firms that plan to hold these till maturity.

**Certificates of Deposit** A certificate of deposit, or CD, is a time deposit with a bank or financial institution. Banks issue CDs for maturity periods ranging from 14 days to one year and financial institutions issue CDs with maturity period ranging between 1 year and 3 years. CDs are

issued in denominations of ₹ 1 lakh (maturity value) and are negotiable. CDs are issued at a discount to the face value.

CDs are a popular form of short-term investment for companies for the following reasons: (i) Banks are normally willing to tailor the denominations and maturities to suit the needs of the investors. (ii) CDs are transferable. (iii) CDs are generally risk-free. (iv) CDs generally offer a higher rate of interest than Treasury bills or term deposits.

### **Elements of Cash and Liquidity Management**

In recent years the importance of cash and liquidity management has increased dramatically. Cash management comprises of five basic elements.

- 1. Collection** The firm must accelerate the receipts into available funds.
- 2. Disbursement** The firm must control the release and timing of funds.
- 3. Concentration** The firm must inexpensively mobilise funds from outlying banks to a single location for their efficient use.
- 4. Investment** The firm must maximise yield within acceptable limits of risk and maturity.
- 5. Information and Control** The firm must develop reliable short term cash forecasts and obtain accurate, timely data on bank balances, bank deposits, and so on.

## **24.7 ■ CASH MANAGEMENT MODELS**

The cash budget of the firm indicates periods when the firm is expected to have shortage of funds and surplus of funds. If a shortage is expected, ways and means of overcoming the shortage must be explored. On the other hand, if a surplus is projected, it has to be determined how it should be split between marketable securities and cash holdings. Several cash management models have addressed this issue of split between marketable securities and cash holdings. In this section we will discuss two of these models: (i) the Baumol model and (ii) the Miller and Orr model.

## Baumol Model

William J. Baumol proposed a model which applies the economic order quantity (EOQ) concept, commonly used in inventory management, to determine the cash conversion size (which in turn influences the average cash holding of the firm). The purpose of such an analysis is to balance the income foregone when the firm holds cash balances (rather than invests in marketable securities) against the transaction costs incurred when marketable securities are converted into cash.

To illustrate the nature of this analysis, let us consider the situation of Zeta Limited.

- Zeta requires ₹ 1.5 million in cash for meeting its transaction needs (represented by the symbol  $T$ ) over the next three months, its planning period for liquidity decisions. This amount is available with Zeta in the form of marketable securities.
- To meet the projected cash needs, Zeta can sell its marketable securities in any of the five lot sizes: ₹ 100,000, ₹ 2,00,000, ₹ 300,000, ₹ 400,000 and ₹ 500,000. These cash conversion sizes,  $C$ , are shown in line 1 of [Exhibit 24.7](#).
- The number of times the marketable securities will be converted into cash is simply  $T/C$ . The value of  $T/C$ , given  $T = ₹ 1,500,000$  and  $C$  varying in the range ₹ 100,000 – ₹ 500,000, is shown in line 2 of [Exhibit 24.7](#).
- The cash payments are made evenly over the three months planning period. This means that the cash balance of the firm behaves in the saw tooth manner as shown in [Exhibit 24.8](#). Hence the average balance is simply  $C/2$ . The average cash balances corresponding to the different cash conversion sizes are shown in line 3 of [Exhibit 24.7](#).
- Zeta can earn 16 percent annual yield on its marketable securities. This implies that the interest rate for the three months planning period is 4 percent (represented by the symbol  $I$ ). Since the average cash balance holding is  $C/2$ , the interest income foregone is  $C/2 \times 0.04$ . This is shown in line 4 of [Exhibit 24.7](#).
- The conversion of marketable securities into cash entails a fixed cost (represented by the symbol  $b$ ) of ₹ 500 per transaction.  $b$  is independent of the size of the cash conversion. The total conversion cost during the planning period will be equal to: number of cash

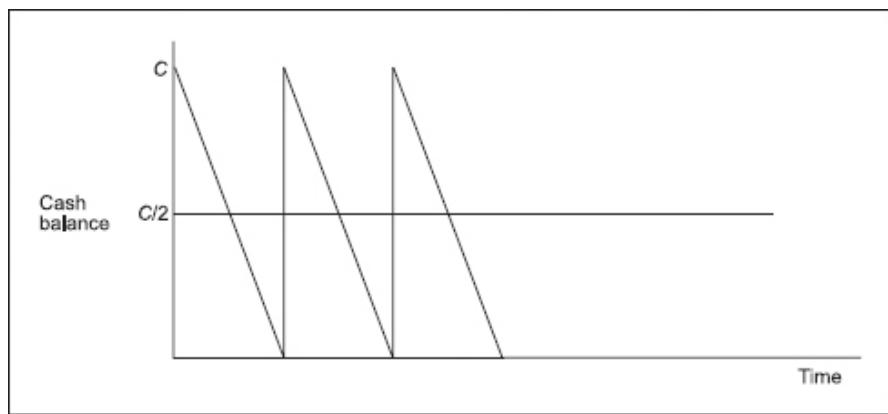
orders  $\times$  cost per transaction. This is shown in line 5 of [Exhibit 24.7](#). In general, the total conversion cost is  $(T/C) b$ .

- The total cost of ordering and holding,  $TC$ , is shown in line 6 of [Exhibit 24.7](#).

### **Exhibit 24.7 Establishing the Optimal Cash Conversion Size**

	₹ 100,000	200,000	300,000	400,000	500,000
1. Cash conversion size (the amount of marketable securities that will be converted into cash)					
2. Number of conversions during the planning period of three months ( $1,500,000 \div \text{line 1}$ )	15.00	7.50	5.00	3.75	3.00
3. Average cash balance (line 1 $\div$ 2)	₹ 50,000	100,000	150,000	200,000	250,000
4. Interest income foregone (line 3 $\times .04$ )	₹ 2,000	4,000	6,000	8,000	10,000
5. Cost of cash conversion (₹ 500 $\times$ line 2)	₹ 7,500	3,750	2,500	1,875	1,500
6. Total cost of ordering and holding cash (line 4 + line 5)	₹ 9,500	7,750	8,500	9,875	11,500

### **Exhibit 24.8 Cash Balances According to the Baumol Model**



Looking at the total costs (line 6 of [Exhibit 24.7](#)), we find that it is minimised when  $C$ , the conversion order, is ₹ 200,000. This means that at the beginning of the planning period Zeta should convert only ₹ 200,000 of its marketable securities into cash. The remaining amount should be converted into cash in lots of ₹ 200,000, as dictated by the disbursal needs of the firm.

The foregoing analysis may be represented in the form of a general model employing the following symbols developed in our illustration.

$C$  = amount of marketable securities converted into cash per order.

$I$  = interest rate earned per planning period on investment in marketable securities.

$T$  = projected cash requirements during the planning period.

$S$  = total of conversion and holding costs.

$S$  can be expressed as:

$$S = \frac{I(C/2)}{\text{Interest income foregone}} + \frac{b(T/C)}{\text{Conversion costs}} \quad (24.1)$$

The value of  $C$  which minimises  $S$  can be found from the following equation:

$$C = \sqrt{\frac{2bT}{I}} \quad (24.2)_3$$

Applying Eq. (24.2) to the situation of Zeta Limited we get:

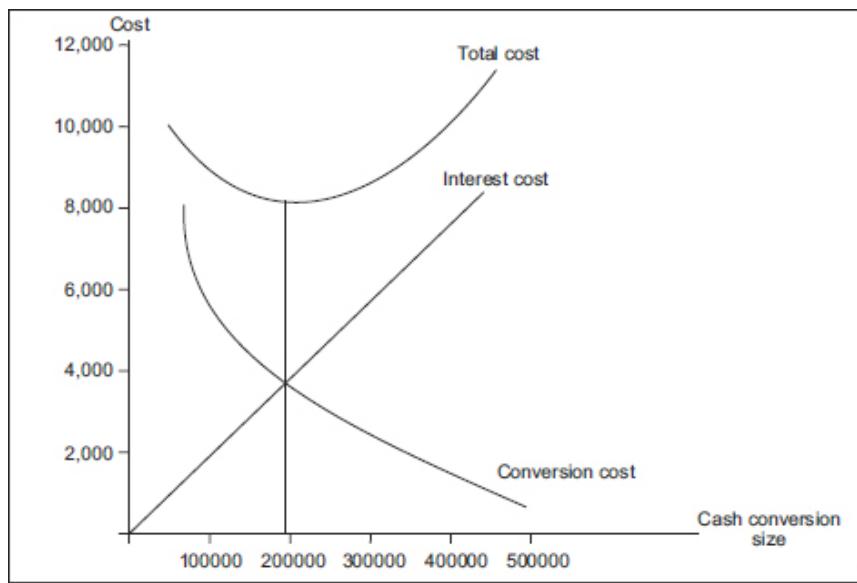
$$C = \sqrt{\frac{2 \times 500 \times 1,500,000}{0.04}} = ₹ 193,600.4$$

This solution is shown graphically in [Exhibit 24.9](#).

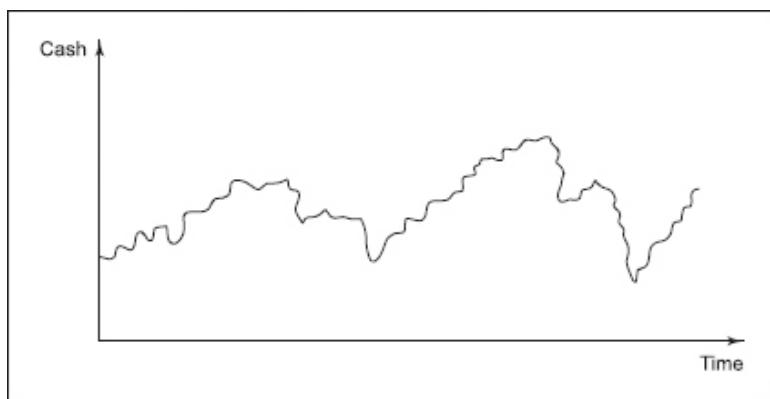
## Miller and Orr Model

Expanding on the Baumol model, Miller and Orr consider a stochastic generating process for periodic changes in cash balance. As against the completely deterministic assumptions of the Baumol model, Miller and Orr assume that the changes in cash balance over a given period are random, in size as well as direction, as shown in [Exhibit 24.10](#). As the number of periods increases, the cash balance changes form a normal distribution.

### Exhibit 24.9 Graphic Solution to the Baumol Model



### Exhibit 24.10 Changes in Cash Balance



Given this behaviour of cash balance changes, Miller and Orr model seeks to answer the following questions:

- When should transfers be effected between marketable securities and cash?
- What should be the magnitude of these transfers?

According to the Miller and Orr model, upward changes in cash balance are allowed till the cash balance reaches an “upper control limit” ( $UL$ ), as shown in [Exhibit 24.11](#). As this level is attained the cash balance is reduced to a “return point” ( $RP$ ) by investing  $UL - RP$  in marketable securities. On the other hand, downward changes are permitted only till the cash balance touches a “lower control limit” ( $LL$ ), as shown in [Exhibit 24.11](#). Once this level is reached, enough marketable securities are disposed to restore the cash balance to its “return point” ( $RP$ ).

While the value of the “lower control level” ( $LL$ ) is set by the management based on what it considers to be the minimum below which the cash balance should not fall, the values of  $RP$  and  $UL$  have been derived by Miller and Orr with a view to minimising the total ordering and holding costs. The following are the results of the analysis.

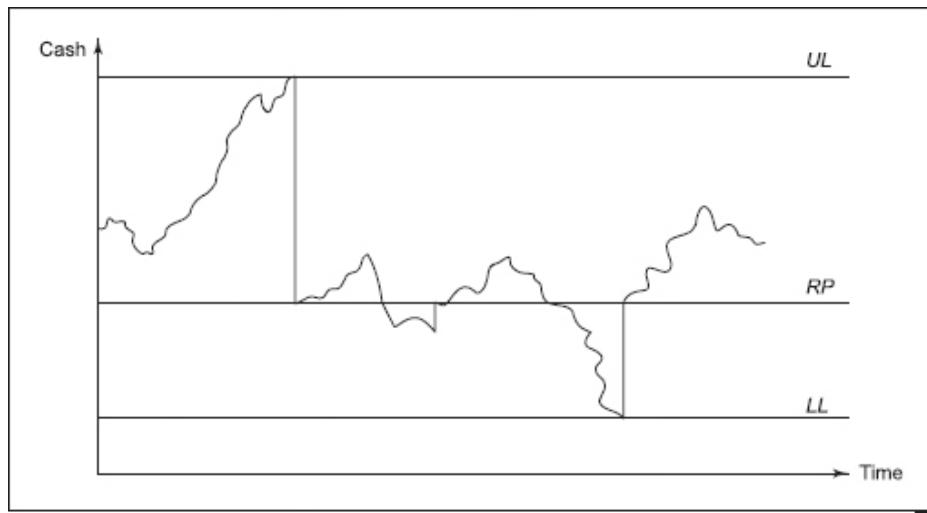
$$RP = \sqrt[3]{\frac{3b\sigma^2}{4I}} + LL \quad (24.3)$$

$$UL = 3RP - 2LL \quad (24.4)$$

where  $RP$  is the return point,  $b$  is the fixed cost per order for converting marketable securities into cash,  $I$  is the daily interest rate earned on marketable securities,  $\sigma^2$  is the variance of daily changes in the expected cash balance,  $LL$  is the lower control limit, and  $UL$  is the upper control limit.



## Exhibit 24.11 | Changes in Cash Balance with Managerial Intervention as per Miller and Orr Model



**Illustration** Beta Limited provides the following information about its liquidity.

- The annual yield available on marketable securities is 12 percent. On a daily basis the yield,  $I$ , using a 360-day year, works out to:

$$\frac{12}{360} = 0.033 \text{ or } 0.0333 \text{ percent}$$

- The fixed cost of effecting a marketable securities transaction,  $b$ , is ₹ 1,600.
- The standard deviation,  $\sigma$ , of the change in daily cash balance is ₹ 5,000.
- The management of Beta would like to maintain a minimum cash balance of ₹ 50,000.

Given the above information, the return point and the upper control limit for Beta as per Miller and Orr model, are as follows:

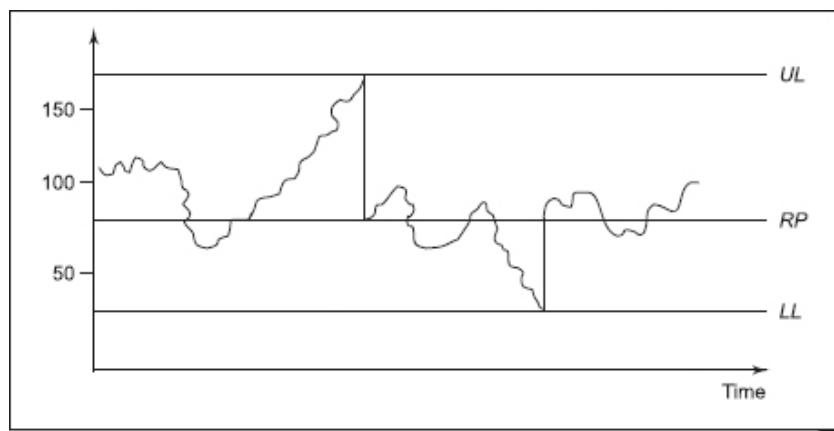
$$RP = \sqrt[3]{\frac{3(1600)(5000)^2}{4 \times 0.00033}} + 50,000 = 94,964$$

$$UL = 3 \times 94,964 - 2 \times 50,000 = 184,892$$

The solutions to this example are shown graphically in [Exhibit 24.12](#). If the cash balance reaches the upper control limit of ₹ 184,892, the financial manager should buy marketable securities for ₹ 89,928. On the other hand, if the cash balance touches the lower control limit of ₹ 50,000, the financial manager should sell marketable securities to restore the cash balance to

the return point level of ₹ 94,964. As long as the cash balance lies between the upper control limit and the lower control limit, that is between ₹ 184,892 and ₹ 50,000, no securities transaction should be undertaken. Such a course of action will minimise the sum of transaction costs and interest income foregone.

### **Exhibit 24.12 Application of Miller and Orr Model to Beta Limited**



## **SUMMARY**

- As John Maynard Keynes put forth, there are three possible motivates for holding cash, viz., **transaction motive**, **precautionary motive**, and **speculative motive**.
- The principal method of short-term cash forecasting is the **receipts and payments method**. The cash budget, prepared under this method, shows the timing and magnitude of expected cash receipts and payments over the forecast period, irrespective of how they are classified in accounting.
- The method generally used for long-term cash forecasting is the **adjusted net income method**, which resembles the funds flow statement.
- To enhance the efficiency of cash management, collections and disbursements must be properly monitored. In this context, the following are helpful: prompt billing, expeditious collection of cheques, control of payables, and playing the float.
- Various options are available for investing surplus funds available for short periods: The major options are fixed deposits with banks and money market mutual fund schemes; the minor options are Treasury bills, G-secs, commercial paper, certificates of deposit, inter-corporate deposits, ready forwards, and bill discounting.

- William J. Baumol has proposed a model which applies the **economic order quantity** (EOQ) concept, commonly used in inventory management, to determine the cash conversion size (which in turn influences the average cash holding of the firm).
- Expanding on the Baumol model, Miller and Orr consider a **stochastic generating process** for periodic changes in cash balance.

## QUESTIONS

1. What are the motives for holding cash?
2. What are the uses of short-term cash forecasts (budgets)?
3. Discuss the receipts and payments method of cash budgeting.
4. What are the major sources of cash receipts? How can they be estimated?
5. What are the major sources of cash payments? How can they be estimated?
6. Discuss the adjusted net income method of cash forecasting.
7. Discuss various cash reports used for control purposes.
8. What steps would you take to improve the efficiency of cash management?
9. What is collection float? Disbursement float? Net float?
10. What represents the optimal cash balance for a firm?
11. Discuss the options available to a firm for investing surplus cash.
12. Explain briefly the strategies available to a firm for managing surplus cash.
13. Describe the lock box system and concentration banking.
14. Derive the value of C (the amount of marketable securities converted into cash per order) as per the Baumol model.
15. Discuss the important features of the Miller and Orr model.

## SOLVED PROBLEMS

- 24.1 LTC Brothers have requested you to prepare their cash budget for the period January 20X1 through June 20X1. The following information is available:
- a. The estimated sales for the period of January 20X1 through June 20X1 are as follows: 150,000 per month from January through March, and 200,000 per month from April through June.
  - b. The sales for the months of November and December of 20X0 have been 120,000 each.
  - c. The division of sales between cash and credit sales is as follows: 30 percent cash and 70 percent credit.
  - d. Credit collection pattern is: 40 and 60 percent after one and two months respectively.
  - e. Bad debt losses are nil.

- f. Other anticipated receipts are: (i) 70,000 from the sale of a machine in April, (ii) 3,000 interest on securities in June.
- g. The estimated purchases of materials are: 60,000 per month from January to March and 80,000 per month from April to June.
- h. The payments for purchases are made approximately a month after the purchase.
- i. The purchases for the months of December, 20X0 have been 60,000 for which payments will be made in January 20X1.
- j. Miscellaneous cash purchases of 3,000 per month are planned, January through June.
- k. Wage payments are expected to be 25,000 per month, January through June.
- l. Manufacturing expenses are expected to be 32,000 per month, January through June.
- m. General administrative and selling expenses are expected to be 15,000 per month.
- n. Dividend payment of 30,000 and tax payment of 35,000 are scheduled in June 20X1.
- o. A machine worth 80,000 is planned to be purchased on cash in March 20X1.

The cash balance as on 1<sup>st</sup> January 20X1 is 28,000. The minimum cash balance required by the firm is 30,000. Prepare a statement showing the surplus/ deficit in relation to the minimum cash balance required.

*Solution*

1. The forecast of cash receipts, cash payments, and cash position is prepared in the statements given below

	Forecast of Cash Receipts						(amounts in 000's)	
	November	December	January	February	March	April	May	June
1. Sales	120	120	150	150	150	200	200	200
2. Credit sales	84	84	105	105	105	140	140	140
3. Cash sales	36	36	45	45	45	60	60	60
4. Collection of receivables								
(a) Previous month		33.6	33.6	42.0	42.0	42.0	56.0	56.0
(b) Two months earlier			50.4	50.4	63.0	63.0	63.0	84.0
5. Sale of machine						70.0		
6. Interest on securities							3.0	
7. Total receipts			129.0	137.4	150.0	235.0	179.0	203.0

	Forecast of Cash Payments						(amounts in 000's)	
	December	January	February	March	April	May	June	
1. Purchases	60	60	60	60	80	80	80	
2. Payment of accounts payable		60	60	60	60	80	80	
3. Cash purchases		3	3	3	3	3	3	
4. Wage payments		25	25	25	25	25	25	
5. Manufacturing expenses		32	32	32	32	32	32	
6. General, administrative and selling expenses		15	15	15	15	15	15	
7. Dividends							30	
8. Taxes							35	
9. Acquisition of machinery				80				
Total payments (2 to 9)		135	135	215	135	155	220	

	Summary of Cash Payments						(amounts in 000's)	
	January	February	March	April	May	June		
1. Opening balance	28							
2. Receipts	129.0	137.4	150.0	235.0	179.0	203.0		
3. Payments	135.0	135.0	215.0	135.0	155.0	220.0		
4. Net cash flow (2–3)	(6.0)	2.4	(65.0)	100.0	24.0	(17.0)		
5. Cumulative net cash flow	(6.0)	(3.6)	(68.6)	31.4	55.4	38.4		
6. Opening balance + cumulative net cash flow	22.0	24.4	(40.6)	59.4	83.4	66.4		
7. Minimum cash balance required	30.0	30.0	30.0	30.0	30.0	30.0		
8. Surplus/(Deficit)	(8.0)	(5.6)	70.6	29.4	53.0	36.4		

24.2 Zion Limited expects its cash flows to behave in a random manner, as assumed by the Miller and Orr model. Zion wants you to establish the 'return point' and

the ‘upper control limit’. It provides the following information.

- Annual yield on marketable securities is 10 percent.
- The fixed cost of effecting a marketable securities transaction is ₹ 2500.
- The standard deviation of the change in daily cash balance is ₹ 10,000.
- The management wants to maintain a minimum cash balance of ₹ 200,000.

*Solution* The ‘return point’ is:

$$RP = \sqrt[3]{\frac{3b\sigma^2}{4I}} + LL$$

where  $b$  is the fixed cost of conversion,  $\sigma^2$  is the variance of daily changes in the expected cash balance,  $I$  is the daily interest rate earned on marketable securities, and  $LL$  is the lower control limit.

$$RP = \sqrt[3]{\frac{3 \times 2500 \times (10000)^2}{4 \times .0002778}} + 200,000$$

$$= 87,718 + 200,000 = ₹ 287,718$$

$$UL = 3RP - 2 LL$$

$$= ₹ 463,154$$

## PROBLEMS

**24.1 Cash Budget** Mr. Patwari has recently set up a small restaurant. His business is good but because of heavy personal withdrawals he is facing a liquidity problem. To get a better handle over his cash flows, he requests you to prepare a cash budget for the next quarter, January through March, for him. He has provided you with the following information:

- a. Sales are expected to be: ₹ 50,000 in January, ₹ 55,000 in February, and ₹ 60,000 in March. All sales will be in cash.
- b. His estimated purchases are: ₹ 20,000 in January, ₹ 22,000 in February, and ₹ 25,000 in March. Payments for purchases will be made after a lag of one month. Outstanding on account of purchases in December last are ₹ 22,000.
- c. The rent per month is ₹ 5,000 and his personal withdrawal per month is ₹ 5,000.
- d. Salaries and other expenses, payable in cash, are expected to be: ₹ 15,000 in January, ₹ 18,000 in February, and ₹ 20,000 in March.
- e. He plans to buy furniture worth ₹ 25,000 on cash payment in February.
- f. The cash balance at present is ₹ 5,000. His target cash balance, however, is ₹ 8,000. What will be surplus/ deficit of cash in relation to his target cash balance?

**24.2 Steady State Balance** Datta Company issues cheques of ₹ 4,000 daily and it takes 8 days for them to be cleared. Datta Company receives cheques of ₹

20,000 daily and it takes 5 days for them to be realised. Assume that there is a balance of ₹ 30,000 to begin with; show the balance in the books of the firm and the books of the bank. What is the balance in the steady state?

**24.3 Baumol Model** Sanman Limited requires ₹ 2.5 million in cash for meeting its transaction needs over the next six months, its planning horizon for liquidity decisions. Sanman currently has the amount in the form of marketable securities. The cash payments will be made evenly over the six month planning period. Sanman earns 10 percent annual yield on its marketable securities. The conversion of marketable securities into cash entails a fixed cost of ₹ 1,200 per transaction. What is the optimal conversion size as per the Baumol model?

**24.4 Miller and Orr Model** Avinash Company expects its cash flows to behave in a random manner, as assumed by the Miller and Orr model. Avinash wants you to establish the ‘upper control limit’ and the ‘return point’. It provides the following information as requested by you.

- The annual yield on marketable securities is 12 percent.
- The fixed cost of effecting a marketable securities transaction is ₹ 1,500.
- The standard deviation of the change in daily cash balance is ₹ 6,000.
- The management of Avinash would like to maintain a minimum cash balance of ₹ 100,000.

**24.5 Boumol Model** Shriram Corporation requires ₹ 35 million in cash for meeting its transaction needs over the next six months, its planning horizon for liquidity decisions. Shriram currently has the amount in the form of marketable securities. The cash payments will be made evenly over the six month planning period. Shriram earns 10 percent annual yield on its marketable securities. The conversion of marketable securities into cash entails a fixed cost of ₹ 2800 per transaction. What is the optimal conversion size as per the Baumol model?

**24.6 Miller and Orr Model** Seattle Limited expects its cash flows to behave in a random manner, as assumed by the Miller and Orr model. The following information has been gathered:

- Annual yield on marketable securities = 12 percent
- The fixed cost of effecting a marketable securities transaction = ₹ 3,200
- The standard deviation of the change in daily cash balance = ₹ 22,000
- The management wants to maintain a minimum cash balance of ₹ 800,000

What is the ‘upper control limit’? Assume a year to be of 360 days.

## MINICASE

1. Mr. Ramesh, the chief executive of Caltron Limited, has requested you to prepare a cash budget for the company for the period January 1, 20X1 through June 30, 20X1. The sales for November 20X0 was ₹ 30 million and December 20X0 was ₹ 40 million. The projected sales for January through August of 20X1 (₹ in million) are as follows.

January: 40, February: 45, March: 50, April: 50, May: 55, June: 50, July: 45, August: 40

Caltron's credit policy (2/10, net 30) allows a 2 percent discount on payments made by the 10<sup>th</sup> day of sale-otherwise the full amount is due on the 30<sup>th</sup> day. It is expected that 40 percent of the customers will take the discount, 50 percent of the customers will pay the next month, 8 percent of the customers will pay in the second month after sales, and 2 percent of the customers will turn out to be bad debts. Assume that the collection pattern for the sales on which cash discount is taken is as follows: 70 percent during the month of sales and 30 percent during the following month.

The production process commences two months before the anticipated sales. The variable cost of production is 50 percent of the sales (40 percent represents material cost and 10 percent others). Materials are bought two months before expected sales. 50 percent of the purchase cost is paid for in one month of purchase and 50 percent in the following month. Other variable production costs are paid in the month of incurrence. Assume that the production costs are incurred immediately when the production process commences two months before the anticipated sales.

Fixed costs are paid for in the month during which they are incurred. The expected fixed costs during the period January through June 20X1 are as follows:

Factory overheads	: ₹ 1 million per month
Selling and administration expenses	: ₹ 2 million per month
Depreciation	: ₹ 2 million per month
Interest	: ₹ 9 million each in March and June

Caltron is planning to buy a new machine costing ₹ 30 million in April and pay ₹ 15 million as dividends in June.

As per the current projections, the firm will have a cash balance of ₹ 12 million as on 1.1.20X1 which also represents the minimum balance the company would like to maintain subsequently.

**Required:** Prepare the cash budget for the period 1.1.20X1 through 30.6.20X1.

- 1 Of course, I would not like to press the point further for an already hard pressed firm!
- 2 Other alternatives like (i) delaying payment to suppliers of material and (ii) expediting the collection of receivables are also available.
- 3 Eq. (24.2) may be derived as follows.

Step 1: Find the first derivative of the S with respect to C:

$$\frac{dS}{dC} = \frac{I}{2} - \frac{bT}{C^2} \quad (1)$$

Step 2: Set the first derivative equal to 0:

$$\frac{I}{2} - \frac{bT}{C^2} = 0$$

Step 3: Solve this for C:

$$C = \sqrt{\frac{2bT}{I}}$$

- 4 It may be noted that the solution obtained here (₹ 193,600) by applying the general equation is slightly different from the solution obtained earlier (₹ 200,000) using numerical analysis. The discrepancy has arisen because the general equation assumes that conversion can take place in any amounts whereas the numerical analysis of Zeta Limited assumed that marketable securities can be sold only in one of the five discrete amounts (namely ₹ 100,000, ₹ 200,000, ₹ 300,000, ₹ 400,000, and ₹ 500,000).

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter24/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter24/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Credit Management

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe the terms of payment used widely in practice.
- ✓ Discuss the important dimensions of a firm's credit policy.
- ✓ Explain the approaches used for credit analysis.
- ✓ Discuss the methods used for control of receivables.

While business firms would like to sell on cash, the pressure of competition and the force of custom persuades them to sell on credit. Firms grant credit to facilitate sales. It is valuable to customers as it augments their resources – it is particularly appealing to those customers who cannot borrow from other sources or find it very expensive or inconvenient.

The credit period extended by business firms usually ranges from 15 days to 60 days. When goods are sold on credit, finished goods get converted into accounts receivable (trade receivables) in the books of the seller. In the books of the buyer, the obligation arising from credit purchase is represented as accounts payable (trade payables).

A firm's investment in accounts receivable depends on how much it sells on credit and how long it takes to collect receivables. For example, if a firm sells ₹ 1 million worth of goods on credit a day and its average collection period is 40 days, its accounts receivable will be ₹ 40 million. Accounts receivable (or trade receivables as they are referred to in India) constitute the third most important asset category for business firms, after plant and equipment and inventories. Hence it behooves a firm to manage its credit well.

## 25.1 ■ TERMS OF PAYMENT

Terms of payment vary widely in practice. At one end, if the seller has financial sinews it may extend liberal credit to the buyer till it converts goods bought into cash. At the other end, the buyer may pay cash in advance to the seller and finance the entire trade cycle. Most commonly, however, some in-between arrangement is chosen wherein the trade cycle is financed partly by the seller, partly by the buyer, and partly by some financial intermediary. The major terms of payment are discussed below.

**Cash Terms** When goods are sold on cash terms, the payment is received either before the goods are shipped (cash in advance) or when the goods are delivered (cash on delivery).

Cash in advance is generally insisted upon when goods are made to order. In such a case, the seller would like to finance production and eliminate marketing risks. Cash on delivery is often demanded by the seller if it is in a strong bargaining position and/or the customer is perceived to be risky.

**Open Account** Credit sales are generally on open account. This means that the seller first ships the goods and then sends the invoice (bill). The credit terms (credit period, cash discount for prompt payment, the period of discount and so on) are stated in the invoice which is acknowledged by the buyer. There is no formal acknowledgement of indebtedness by the buyer.

**Credit Period** The credit period refers to the length of time the customer is allowed to pay for its purchases. It is usually mentioned in days from the date of invoice. If a firm allows 30 days, say, of credit with no discount for early payment, its credit terms are stated as 'net 30'.

**Cash Discount** Firms generally offer cash discount to induce customers to make prompt payment. For example, credit terms of 2/10, net 30 mean that a discount of 2 percent is offered if the payment is made by the tenth day; otherwise, the full payment is due by the thirtieth day.

**Billing** To streamline billings, it is a common practice to send a single bill every month. For example at the end of every month, the customer may be sent a consolidated bill for the purchases made from the 26th of the previous month to the 25th of the current month.

**Consignment** When goods are sent on consignment, they are merely shipped but not sold to the consignee. The consignee acts as the agent of the seller (consignor). The title of the goods is retained by the seller till they are sold by the consignee to a third party. Periodically, sales proceeds are remitted by the consignee to the seller.

**Bill of Exchange** Whether goods are shipped on open account or consignment, the seller does not have strong evidence of the buyer's obligation. A draft represents an unconditional order issued by the seller asking the buyer to pay on demand (demand draft) or at a certain future date (time draft), the amount specified on it. It is typically accompanied by shipping documents that are delivered to the drawee when he pays or accepts the draft. When the drawee accepts a time draft it becomes a trade acceptance. The seller may hold the acceptance till it matures or get it discounted.

The draft performs three useful functions: (i) It serves as a written evidence of a definite obligation. (ii) It helps in reducing the cost of financing to some extent. (iii) It represents a negotiable instrument.

**Letter of Credit** Commonly used in international trade, the letter of credit is now used in domestic trade as well. A letter of credit, or L/C, is issued by a bank on behalf of its customer (buyer) to the seller. As per this document, the bank agrees to honour drafts drawn on it for the supplies made to the customer, if the seller fulfills the conditions laid down in the L/C.

The L/C serves several useful functions: (i) It virtually eliminates credit risk, if the bank has a good standing. (ii) It reduces uncertainty as the seller knows the conditions that should be fulfilled to receive payment. (iii) It offers safety to the buyer who wants to ensure that payment is made only in conformity with the conditions of the L/C.

## 25.2 ■ CREDIT POLICY VARIABLES

The important dimensions of a firm's credit policy are:

- Credit standards
- Credit period
- Cash discount
- Collection effort

These variables are related and have a bearing on the level of sales, bad debt loss, discounts taken by customers, and collection expenses. For purposes of expository convenience we examine each of these variables independently.

## Credit Standards

A pivotal question in the credit policy of a firm is: What standard should be applied in accepting or rejecting an account for credit granting? A firm has a wide range of choice in this respect. At one end of the spectrum, it may decide not to extend credit to any customer, however strong his credit rating may be. At the other end, it may decide to grant credit to all customers irrespective of their credit rating. Between these two extreme positions lie several possibilities, often the more practical ones.

In general, liberal credit standards tend to push sales up by attracting more customers. This is, however, accompanied by a higher incidence of bad debt loss, a larger investment in receivables, and a higher cost of collection. Stiff credit standards have opposite effects. They tend to depress sales, reduce the incidence of bad debt loss, decrease the investment in receivables, and lower the collection cost.

To judge whether credit standards should be relaxed (or tightened) we must measure the impact of credit standard on residual income. Residual income is the surplus left after providing for a charge for additional capital required when credit standards are relaxed.

The effect of relaxing the credit standards on residual income may be estimated as follows:

$$\Delta RI = [\Delta S (1 - V) - \Delta S b_n] (1 - t) - k \Delta I \quad (25.1)$$

where  $\Delta RI$  is the change in residual income,  $\Delta S$  is the increase in sales,  $V$  is the ratio of variable costs to sales,  $b_n$  is the bad debt loss ratio on new sales,  $t$  is the corporate tax rate,  $k$  is the post-tax cost of capital, and  $\Delta I$  is the increase in receivables investment<sup>1</sup>.

On the right hand side of the Eq. (25.1),  $\Delta S (1 - V)$  measures the increase in gross profit (defined here as sales minus variable costs) on account of incremental sales,  $\Delta S b_n$  reflects the bad debt loss on incremental sales,  $[\Delta S (1 - V) - \Delta S b_n] (1 - t)$  represents the post-tax profit arising from increase in sales after considering bad debt losses, and  $k \Delta I$  measures the post-tax opportunity cost of additional funds locked in receivables.

*Example* The current sales of Pioneer Company are ₹ 100 million. The company classifies its customers into 4 credit categories, 1 through 4. Credit rating diminishes as one goes from category 1 to category 4. (Customers in category 1 have the highest credit rating and customers in

category 4 have the lowest credit rating). Pioneer presently extends unlimited credit to customers in categories 1 and 2, limited credit to customers in category 3, and no credit to customers in category 4. As a result of this credit policy, the company is foregoing sales to the extent of ₹ 10 million to customers in category 4. The firm is considering the adoption of a more liberal credit policy under which customers in category 3 would be extended unlimited credit and customers in category 4 would be extended limited credit. Such relaxation would increase the sales by ₹ 15 million on which bad debt losses would be 10 percent. The contribution margin ratio,  $(1 - V)$ , for the firm is 20 percent, the average collection period, ACP, is 40 days, and the post-tax cost of funds,  $k$ , is 10 percent. The tax rate for Pioneer is 40 percent.

Given the above information, the effect of relaxing the credit policy on residual income would be:

$$\begin{aligned} & [15,000,000 (1-0.80) - 15,000,000 \times 0.1] (1-0.4) - 0.10 \times \frac{15,000,000}{360} \times 40 \times 0.80 \\ & = ₹ 766,667 \end{aligned}$$

Since the impact of change in credit standards on residual income is positive, the proposed change is desirable.

## Credit Period

The credit period refers to the length of time customers are allowed to pay for their purchases. It generally varies from 15 days to 60 days. When a firm does not extend any credit, the credit period would obviously be zero. If a firm allows 30 days, say, of credit, with no discount to induce early payments, its credit terms are stated as 'net 30'.

Lengthening of the credit period pushes sales up by inducing existing customers to purchase more and attracting additional customers. This is, however, accompanied by a larger investment in debtors and a higher incidence of bad debt loss. Shortening of the credit period would have opposite influences. It tends to lower sales, decrease investment in debtors, and reduce the incidence of bad debt loss.

Since the effects of lengthening the credit period are similar to that of relaxing the credit standards, we may estimate the effect on residual income of change in credit period by using the same formula:

$$\Delta RI = [\Delta S (1 - V) - \Delta S b_n] (1-t) - k \Delta I$$

Excepting  $\Delta I$ , the components of this formula are calculated as discussed earlier.  $\Delta I$ , here, is calculated as follows:

$$\Delta I = (ACP_n - ACP_o) \left[ \frac{S_o}{360} \right] + V (ACP_n) \frac{\Delta S}{360} \quad (25.2)$$

where  $\Delta I$  is the increase in receivables investment,  $ACP_n$  is the new average collection period (after lengthening the credit period),  $ACP_o$  is the old average collection period,  $V$  is the ratio of variable cost to sales, and  $\Delta S$  is the increase in sales.

On the right hand side of Eq. (25.2), the first term represents the incremental investment in receivables associated with existing sales and the second term represents the investment in receivables arising from incremental sales. It may be noted that the incremental investment in receivables arising from existing sales is based on the value of sales, whereas the investment in receivables arising from new sales is based on the variable costs associated with new sales. The difference exists because the firm would have collected the full sales price on the old receivables earlier in the absence of credit policy change, whereas it invests only the variable costs associated with new receivables.

**Example** Zenith Corporation currently provides 30 days of credit to its customers. Its present level of sales is ₹ 50 million. The firm's cost of capital

is 10 percent and the ratio of variable costs to sales is 0.85. Zenith is considering extending its credit period to 60 days. Such an extension is likely to push sales up by ₹ 5 million. The bad debt proportion on additional sales would be 8 percent. The tax rate for Zenith is 40 percent.

Given the above information, the effect of lengthening the credit period on the residual income of Zenith would be:

$$[5,000,000 \times 0.15 - 5,000,000 \times 0.08] (0.6)$$

$$- 0.10 \left[ (60 - 30) \times \frac{50,000,000}{360} + 0.85 \times 60 \times \frac{5,000,000}{360} \right]$$

$$= [750,000 - 400,000] (0.6) - 0.10 [4,166,667 + 708,333]$$

$$= -₹ 277,500.$$

Since the impact of change in credit period on residual income is negative, the proposed change is not desirable.

## Cash Discount

Firms generally offer cash discounts to induce customers to make prompt payments. The percentage discount and the period during which it is available are reflected in the credit terms. For example, credit terms of 2/10, net 30 mean that a discount of 2 percent is offered if the payment is made by the tenth day; otherwise the full payment is due by the thirtieth day.

Liberalising the cash discount policy may mean that the discount percentage is increased and/or the discount period is lengthened. Such an action tends to enhance sales (because the discount is regarded as price reduction), reduce the average collection period (as customers pay promptly), and increase the cost of discount. The effect of such an action on net profit may be estimated by the following formula:

$$\Delta RI = [\Delta S (1 - V) - \Delta DIS] (1 - t) + k \Delta I \quad (25.3)$$

where  $\Delta RI$  is the change in residual income,  $\Delta S$  is the increase in sales,  $V$  is the variable cost to sales ratio,  $\Delta DIS^2$  is the increase in discount cost,  $t$  is the tax rate,  $k$  is the cost of capital, and  $\Delta I^3$  is the savings in receivable investment.

*Example* The present credit terms of Progressive Company are 1/10, net 30. Its sales are ₹ 80 million, its average collection period, ACP, is 20 days, its variable costs to sales ratio,  $V$ , is 0.85, and its cost of capital,  $k$ , is 10 percent. The proportion of sales on which customers currently take discount,  $p_o$ , is 0.5. Progressive is considering relaxing its discount terms to 2/10, net 30. Such a relaxation is expected to increase sales by ₹ 5 million, reduce the ACP to 14 days, and increase the proportion of discount sales to 0.8. Progressive's tax rate is 40 percent.

Given the above information, the effect of relaxing the discount policy on net profit would be:

$$[5,000,000 (0.15) - 960,000] (1 - 0.4) + 0.10 \times 1,168,055 = -₹ 9,194$$

Since the impact of change in discount policy on gross profit is negative, it is not desirable to change the discount terms from 1/10, net 30 to 2/10, net 30.

## Collection Effort

The collection programme of the firm, aimed at timely collection of receivables, may consist of the following:

- Monitoring the state of receivables
- Dispatch of letters to customers whose due date is approaching
- E-mail and telephonic advice to customers around the due date
- Threat of legal action to overdue accounts
- Legal action against overdue accounts

A rigorous collection programme tends to decrease sales, shorten the average collection period, reduce bad debt percentage, and increase the collection expense. A lax collection programme, on the other hand, would push sales up, lengthen the average collection period, increase the bad debt percentage, and perhaps reduce the collection expense.

The effect of decreasing the rigour of collection programme on residual income may be estimated as follows:

$$\Delta RI = [\Delta S (1 - V) - \Delta BD] (1 - t) - k \Delta I \quad (25.4)$$

where  $\Delta RI$  is the change in residual income,  $\Delta S$  is the increase in sales,  $V$  is the variable costs to sales ratio,  $\Delta BD$  is the increase in bad debt cost<sup>4</sup>,  $t$  is the tax rate,  $k$  is the cost of capital, and  $\Delta I$  is the increase in investment in receivables<sup>5</sup>.

*Example* ABC Company is considering relaxing its collection effort. Its sales are ₹ 40 million, its average collection period, ACP, is 20 days, its variable costs to sales ratio,  $V$ , is 0.80, its cost of capital,  $k$ , is 12 percent, and its bad debt ratio is 0.05. The relaxation in collection effort is expected to push sales up by ₹ 5 million, increase the average collection period to 40 days, and raise the bad debt ratio to 0.06. ABC's tax rate is 40 percent.

Given the above information, the effect of relaxing the collection effort on net profit would be:

$$\begin{aligned} & [5,000,000 (0.2) - 700,000](0.6) - 0.12 \left[ \frac{40,000,000}{360} (40 - 20) + \frac{5,000,000}{360} \times 40 \times 0.80 \right] \\ & = -₹ 140,000 \end{aligned}$$

Since the effect on profit is negative, it is not worthwhile to relax the collection effort.

## 25.3 ■ CREDIT EVALUATION

Proper assessment of credit risks is important as it helps in establishing credit limits. In assessing credit risks, two types of errors occur:

*Type I error* A good customer is misclassified as a poor credit risk.

*Type II error* A bad customer is misclassified as a good credit risk.

Both the errors are costly. Type I error leads to loss of profit on sales to good customers who are denied credit. Type II error results in bad-debt losses on credit sales made to risky customers.

While misclassification errors cannot be eliminated wholly, a firm can mitigate their occurrence by doing proper credit evaluation. Three broad approaches are used for credit evaluation, viz., traditional credit analysis, numerical credit scoring, and discriminant analysis.

## Traditional Credit Analysis

The traditional approach to credit analysis calls for assessing a prospective customer in terms of the “five C’s of credit”

<i>Character</i>	The willingness of the customer to honour his obligations. It reflects integrity, a moral attribute that is considered very important by credit managers.
<i>Capacity</i>	The ability of the customer to meet credit obligations from the operating cash flows.
<i>Capital</i>	The financial reserves of the customer. If the customer has problems in meeting credit obligations from operating cash flow, the focus shifts to its capital.
<i>Collateral</i>	The security offered by the customer in the form of pledged assets.
<i>Conditions</i>	The general economic conditions that affect the customer.

To get information on the five C’s, a firm may rely on the following:

*Financial Statements* Financial statements contain a wealth of information. A searching analysis of the customer’s financial statements can provide useful insights into the creditworthiness of the customer. The following ratios seem particularly helpful in this context: current ratio, acid-test ratio, debt-equity ratio, EBIT to total assets ratio, and return on equity.

*Bank References* The banker of the prospective customer may be another source of information. To ensure a higher degree of candour, the customer’s banker may be approached indirectly through the bank of the firm granting credit.

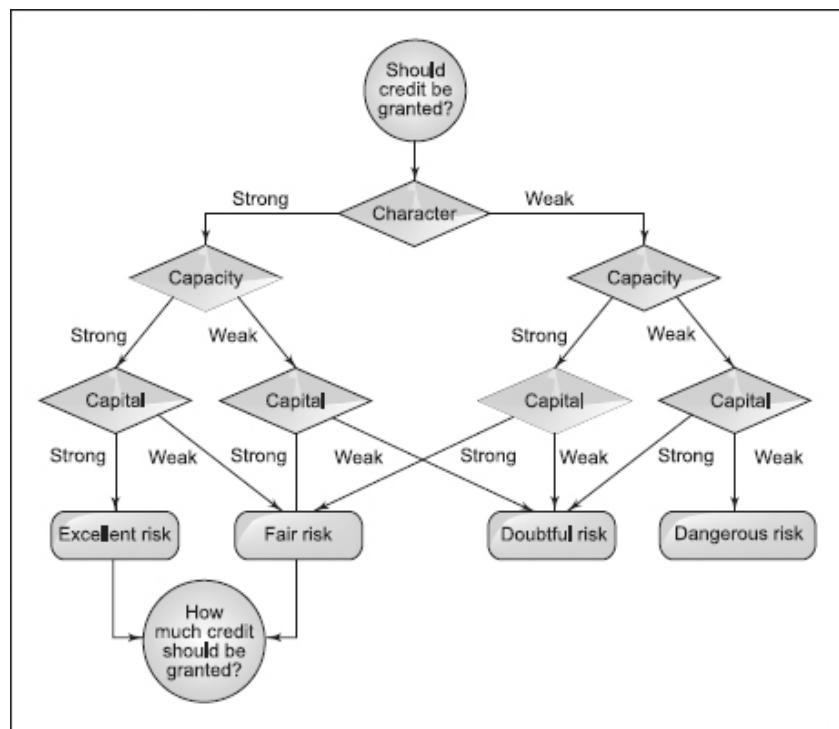
*Experience of the Firm* Consulting one’s own experience is very important. If the firm had previous dealings with the customer, then it is worth asking: How prompt has the customer been in making payments? How well has the customer honoured his word in the past? Where the customer is being approached for the first time, the impression of the company’s sales personnel is useful.

*Prices and Yields on Securities* For listed companies, valuable inferences can be derived from stock market data. Higher the price-earnings multiple and lower the yield on bonds, other things being equal, lower will be the credit risk.

[Exhibit 25.1](#) shows a logic that the credit analyst may employ to process credit-related information. For the sake of simplicity, only three C's, viz. character, capacity, and capital are considered. For judging a customer on these dimensions, the credit analyst may use quantitative measures (like financial ratios) and qualitative assessments (like 'trustworthy').

**Sequential Credit Analysis** The full logic of [Exhibit 25.1](#) may be redundant for certain customers. For example, if the character of a customer is found weak, it may be pointless to conduct the credit investigation further. Hence, sequential credit analysis is a more efficient method. In this analysis, investigation is carried further if the benefit of such analysis outweighs its cost. To illustrate, consider three stages of credit analysis: review of the past payment record, detailed internal analysis, and credit investigation by an external agency. The credit analyst proceeds from stage one to stage two only if there is no past payment history and hence a detailed internal credit analysis is warranted. Likewise, the credit analyst goes from stage two to stage three only if internal credit analysis suggests that the customer poses a medium risk and hence there is a need for external credit analysis.

### Exhibit 25.1 Traditional Credit Analysis<sup>6</sup>



# Numerical Credit Scoring

In traditional credit analysis, customers are assigned to various risk classes somewhat judgmentally on the basis of the five C's of credit. Credit analysts may, however, want to use a more systematic numerical credit scoring system. Such a system may involve the following steps:

1. Identify factors relevant for credit evaluation.
  2. Assign weights to these factors that reflect their relative importance.
  3. Rate the customer on various factors, using a suitable rating scale (usually a 5-point scale or a 7-point scale is used).
  4. For each factor, multiply the factor rating with the factor weight to get the factor score.
  5. Add all the factor scores to get the overall customer rating index.
  6. Based on the rating index, classify the customer.

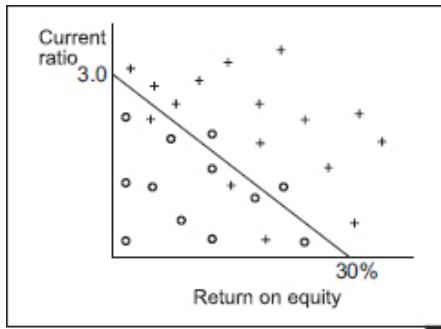
[Exhibit 25.2](#) illustrates the use of this procedure for assigning a rating index.

## **Exhibit 25.2** Construction of a Credit Rating Index (based on a 5-point rating scale)

## Discriminant Analysis

The credit index described above is somewhat *ad hoc* in nature and is based on weights which are subjective in nature. Can a better credit index be constructed? Yes, the technique of discriminant analysis may be employed to construct a better risk index. The nature of this analysis may be discussed with the help of a simple example. ABC Company manufactures gensets for industrial customers. It considers the following financial ratios as the basic determinants of creditworthiness of its customers: current ratio and return on net worth. The plot of its customers on a graph of these two variables is shown in [Exhibit 25.3](#).

### Exhibit 25.3 Discriminating Power of Current Ratio and Return on Equity



+s represent customers who have paid their dues and Os represent customers who have defaulted. The straight line seems to separate the +s from the Os – while it may not be possible to completely separate the +s and Os with the help of a straight line, the straight line does a fairly good job of segregating the two groups. The equation for this straight line is:

$$Z = 1 \text{ Current ratio} + 0.1 \text{ Return on equity}$$

Since this is the line which discriminates between the good customers (those who pay) and the bad customers (those who default), a customer with a Z score of more than 3 is deemed creditworthy and a customer with a Z score of less than 3 is considered not creditworthy<sup>7</sup>. Of course, the higher the Z score, the stronger the credit rating.

In the foregoing discussion we considered a Z function of two variables. In most of the practical applications a Z function of several variables is considered.

## Risk Classification Scheme

On the basis of information and analysis in the credit investigation process, customers may be classified into various risk categories. A simple risk classification scheme is shown in [Exhibit 25.4](#).

The risk classification scheme described in [Exhibit 25.4](#) is one of the many risk classification schemes that may be used. Each firm would have to develop a risk classification scheme appropriate to its needs and circumstances.

### **Exhibit 25.4 Risk Classification Scheme**

<i>Risk Class</i>	<i>Description</i>
1	Customers with <i>no</i> risk of default
2	Customers with <i>negligible</i> risk of default (default rate less than 2 percent)
3	Customers with <i>little</i> risk of default (default rate between 2 percent and 5 percent)
4	Customers with <i>some</i> risk of default (default rate between 5 percent and 10 percent)
5	Customers with <i>significant</i> risk of default (default rate in excess of 10 percent)

## 25.4 CREDIT GRANTING DECISION

Once the credit worthiness of a customer has been assessed the next question is: Should the credit be offered? If there is no possibility of a repeat order, the situation may be represented by a decision tree as shown in [Exhibit 25.5](#).

In [Exhibit 25.5](#),  $p$  is the probability that the customer pays his dues,  $(1 - p)$  is the probability that the customer defaults, REV is the revenue from sale, COST is the cost of goods sold. The expected profit<sup>8</sup> for the action ‘offer credit’ is:

$$p(\text{REV} - \text{COST}) - (1 - p) \text{ COST} \quad (25.5)$$

The expected profit for the action ‘refuse credit’ is 0. Obviously, if the expected profit of the course of action ‘offer credit’ is positive, it is desirable to extend credit, otherwise not.

*Example* ABC Company is considering offering credit to a customer. The probability that the customer would pay is 0.8 and the probability that the customer would default is 0.2. The revenue from the sale would be ₹ 1,200 and the cost of sale would be ₹ 800.

The expected profit for the action “offer credit” is:

$$0.8 (1,200 - 800) - 0.2(800) = ₹ 160$$

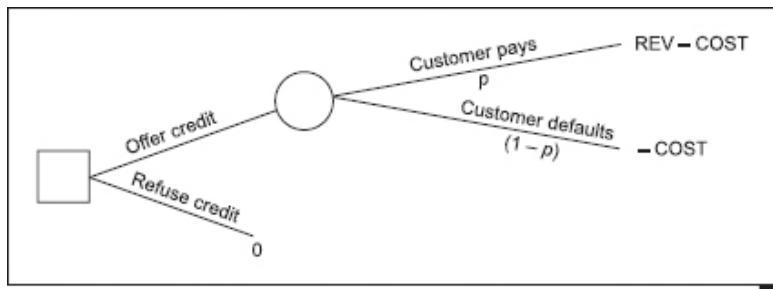
## Repeat Order

What happens when there is a possibility of a repeat order? [Exhibit 25.6](#) illustrates this situation. PQR Company is considering extending credit to a customer who is expected to place a repeat order.  $p_1$  is the probability that the customer pays on the first order and  $p_2$  is the probability that the customer pays on the repeat order. (The repeat order, of course, would be accepted only if the customer does not default on the first order). One thing about this situation needs to be emphasised. Once the customer pays for the first order, the probability that he would default on the second order is less than the probability of his defaulting on the first order. In the case shown in [Exhibit 25.6](#), for example, the probability of default decreases from 0.1 to 0.05. The revenue from the sale would be ₹ 2,000 and the cost of sale would be ₹ 1,500. The expected profit of offering credit in this case, ignoring the time value of money, is:

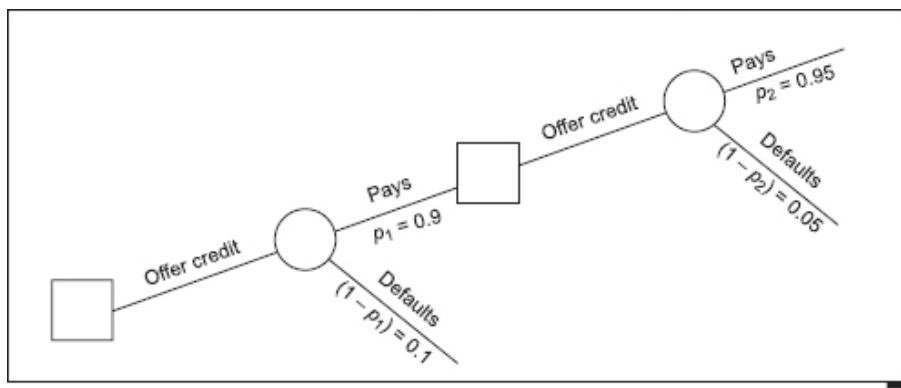
$$\{p_1(\text{REV}_1 - \text{COST}_1) - (1-p_1)\text{COST}_1\} + p_1 \times \{p_2(\text{REV}_2 - \text{COST}_2) - (1 - p_2)\text{COST}_2\} \quad (25.6)$$
$$\{0.9(2000 - 1500) - 0.1(1500)\} + 0.9 \{0.95(2000 - 1500) - 0.05(1500)\} = 660$$

Expected profit on initial order + Probability of payment and repeat order × Expected profit on repeat order

### Exhibit 25.5 A Decision Tree for Credit Granting Decision



**Exhibit 25.6 | A Decision Tree for Granting Credit (Repeat Order Case)**



## **25.5 ■ CONTROL OF ACCOUNTS RECEIVABLES**

Traditionally, two methods have been commonly suggested for monitoring accounts receivable: days sales outstanding and ageing schedule. While these methods are popularly used, they have a serious deficiency: they are based on an aggregation of sales and receivables. To overcome the weakness of the traditional methods, the collection matrix approach has been suggested. This section discusses the traditional methods and the collection matrix approach.

## Days Sales Outstanding

The days sales outstanding (DSO, hereafter) at a given time ' $t$ ' may be defined as the ratio of accounts receivable outstanding at that time to average daily sales figure during the preceding 30 days, 60 days, 90 days, or some other relevant period.

$$DSO_t = \frac{\text{Accounts receivable at time } t}{\text{Average daily sales}}$$

To illustrate the calculation of this measure, consider the monthly sales and month-end accounts receivable for a company:

<i>Sales and Receivables Data</i>					
<i>Month</i>	<i>Sales</i>	<i>Receivables</i>	<i>Month</i>	<i>Sales</i>	<i>Receivables</i>
January	150	400	July	190	340
February	156	360	August	200	350
March	158	320	September	210	360
April	150	310	October	220	380
May	170	300	November	230	400
June	180	320	December	240	420

If the DSO is calculated at the end of each quarter, we get the following picture:

<i>Quarter</i>	<i>Days Sales Outstanding</i>
First	$\frac{320}{(150 + 156 + 158) / 90} = 62 \text{ days}$
Second	$\frac{320}{(150 + 170 + 180) / 91} = 58 \text{ days}$
Third	$\frac{360}{(190 + 200 + 210) / 92} = 55 \text{ days}$
Fourth	$\frac{420}{(220 + 230 + 240) / 92} = 56 \text{ days}$

Looking at the DSO we see that it decreased slightly over last year, suggesting that the collections improved a little.

According to this method, accounts receivable are deemed to be in control if the DSO is equal to or less than a certain norm. If the value of DSO exceeds the specified norm, collections are considered to be slow.

## **Ageing Schedule**

The ageing schedule (AS) classifies outstanding accounts receivables at a given point of time into different age brackets. An illustrative AS is given below.

<i>Age Group (in days)</i>	<i>Percent of Receivables</i>
0 – 30	35
31 – 60	40
61 – 90	20
> 90	5

The actual AS of the firm is compared with some standard AS to determine whether accounts receivable are in control. A problem is indicated if the actual AS shows a greater proportion of receivables, compared with the standard AS, in the higher age groups.

## Collection Matrix

The average collection period and the ageing schedule have traditionally been very popular measures for monitoring receivables. However, they suffer from a limitation in that they are influenced by the sales pattern as well as the payment behaviour of the customers. If sales are increasing, the average collection period and the ageing schedule will differ from what they would be if sales are constant. This holds even when the payment behaviour of customers remains unchanged. The reason is simple: a greater portion of sales is billed currently. Similarly, decreasing sales lead to the same results. The reason here is that a smaller portion of sales is billed currently.

In order to study correctly the changes in payment behaviour of customers, it is helpful to look at the pattern of collections associated with credit sales. [Exhibit 25.7](#) shows an illustrative collection matrix. For example, the credit sales during the month of January are collected as follows: 13 percent in January (the month of sales), 42 percent in February (the first following month), 33 percent in March (the second following month), and 12 percent in April (the third following month).

From the collection pattern, one can judge whether the collection is improving, stable, or deteriorating. A secondary benefit of such an analysis is that it provides a historical record of collection percentages that can be useful in projecting the pattern of collections from future sales.

**Exhibit 25.7** Collection Matrix

Percentage of Receivables Collected During the	January Sales	February Sales	March Sales	April Sales	May Sales	June Sales
Month of sales	13	14	15	12	10	9
First following month	42	35	40	40	36	35
Second following month	33	40	21	24	26	26
Third following month	12	11	24	19	24	25
Fourth following month	—	—	—	5	4	5

## **25.6 ■ CREDIT MANAGEMENT IN INDIA**

So far we discussed the framework for the management of trade credit. Now we turn to the question: How is trade credit managed in India? This section makes some observations regarding management of trade credit in India<sup>9</sup>. These observations are divided into three broad areas: (i) credit policy, (ii) credit analysis, and (iii) control of accounts receivable. Following these observations are some comments on the ways and means of improving receivables management in India.

## **Credit Policy**

1. Very few companies have attempted a systematic articulation and formalisation of their credit policy. Generally, credit policies have emerged as unstated conventions.
2. The underlying credit philosophy is sometimes stated in terms too general to be of much relevance in guiding credit decisions. Wit the following statement made by a company.  
“Our credit policy seeks to maximise sales growth consistent with an acceptable degree risk.”
3. The credit period offered by firms varies from 0 to 90 days. Firms manufacturing consumer products (with some notable exceptions such as textiles and garment units) seem to offer no credit or very limited credit, whereas firms manufacturing capital goods offer longer credit.
4. The practice of offering cash discount for payment is not very common.

## Credit Analysis

1. Prospective customers are generally required to furnish two or three trade references. However, the follow up of these trade references is not very common.
2. The financial statements of the prospective customers are, in general, not analysed in detail. Creditors often do not bother to look into mortgages.
3. Independent credit rating agencies are conspicuous by their absence. This represents a striking contrast to the U.S., where there are several nationally known independent credit rating agencies. Creditors obtain fairly reliable information about the credit standing of prospective customers from these agencies.
4. Some of the questions creditors often ask about prospective customers before extending credit are:  
What is the cash credit limit of the customer? How long has the customer been in the business?
5. Sometimes customers are requested to advise their bankers to provide credit information. However, the assessments provided by the banks are often couched in very general terms and are not very useful.
6. The larger business firms usually classify their customers into several credit categories. One large pharmaceutical concern, for example, uses the following classification
  - A – Completely reliable customers
  - B – Highly reliable customers
  - C – Slightly risky customers
  - D – Doubtful customers

## **Control of Receivables**

1. Monitoring and controlling of accounts receivable is often neither very thorough nor systematic. Very few firms have well-defined systems for monitoring and controlling accounts receivables.
2. The measures commonly employed for judging whether accounts receivables are “in control” are:

Bad debt losses

Average collection period

Ageing schedule

## Room for Improvement

1. Management of receivables must be accorded the importance it deserves. This responsibility should be shouldered by a senior executive.
2. Credit policies need to be articulated in explicit terms and revised periodically in the light of internal and external changes.
3. There should be better co-ordination between sales, production, and finance departments.
4. Firms granting credit should examine the published statements of prospective customers with great rigour.
5. References provided by the prospective customers should be consulted and necessary follow-up action should be taken.
6. A well defined collection programme must be developed.

### Some Guidelines for Managing Receivables

Here are some guidelines for managing receivables:

1. *Invoice properly* Send the invoice the same day the order is shipped and state clearly the terms of payment.
2. *Ensure the cooperation of administrative and marketing personnel* There has to be a consistency between the communications and actions of finance, administration, and marketing departments.
3. *Communicate professionally with delinquent accounts* In communicating with delinquent accounts maintain the right balance between cordiality and firmness. Use motivational tactics such as "As we had agreed upon," and "In order to prevent future problems."

## SUMMARY

- As business firms generally sell on credit, **accounts receivable** represents an important asset category.
- The important dimensions of a firm's **credit policy** are: credit standards, credit period, cash discount, and collection policy.
- **Liberal credit standards** push sales up. This is, however, accompanied by a higher incidence of bad debt loss, larger investment in receivables, and a higher cost of collection. **Stiff credit standards** have opposite effects.
- The effect of longer **credit period** (shorter credit period) are similar to those of liberal credit standards (stiff credit standards).

- Liberalising the **cash discount policy** tends to enhance sales, reduce the average collection period, and increase the cost of discount. Tightening the cash discount policy has the opposite effects.
- A rigorous **collection programme** tends to decrease sales, shorten the average collection period, reduce bad debt percentage, and increase the collection expense. A tax collection programme has the opposite effects.
- In assessing credit risk two types of errors occur: (i) **Type I error** wherein a good customer is misclassified as a poor credit risk. (ii) **Type II error** wherein a bad customer is misclassified as a good credit risk.
- The traditional approach to credit analysis calls for assessing a prospective customer in terms of the '**five C's of credit**', viz. character, capacity, capital, collateral, and conditions and classifying them judgmentally into various risk classes.
- Credit analysis may be done using a **numerical credit scoring system** or **discriminant analysis**.
- Once the creditworthiness of a customer is assessed, the next question is: Should the credit be offered? If the expected profit of the course of action 'offer credit' is positive, it is desirable to extend the credit, otherwise not.
- **Days sales outstanding (DSO)** and **ageing schedule (AS)** are commonly used for monitoring accounts receivable. DSO is simply the ratio of accounts receivable to average daily sales; AS classifies outstanding accounts receivable into different age brackets.
- The major weakness of the DSO and AS methods is that they aggregate sales and accounts receivable over a period of time. Such an aggregation makes it difficult to detect changes in the pattern of payment.
- The **collection matrix** overcomes this deficiency and focuses on payment behaviour, the key issue in monitoring accounts receivable.

## QUESTIONS

1. Describe the major terms of payment in practice.
2. What are the important dimensions of a firm's credit policy?
3. Discuss the consequences of lengthening versus shortening of the credit period.
4. Discuss the effects of liberal versus stiff credit standards.
5. What are the effects of liberalising the cash discount policy?
6. Describe the five C's of credit.
7. Explain the numerical credit scoring system.
8. How is discriminant analysis used in credit rating?
9. Develop a simple system of risk classification and explain its rationale.
10. Once the creditworthiness of a customer has been assessed, how would you go about analysing the credit granting decision?

11. What are the shortcomings of the DSO and AS methods?
12. Describe the collection matrix approach to receivables analysis and control. How does it overcome the deficiencies of the DSO and AS methods?

## SOLVED PROBLEMS

25.1 Apex Limited classifies its customers into five risk categories, 1 through 5. Presently Apex extends unlimited credit to customers in categories 1 through 3, limited credit to customers in category 4, and no credit to customers in category 5. Due to this policy, the company is foregoing sales of ₹ 3 million to customers in category 4 and ₹ 6 million to customers in category 5. Apex is considering the adoption of a more liberal credit policy under which customers in category 4 would be extended unlimited credit and customers in category 5 would be extended limited credit. Such relaxation would increase sales by ₹ 9,000,000 on which bad debt losses would be 10 percent. The contribution margin ratio ( $1 - V$ ) for Apex is 20 percent. The average collection period, ACP, is 50 days and the post tax cost of funds,  $k$ , is 12 percent. The tax rate for Apex is 40 percent.

What will be the effect of relaxing the credit policy on residual income?

*Solution* The effect of relaxing the credit policy on residual income would be:

$$\begin{aligned}\Delta RI &= [\Delta S (1 - V) - \Delta S b_n] (1 - t) - k \Delta I \\ \Delta I &= \frac{\Delta S}{360} \times ACP \times V = \frac{9,000,000}{360} \times 50 \times 0.8 = 10,000,000 \\ \Delta RI &= [9,000,000 \times 0.20 - 9,000,000 \times 0.10] (1 - 0.4) - 0.12 \times 10,000,000 \\ &= ₹ 420,000\end{aligned}$$

25.2 Manish Corporation currently provides 45 days of credit to its customers. Its present sales are ₹ 80 million. The firm's cost of capital is 13 percent and the ratio of variable costs to sales is 0.75. Manish is considering extending its credit period to 60 days. Such an extension is likely to push sales up by ₹ 20 million. The bad debt proportion on additional sales would be 10 percent. The tax rate for Manish is 35 percent.

What will be the effect of lengthening the credit period on the residual income of Manish?

*Solution* The effect of lengthening the credit period on the residual income of Manish would be:

$$\begin{aligned}\Delta RI &= [\Delta S (1 - V) - \Delta S b_n] (1 - t) - k \Delta I \\ \Delta I &= (ACP_N - ACP_O) \left[ \frac{S_o}{360} \right] + V(ACP_N) \Delta S \\ &= (60 - 45) \times \frac{80,000,000}{360} + 0.75 \times 60 \times \frac{20,000,000}{360} = 5,833,333\end{aligned}$$

So,  $\Delta RI$  will be

$$[20,000,000 \times 0.25 - 20,000,000 \times 0.10] (0.65) - 0.13 \times 5,833,333 \\ = 1,950,000 - 758,333 = ₹ 1,191,667$$

- 25.3 The present credit terms of Multimedia Company are 2/15, net 45. Its sales are ₹ 200 million, its average collection period, ACP, is 30 days, its variable costs to sales ratio,  $V$ , is 0.80, and its cost of capital,  $k$ , is 12 percent. The proportion of sales on which customers currently take discount,  $p_o$ , is 0.5. Multimedia is considering relaxing its discount terms to 3/15, net 45. Such a relaxation is expected to increase sales by ₹ 10 million, reduce the ACP to 27 days, and increase the proportion of discount sales to 0.6. Multimedia's tax rate is 40 percent.

What will be the effect of liberalising the cash discount on residual income?

*Solution* The effect of liberalising the cash discount on residual income is:

$$\begin{aligned}\Delta RI &= [\Delta S (1 - V) - \Delta DIS] (1 - t) + k \Delta I \\ \Delta DIS &= p_n (S_o + \Delta S) d_n - p_o S_o d_o \\ &= 0.60 (200,000,000 + 10,000,000) .03 - 0.50 \times 200,000,000 \times 0.02 \\ &= 1,78,000 \\ \Delta I &= \frac{S_o}{360} (ACP_O - ACP_N) - V \frac{\Delta S}{360} ACP_N \\ &= \frac{200,000,000}{360} (30 - 27) - 0.8 \times \frac{10,000,000}{360} \times 27 \\ &= 1,066,667 \\ \Delta RI &= [10,000,000 (0.2) - 1,780,000] (0.6) + 0.12 \times 1,066,667 \\ &= ₹ 260,000\end{aligned}$$

- 25.4 Vibgyor Limited is considering relaxing its collection effort. Its sales are ₹ 100 million, its average collection period, ACP, is 30 days, its variable costs to sales ratio,  $V$ , is 0.75, its cost of capital,  $k$ , is 14 percent, and its bad debt ratio,  $b_o$ , is 0.04. Vibgyor's tax rate is 30 percent.

The relaxation in collection effort is expected to push sales up by ₹ 10 million, increase the average collection period to 40 days, and raise the bad debts ratio to 0.05. What will be the effect of relaxing the collection effort on residual income?

*Solution* Given the above information, the effect of relaxing the collection effort on residual income would be:

$$\begin{aligned}\Delta RI &= [\Delta S (1 - V) - \Delta BD] (1 - t) - k \Delta I \\ \Delta BD &= b_n (S_o + \Delta S) - b_o S_o \\ &= .05(100,000,000 + 10,000,000) - .04 \times 100,000,000 \\ &= ₹ 1,500,000 \\ \Delta I &= \frac{S_o}{360} (ACP_N - ACP_O) + \frac{\Delta S}{360} ACP_N V \\ &= 2,777,778 + 833,333 = ₹ 3,611,111 \\ \text{So, } \Delta RI &= [10,000,000 (0.25) - 1,500,000] (0.7) - 0.14 \times 3,611,111 \\ &= ₹ 194,444\end{aligned}$$

- Vineeta Enterprises sells on terms 2/10, net 45. Annual sales are ₹ 90 million. 25.5 30 percent of its customers pay on the 10th day and take the discount. If accounts receivable average to ₹ 12 million, what is the average collection period (ACP) on non-discount sales?

*Solution*

$$\text{Accounts receivable} = \frac{\text{ACP on discount sales}}{360} \left[ \frac{\text{Discount sales}}{360} \right] + \frac{\text{ACP on non-discount sales}}{360} \left[ \frac{\text{Non-discount sales}}{360} \right]$$

Plugging the values given in the problem, we get:

$$12,000,000 = (10) \frac{27,000,000}{360} + (\text{ACP on non-discount sales}) \frac{63,000,000}{360}$$

Hence,

$$\text{ACP on non-discount sales} = \frac{12,000,000 - (10) \frac{27,000,000}{360}}{\frac{63,000,000}{360}} = 64.3 \text{ days}$$

- 25.6 The following information is available for Avinash Company:

		Month	Sales (₹ in million)	End-of-quarter Receivables (₹ in million)
I	Quarter	January	40.0	3.0
		February	50.0	20.0
		March	60.0	40.0
II	Quarter	April	60.0	5.0
		May	50.0	18.0
		June	40.0	25.0
III	Quarter	July	50.0	4.0
		August	50.0	20.0
		September	50.0	30.0

*Required:*

- Calculate the days sales outstanding (DSO) at the end of each quarter for averaging periods of 30 days and 60 days.
- Draw up the ageing schedules (A/S) at the end of each quarter using the age brackets 0-30, 31-60, and 61-90 days.

*Solution*

- (a) The DSO is as shown below:

	End of Quarter I	End of Quarter II	End of Quarter III
A. Receivables	₹ 63 million	₹ 48 million	₹ 54 million
B. Daily sales (30 days averaging)	$60/30 = ₹ 2$ million	$40/30 = ₹ 1.333$ million	$50/30 = ₹ 1.667$ million
C. DSO (30 days averaging) = A/B	31.5 days	36 days	32.4 days
D. Daily sales (60 days averaging)	$110/60 = ₹ 1.833$ million	$90/60 = ₹ 1.5$ million	$100/60 = ₹ 1.667$ million
E. DSO (60 days averaging) = A/D	34.4 days	32 days	32.4 days

(b) The ageing schedule is as follows:

Age Bracket	Quarter I	Quarter II	Quarter III
0 – 30	63.5 percent	52.1 percent	55.6 percent
31 – 60	31.8	37.5	37.0
61 – 90	4.8	10.4	7.4

## PROBLEMS

**25.1 Credit Standards** The present sales of Soumya Enterprises are ₹ 50 million. The firm classifies its customers into 3 credit categories: A, B, and C. The firm extends unlimited credit to customers in category A, limited credit to customers in category B, and no credit to customers in category C. As a result of this credit policy, the firm is foregoing sales to the extent of ₹ 5 million to customers in category B and ₹ 10 million to customers in category C. The firm is considering the adoption of a more liberal credit policy under which customers in category B would be extended unlimited credit and customers in category C would be provided limited credit. Such relaxation would increase the sales by ₹ 10 million on which bad debt losses would be 8 percent. The contribution margin ratio for the firm is 15 percent, the average collection period is 60 days, and the cost of capital is 15 percent. The tax rate for the firm is 40 percent.

What will be the effect of relaxing the credit policy on the residual income of the firm?

**25.2 Credit Period** The Malabar Corporation currently provides 45 days of credit to its customers. Its present level of sales is ₹ 15 million. The firm's cost of capital is 15 percent and the ratio of variable costs to sales is 0.80. The firm is considering extending its credit period to 60 days. Such an extension is likely to push sales up by ₹ 1.5 million. The bad debt proportion on additional sales would be 5 percent. The tax rate is 45 percent.

What will be the effect of lengthening the credit period on the residual income of the firm?

**25.3 Credit Terms** The present credit terms of Bharatiya Company are 1/10, net 30. Its sales are ₹ 12 million, its average collection period is 24 days, its variable cost to sales ratio is 0.80, and its cost of funds is 15 percent. The proportion of sales in which customers currently take discount is 0.3. Bharatiya Company is considering relaxing its discount terms to 2/10, net 30. Such relaxation is expected to increase the sales by ₹ 1.2 million, reduce the average collection period to 16 days, and increase the proportion of discount sales to 0.7.

What will be the effect of relaxing the discount policy on residual income? The tax rate of the firm is 50 percent.

**25.4 Collection Effort** Manish Ventures is considering relaxing its collection efforts. Presently its sales are ₹ 50 million, its average collection period 25 days, its variable costs to sales ratio 0.75, its cost of capital 15 percent, and its bad debt

ratio 0.04. The relaxation in collection efforts is expected to push sales up by ₹ 6 million, increase the average collection period to 40 days, and raise the bad debts ratio to 0.06. The tax rate of the firm is 30 percent.

What will be the effect of relaxing the collection effort on the residual income of the firm?

**25.5 Average Collection Period** Amit Enterprises sells on terms 2/10, net 45. Total sales for the year are ₹ 40 million. Thirty percent of the customers pay on the tenth day and avail the discount; the remaining 70 percent pay, on average, 50 days after their purchases.

Calculate the average collection period and the average investment in receivables.

**25.6 Average Collection Period** Sabet Company sells on terms 1/5, net 15. The total sales for the year are ₹ 10 million. The cost of goods sold is ₹ 7.5 million. Customers accounting for 30 percent of sales take discount and pay on the fifth day, while others take an average of 25 days to pay.

Calculate:

- (a) the average collection period, and
- (b) the average investment in receivables.

**25.7 Credit Terms** Udar Limited is considering a change in its credit terms from 2/10, net 30 to 3/10, net 45. This change is expected to

- (a) increase the total sales from ₹ 50 million to ₹ 60 million
- (b) decrease the proportion of customers taking discount from 0.70 to 0.60
- (c) increase the average collection period from 20 days to 24 days.

The gross profit margin for the firm is 15 percent and the cost of capital is 12 percent. The tax rate is 40 percent.

Calculate the expected change in residual income.

**25.8 Credit Granting** The financial manager of a firm is wondering whether credit should be granted to a new customer who is expected to make a repeat purchase. On the basis of credit evaluation, the financial manager feels that the probability that the customer will pay is 0.85 and the probability that the customer will default is 0.15. Once the customer pays for the first purchase, the probability that he will pay for the repeat purchase increases to 0.95. The revenues from the sale will be ₹ 10,000 and the cost of sale would be ₹ 8,500—these figures apply to both the initial and repeat purchase. Should credit be granted?

**25.9 Credit Granting** A firm is wondering whether to sell goods to a customer on credit or not. The revenues from sale will be ₹ 10,000 and the cost of sale will be ₹ 8,000. What should be the minimum probability that the customer will pay, in order to sell profitably?

## MINICASE - I

Multitech Limited, set up by a few technocrats in the mid 1990s, enjoyed a fairly healthy growth rate till two years ago. Intense competition in the last few years has slowed down the growth rate considerably.

The present sales of Multitech is ₹ 800 million. In a recent executive committee meeting, Jeevan Reddy, the marketing director, argued for relaxing the credit policy of Multitech to stimulate sales increase. Gautam Singhvi, the finance director, promised to consider this request favourably, provided the relaxation in credit policy had a positive impact on residual income.

The present credit policies of Multitech are as follows:

**Credit Standards** Multitech classifies its customers into 4 categories, 1 through 4. Credit rating diminishes as one goes from category 1 to category 4. Customers in category 1 have the highest credit rating whereas customers in category 4 have the lowest credit rating. Currently Multitech extends unlimited credit to customers in categories 1 and 2, limited credit to customers in category 3, and no credit to customers in category 4.

**Credit Period** Multitech provides 30 days of credit to its customers who are deemed eligible for credit under its credit standards.

**Cash Discount** To induce its customers to pay early, Multitech offers cash discount. Its credit terms are 1/10, net 30.

You have recently joined Multitech as a financial analyst and Gautam Singhvi has asked you to examine the effect of relaxing credit standards, extending the credit period, and providing more generous cash discount.

After talking to executives in the marketing, production, and finance departments you have gathered the following information.

- Presently the proportion of credit sales and cash sales are 0.7 and 0.3 respectively 0.50 percent of the customers (by value) who are granted credit avail of cash discount.
- The contribution margin ratio for Multitech is 20 percent, the tax rate for Multitech is 30 percent, the post-tax cost of capital for Multitech is 12 percent, and the average collection period (ACP) on credit sales is 20 days.
- If the company extends unlimited credit to customers in category 3 and limited credit to customers in category 4, the sales of the company would increase by ₹ 50 million on which the bad debt losses would be 12 percent. The ACP, however, will remain unchanged at 20 days.
- If the company extends its credit period from 30 days to 60 days, its sales to customers who are granted credit will increase by ₹ 40 million. Further, the percentage of customers who will avail of cash discount will decrease to 20 percent. The ACP, as a result of the extension of the credit period, will increase to 50 days.
- If the company relaxes its discount terms to 2/10 net 30, its sales to customers who are granted credit will increase by ₹ 20 million. Further, the percentage of credit customers who will avail of cash discount will increase to 70 percent and the ACP will decrease to 16 days.
  - (a) What will be the effect of relaxing the credit standards on residual income?
  - (b) What will be the effect of extending the credit period on residual income?
  - (c) What will be the effect of relaxing the cash discount policy on residual income?

Examine the impact of these credit policy changes one at a time.

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## MINICASE - II

Ramji is the owner of a small scale unit manufacturing sambar and curry powders on the outskirts of Chennai. Over the years his business had grown in line with the city's growth and he was getting a handsome return of about thirty percent from the unit. Also aiding the growth had been his penchant for collecting all sale proceeds in cash, as most of his traditional customers too preferred such arrangement, all of course to help them 'manage' the taxes. For Ramji, the currency demonetisation had come as a bolt from the blue. And soon afterwards, when his trusted cashier decamped with a sizeable amount of the new notes he could arrange to get in exchange, Ramji had just thrown up his hands in despair. It was then that he had asked his son Karthik, a successful consultant, to devise and implement suitable strategies to put the unit's finances on a sound footing. Karthik, familiar with the ways of his father, had convinced him that the days of cash were over for good and that it would be foolish to limit the business for fear of the taxes.

At the time of demonetisation, the annual sales of the firm were at ₹ 120 lakhs. The variable cost was 40 percent of the sales. Though the customers were allowed a credit period of only 20 days, in practice the payments were received in 30 days. As was customary, there was an employee for making the rounds through the customers for collecting payments. The first thing Karthik did was to intimate all the regular customers that those who made payments for the purchases online would be entitled to a discount of 2/10 net 20 and those who made payments in cheque, a discount of 1/10 net 20 and that a penalty of 1 percent per day of delay would be levied on payments received beyond 20 days. Also, he terminated the services of the collection man who was drawing a salary of ₹ 10,000 per month. He recruited a new cashier, a young computer literate graduate with impeccable references, at a salary of ₹ 25,000 per month, ₹ 10,000 more than that of the earlier cashier. To Ramji's surprise, as soon as the new policy was announced, about 60 percent of the customers opted for the online mode and 10 percent for the cheque mode of payment and availed of the discount and over an year the sales increased by 30 percent. Bad debts got reduced to 1 percent from the earlier level of 3 percent. The average collection period on non-discount sales also got reduced to 20 days. At the end of the year, Ramji asked his cashier to make a brief report on the change in residual profits. Show with calculations how his report would look like.

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1 Note that  $\Delta I$  is equal to:

$$\frac{\Delta S}{360} \times ACP \times V$$

where  $\Delta S/360$  is the average daily change (increase) in sales. The divisor here can with equal justification be 365, rather than 360, and ACP is the average collection period.

2  $\Delta DIS$  is equal to

$$p_n (S_0 + \Delta S)d_n - p_o S_o d_o$$

where  $p_n$  is the proportion of discount sales after liberalising the discount terms,  $S_0$  is the sales before liberalising the discount terms,  $\Delta S$  is incremental sales,  $d_n$  is the new discount percentage,  $p_o$  is the proportion of discount sales before liberalising the discount terms, and  $d_o$  is the old discount percentage.

3  $\Delta I = \frac{S_0}{360} (ACP_o - ACP_n) - V \frac{\Delta S}{360} ACP_n$

where  $S_0$  is the sales before liberalising the discount terms,  $ACP_o$  is the average collection period before liberalising the discount terms,  $ACP_n$  is the average collection period after liberalising the discount terms,  $V$  is the proportion of variable costs to sales, and  $\Delta S$  is the increase in sales as a result of liberalising the discount terms.

4  $\Delta BD$  is equal to:

$$b_n (S_0 + \Delta S) - b_o S_o$$

5  $\Delta I$  is equal to:

$$\frac{S_0}{360} (ACP_n - ACP_o) + \frac{\Delta S}{360} ACP_n V$$

6 This figure is from the book *Guide to Working Capital Management* by Keith V. Smith, McGraw-Hill Book Company, New York, 1979.

7 The number 3, of course, is an arbitrary constant. We could use any other number just as well. Suppose we use 9. In this case the Z function would be:

$$Z = 3 \text{ Current ratio} + 0.3 \text{ Return on equity}$$

The point to be emphasised is that the ratio of weights applied to current ratio and return on equity should be 10:1.

8 In this discussion, profit refers to pre-tax profit.

9 These observations are based mainly on several semi-structured personal interviews conducted by the author with business executives.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter25/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter25/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Mini Cases
- Additional Solved Problems
- Excel on Solved Problems
- Answer Key



## Inventory Management

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Distinguish between ‘organisation’ inventories and ‘in-process’ inventories.
- ✓ Explain the EOQ model.
- ✓ Show how the order point may be determined.
- ✓ Discuss the techniques for monitoring and control of receivables.

There are three types of inventories: raw materials, work-in-process, and finished goods. *Raw materials* are materials and components that are inputs in making the final product. *Work-in-process*, also called stock-in-process, refers to goods in the intermediate stages of production. *Finished goods* consist of final products that are ready for sale. While manufacturing firms generally hold all the three types of inventories, distribution firms hold mostly finished goods.

Inventories represent the second largest asset category for manufacturing companies, next only to plant and equipment. The proportion of inventories to total assets generally varies between 15 and 30 percent. Given substantial investment in inventories, the importance of inventory management cannot be overemphasised.

Decisions relating to inventories are taken primarily by executives in production, purchasing, and marketing departments. Usually, raw material policies are shaped by purchasing and production executives, work-in-process inventory is influenced by the decisions of production executives, and finished goods inventory policy is evolved by production and marketing executives. Yet, as inventory management has important financial implications, the financial manager has the responsibility to ensure that inventories are properly monitored and controlled. He has to emphasise the financial point of view and initiate programmes with the participation and involvement of others for effective management of inventories.

## 26.1 NEED FOR INVENTORIES

What purpose is served by inventories? Before we answer this question, a distinction may be drawn between ‘process or movement’ inventories and ‘organisation’ inventories. ‘Process or movement’ inventories are required because it takes time to complete a process/operation and to move products from one stage to another. The average quantity of such inventories would be equal to:

$$\frac{\text{Average output of the process} \quad \text{Time required for the process (or time}}{\text{(or average usage at the end} \quad \times \quad \text{required in movement)}} \\ \text{of the movement)}$$

For example:

- If the average output of a process is 500 units per day and the process time is 5 days, the average process inventory would be 2,500 units.
- If the average sales at the warehouse are 100 units a week and the transit (movement) time required to ship the goods from the plant to the warehouse is 3 weeks, the average movement inventory would be 300 units.

‘Organisation’ inventories are maintained to widen the latitude in planning and scheduling successive operations. Raw material inventory enables a firm to decouple its purchasing and production activities to some extent. It provides flexibility in purchasing and production. The firm can wait for an opportune buying moment without affecting its production schedule. Likewise the production schedule need not be influenced by immediate purchasing activity.

In-process inventory<sup>1</sup> provides flexibility in production scheduling so that an efficient schedule and high utilisation of capacity may be attained. Without in-process inventory, a bottleneck at any stage in the production process renders idle the machines and facilities at subsequent stages. This results in delay and idle facilities.

Finished good inventory enables a firm to decouple its production programme and marketing activities so that desirable results can be achieved on both the fronts. If adequate finished goods inventory is available, the marketing department can meet the needs of customers promptly, irrespective of the quantity and composition of goods flowing out of the production line currently. By the same token, the volume and

composition of current output from the production line may be determined somewhat independently of the volume and composition of the current off take in the market.

## 26.2 ■ ORDER QUANTITY – EOQ MODEL

There are two basic questions relating to inventory management:

- What should be the size of the order?
- At what level should the order be placed?

To answer the first question, the basic Economic Order Quantity (EOQ hereafter) model is helpful. Before we discuss the EOQ model let us distinguish between three types of costs in the context of inventory management: ordering costs, carrying costs, and shortage costs.

*Ordering costs* relating to purchased items would include expenses on the following: requisitioning, preparation of purchase order, expediting, transport, and receiving and placing in storage. Ordering costs pertaining to items manufactured in the company would include expenses on the following: requisitioning, set-up, and receiving and placing in storage.

*Carrying costs* include expenses on the following: interest on capital locked up in inventory, storage, insurance, and obsolescence. Carrying costs generally are about 25 percent of the value of inventories held.

*Shortage costs* arise when inventories are short of requirement for meeting the needs of production or the demand of customers. Inventory shortages may result in one or more of the following: high costs concomitant with 'crash' procurement, less efficient and uneconomic production schedules, and customer dissatisfaction and loss of sales. Measurement of shortage costs when shortage results in failure to meet customer demand is relatively difficult because the effects are both long-term and short-term and somewhat intangible in nature.

When a firm orders large quantities, in a bid to reduce the total ordering costs, the average inventory, other things being equal, tends to be high thereby increasing the carrying costs. Also, when a firm carries a large safety stock to reduce shortage costs its carrying costs tend to be high. In view of such relationships, minimisation of overall costs of inventory management would require a consideration of trade-offs among these costs.

**Assumptions of the EOQ Model** The basic EOQ<sup>2</sup> model is based on the following assumptions:

- The forecast usage/demand for a given period, usually one year, is known.
- The usage/demand is even throughout the period.
- Inventory orders can be replenished immediately (There is no delay in placing and receiving orders).
- There are two distinguishable costs associated with inventories: costs of ordering and costs of carrying<sup>3</sup>.
- The cost per order is constant regardless of the size of order.
- The cost of carrying is a fixed percentage of the average value of inventory.

**EOQ Formula** For determining the EOQ formula we shall use the following symbols:

$U$  = annual usage/demand

$Q$  = quantity ordered

$F$  = cost per order

$C$  = percent carrying cost

$P$  = price per unit

$TC$  = total costs of ordering and carrying

Given the above assumptions and symbols, the total costs of ordering and carrying inventories are equal to:

$$TC = \frac{U}{Q} \times F + \frac{Q}{2} \times P \times C \quad (26.1)$$

In Eq. (26.1), the first term on the right-hand side is the ordering cost, obtained as the product of the number of orders ( $U/Q$ ) and the cost per order ( $F$ ), and the second term on the right-hand side is the carrying cost, obtained as the product of the average value of inventory holding ( $QP/2$ ) and the percentage carrying cost ( $C$ ).

Exhibit 26.1 shows a graph illustrating the behaviour of the carrying cost, the ordering cost, and the sum of these two costs. The carrying cost varies directly with the order size (since the average level of inventory is one-half of the order size), whereas the ordering cost varies inversely with the order size. The total cost of ordering and carrying is minimised when

$$Q = \sqrt{\frac{2FU}{PC}} \quad (26.2)$$

The formula embodied in Eq. (26.2) is the EOQ formula. It is a useful tool for inventory management. It tells us what should be the order size for purchased items and what should be the size of production run for manufactured items.

The EOQ model may be illustrated with the help of the following data relating to Ace Company.

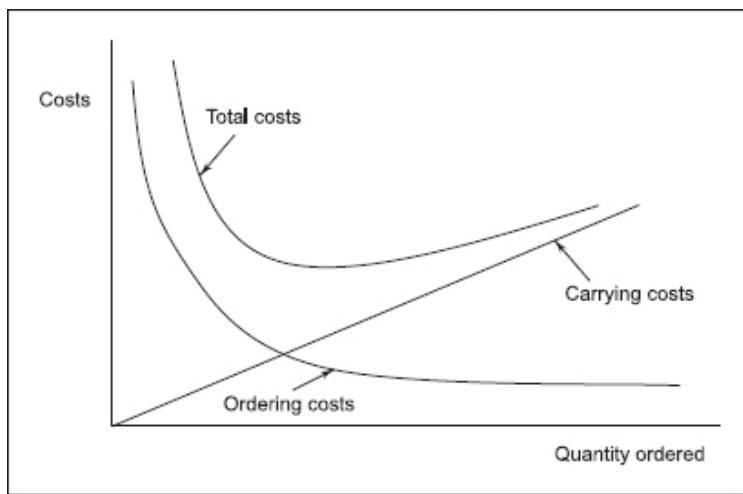
$U$ = annual sales	= 20,000 units
$F$ = fixed cost per order	= ₹ 2,000
$P$ = purchase price per unit	= ₹ 12
$C$ = carrying cost	= 25 percent of inventory value.

Plugging in these values in Eq. (26.2), we get

$$Q = \sqrt{\frac{2 \times 2,000 \times 20,000}{12 \times 0.25}} = 5,164$$

### Exhibit 26.1

### Behaviour of Inventory Related Costs



**Quantity Discounts and Order Quantity** The standard EOQ analysis is based on the assumption that the price per unit remains constant irrespective of the order size. When quantity discounts are available, which is often the case, the price per unit is influenced by the order quantity. This violates the applicability of the EOQ formula. However, the EOQ framework can still be used as a starting point for analysing the problem. To determine the optimal order size when quantity discounts are available the following procedure may be used.

1. Determine the order quantity using the standard EOQ formula assuming no quantity discount. Call it  $Q^*$ .
2. If  $Q^*$  enables the firm to get quantity discount then it represents the optimal order size.
3. If  $Q^*$  is less than the minimum order size required for quantity discount (call it  $Q'$ ), compute the change in profit as a result of increasing the order quantity from  $Q^*$  to  $Q'$  as follows:

$$\Delta\pi = UD + \left[ \frac{U}{Q^*} - \frac{U}{Q'} \right] F - \left[ \frac{Q'(P-D)C}{2} - \frac{Q^*PC}{2} \right] \quad (26.3)$$

where  $\Delta\pi$  is the change in profit,  $U$  is the annual usage/demand,  $D$  is the discount per unit when quantity discount is available,  $Q^*$  is the economic order quantity assuming no quantity discount,  $Q'$  is the minimum order size required for quantity discount,  $F$  is the fixed cost of placing an order,  $P$  is the unit purchase price without discount, and  $C$  is the inventory carrying cost expressed as a percentage.

On the right-hand side of Eq. (26.3), the first term represents savings in price, the second term represents the savings in ordering cost, and the third term represents the increase in carrying cost.

4. If the change in profit is positive,  $Q'$  represents the optimal order quantity. If the change in profit is negative,  $Q^*$  represents the optimal order quantity.

To illustrate the above procedure, consider the following data pertaining to Quantum Limited.

$$\begin{aligned} U &= \text{annual usage} = 10,000 \text{ units} \\ F &= \text{fixed cost per order} = ₹ 150 \\ P &= \text{purchase price per unit} = ₹ 20 \\ C &= \text{carrying cost} = 25 \text{ percent of inventory value} \\ Q &= \text{minimum order size required} = 1,000 \text{ units} \\ &\quad \text{for quantity discount} \\ D &= \text{discount per unit} = ₹ 1. \end{aligned}$$

The EOQ, assuming no quantity discount, is:

$$Q^* = \sqrt{\frac{2FU}{PC}} = \sqrt{\frac{2 \times 150 \times 10,000}{20 \times 0.25}} = 775 \text{ units}$$

Since  $Q^*$  is less than  $Q'$  (1,000), the change in profit as a result of increasing the order quantity from  $Q^*$  to  $Q'$  is:

$$\begin{aligned} &UD + \left[ \frac{U}{Q^*} - \frac{U}{Q'} \right] F - \left[ \frac{Q'(P-D)C}{2} - \frac{Q^*PC}{2} \right] \\ &= 10,000 \times 1 + \left[ \frac{10,000}{775} - \frac{10,000}{1,000} \right] 150 \\ &\quad - \left[ \frac{1,000(20-1)0.25}{2} - \frac{775 \times 20 \times 0.25}{2} \right] \\ &= 10,000 + 435 - (2,375 - 1,938) \\ &= ₹ 9,998 \end{aligned}$$

Since the change in profit is positive,  $Q' = 1,000$  represents the optimal order quantity.

Note that the above procedure is based on the principle of marginal analysis. This involves comparing incremental benefits with incremental costs in going from one level of inventory to another. This principle may be used to compare a proposed order quantity with the present order quantity and more generally for comparing any set of alternatives.

**Inflation and Order Quantity** An implicit assumption of EOQ analysis is that the purchase price per unit is constant. In an inflationary period - and we appear to be in an era of secular inflation - this assumption is not valid. If the rate of inflation is predictable, the EOQ formula can be applied with one simple modification: deduct the rate of inflation from C, the annual carrying cost expressed as a percentage. Why is the deduction to be made? The reason is that the rise in inventory values in the wake of inflation offsets to some extent the carrying cost associated with inventory holding.

The above adjustment might suggest that the average inventory (and EOQ) increases during an inflationary period. This may not be true because the carrying cost also tends to increase during an inflationary period, thus lowering the EOQ and average inventories. The net effect of inflation on the EOQ and average inventory holding may be negligible. However, the factor of inflation should be considered explicitly.

## 26.3 ■ ORDER POINT

The standard EOQ model assumes that materials can be procured instantaneously and hence implies that the firm may place an order for replenishment when the inventory level drops to zero. In the real world, however, procurement of materials takes time and hence the order level<sup>5</sup> must be such that the inventory at the time of ordering suffices to meet the needs of production during the procurement period.

If the usage rate of materials and the lead time for procurement are known with certainty, then the ordering level would simply be:

$$\text{Lead time in days for procurement} \times \text{Average daily usage}$$

When the usage rate and lead time are likely to vary, the reorder level should be higher than the normal consumption period requirement during the procurement period to provide a measure of safety in face of variability of usage and lead time. Put differently, the reorder level should be equal to:

$$\text{Normal consumption} + \text{Safety stock}$$

**Safety Stock** What should be the level of safety stock? In a simple situation, where only the usage rate is variable and the maximum usage rate can be specified, the safety stock required to seek total protection against stockout is simply:

$$(\text{Maximum usage rate} - \text{Average usage rate}) \times \text{Lead time}$$

When both the lead time and usage rate vary, which is often the case, and the range of variation is wide, complete protection against stockout may require an excessively large safety stock. For example, if the lead time varies between 60 days and 180 days with an average value of 90 days, and the usage rate varies between 75 units and 125 units per day with an average value of 100 units per day, a safety stock of 13,500 units is required for complete protection against stockout. This has been worked out as follows:

Maximum possible usage	– Normal usage
$(\text{Maximum daily usage} \times \text{Maximum lead time})$	$– (\text{Average daily usage} \times \text{Average lead time})$

$$125 \times 180 - 100 \times 90 = 13,500$$

Since inventory carrying costs are proportional to the level of inventories carried, it rarely makes sense to seek total protection against stockout. In view of the trade-off between stockout cost and inventory carrying cost, the optimal level of safety stock is usually much less than the level of safety stock required to achieve total protection against stockouts. The procedure for establishing the optimal safety stock may be illustrated with an example. ABC Company manufactures cables requiring aluminium rods. The probability distributions of the daily usage rate and the lead time for procurement are given as follows - these distributions are independent.

Daily usage rate in tons	Probability	Lead time in days	Probability
10	0.2	20	0.25
20	0.6	30	0.50
30	0.2	40	0.25

In this case, the normal usage during the normal procurement period is 600 tons. This is the product of the average daily usage of 20 tons ( $0.2 \times 10 + 0.6 \times 20 + 0.20 \times 30$ ) and the average lead time of 30 days ( $0.25 \times 20 + 0.5 \times 30 + 0.25 \times 40$ ).

The maximum possible usage is 1200 tons: 30 tons (maximum daily usage)  $\times$  40 (maximum lead time in days). The probability for the same is 0.05. This is simply the probability of a daily usage of 30 tons which is 0.2 multiplied by the probability of a lead time of 40 days which is 0.25. You can similarly figure out the other levels of usage and the probabilities associated with them.

The stockout cost is estimated to be ₹ 10,000 per ton. The carrying cost is ₹ 1,400 per ton per year. The costs associated with various levels of safety stock are shown in [Exhibit 26.2](#). Looking at the total cost column in this exhibit we find that the optimal level of safety stock is 300 tons. At this level of safety stock the sum of expected stockout cost and carrying stock is minimal. Given this safety stock of 300 tons and a normal consumption of 600 tons during the lead time, the reorder level is 900 tons.

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## Exhibit 26.2 | Costs Associated with Various Levels of Safety Stock

Safety Stock	Stockouts	Stockout Cost	Probability	Expected Stockout Cost	Carrying Cost	Total Cost
Tons		₹		₹	₹	₹
600	0	0	0	0	840,000	840,000
300	300	3,000,000	.05	150,000	420,000	570,000
200	100	1,000,000	.10	100,000	280,000	580,000
	400	4,000,000	.05	200,000		
				300,000		
0	200	2,000,000	.15	300,000	0	900,000
	300	3,000,000	.10	300,000		
	600	6,000,000	.05	300,000		
				900,000		

**Other Factors** The foregoing analysis is based on certain simplifying assumptions. In the real world some additional considerations ought to be taken into account. These may relate to one or more of the following:

- **Anticipated scarcity** When a certain raw material or product is likely to become scarce in future, it may make sense to carry a larger inventory than what is required otherwise to protect against scarcity or non-availability in future.
- **Expected price change** If a price change is in the offing, the level of inventory carried may be adjusted according to the direction of the expected price change—an expected increase in price may warrant an increase in the level of inventory carried and an expected fall in price may justify a decrease in the level of inventory carried.
- **Obsolescence risk** The presence of obsolescence risk suggests a reduction in the level of inventory carried—the degree of reduction would, of course, depend on how serious the obsolescence risk is.
- **Government restrictions** If the government imposes restriction on the level of inventory that can be maintained directly or indirectly (through the policies of commercial banks), then this becomes a constraint in inventory management.
- **Marketing considerations** Sometimes the compulsions of the market dictate the levels of inventory maintained by the firm. If the market is highly competitive and the behaviour of consumers unpredictable, large inventory may have to be carried to ensure that selling opportunities are fully exploited.

## 26.4 ■ COSTING OF RAW MATERIALS AND VALUATION OF STOCKS

**Costing of Raw Materials** According to Ind AS 2, companies can choose between the following methods for determining the cost of inventories used in production.

**FIFO Method** This method assumes that the order in which materials are received in the stores is the order in which they are issued from the stores. Hence, the material which is issued first is priced on the basis of the cost of material received earliest, so on and so forth.

**Weighted Average** Cost under this method, material issues from stores are priced at the weighted average cost of the latest goods to arrive in the stores.

**Valuation of Stocks** There are three important types of inventories carried by a manufacturing organisation: (i) raw material inventory, (ii) work-in-process inventory, and (iii) finished goods inventory.

The valuation of work-in-process and finished goods inventory depends on (i) the method used for pricing materials, and (ii) the manner in which fixed manufacturing overhead costs are treated. Since the methods for pricing materials have been discussed earlier, let us look at how fixed manufacturing overheads costs are treated. For this purpose, two systems of costing viz., direct costing and absorption costing are used. Under **direct costing**, fixed manufacturing overheads costs are treated as period costs and not as product costs. Put differently, they are charged directly to the income statement and hence not reflected in the valuation of inventories. Under **absorption costing**, on the other hand, fixed manufacturing overheads costs are treated as product (inventoriable) costs and not period costs. Hence, inventory valuation reflects an allocated share of fixed manufacturing overhead costs.

Quite naturally, the valuation of work-in-process and finished goods inventory is lower, *ceteris paribus*, under direct costing and higher under absorption costing. Further, when the inventory level increases, the reported profit under direct costing is lower than the reported profit under absorption costing. By the same token, when the inventory level decreases, the reported profit under direct costing is higher than what it is under absorption costing.

## 26.5 ■ MONITORING AND CONTROL OF INVENTORIES

This section discusses the tool of ABC analysis, the concept of just-in-time inventory control, and the steps that may be taken to maintain control over inventories.

**ABC Analysis** In most inventories, a small proportion of items accounts for a very substantial usage (in terms of the monetary value of annual consumption) and a large proportion of items accounts for a very small usage (in terms of the monetary value of annual consumption). ABC analysis, based on this empirical reality, advocates in essence a selective approach to inventory control which calls for a greater concentration of effort on inventory items accounting for the bulk of usage value. This approach calls for classifying inventories into three broad categories, A, B, and C. Category A, representing the most important items, generally consists of 15 to 25 percent of inventory items and accounts for 60 to 75 percent of annual usage value. Category B, representing items of moderate importance, generally consists of 20 to 30 percent of inventory items and accounts for 20 to 30 percent of annual usage value. Category C, representing items of least importance, generally consists of 40 to 60 percent of inventory items and accounts for 10 to 15 percent of annual usage value. [Exhibit 26.3](#) shows the typical relationship between cumulative percentage of items and cumulative usage of items.

**Just-in-Time Inventory Control** The just-in-time inventory control system, originally developed by Taichi Okno of Japan, simply implies that the firm should maintain a minimal level of inventory and rely on suppliers to provide parts and components 'just-in-time' to meet its assembly requirements. This may be contrasted with the traditional inventory management system which calls for maintaining a healthy level of safety stock to provide a reasonable protection against uncertainties of consumption and supply - the traditional system may be referred to as a 'just-in-case' system.

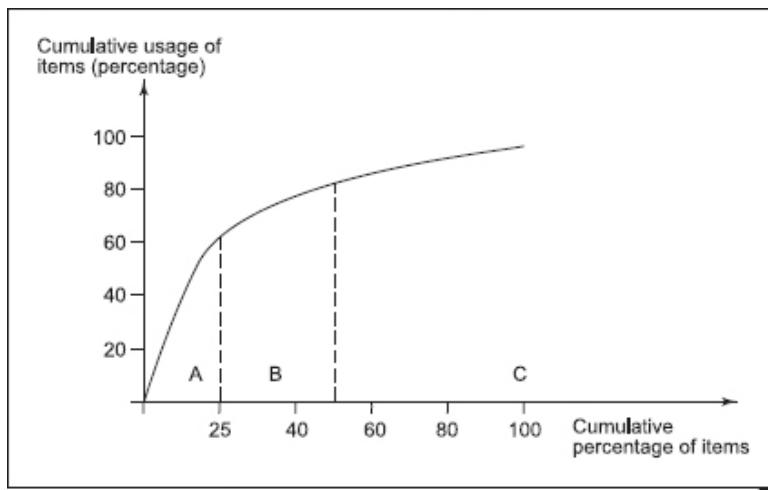
The just-in-time inventory system, while conceptually very appealing, is difficult to implement because it involves a significant change in the total production and management system. It requires *inter alia* (i) a strong and dependable relationship with suppliers who are geographically not very

remote from the manufacturing facility, (ii) a reliable transportation system, and (iii) an easy physical access in the form of enough doors and conveniently located docks and storage areas to dovetail incoming supplies to the needs of assembly line.

What is the influence of ‘just-in-time’ inventory system on the average inventory level? To answer this question, let us look at the average inventory under EOQ model:

$$\text{Average inventory} = \sqrt{\frac{2FU}{PC}} + \text{Safety stock} \quad (26.4)$$

### Exhibit 26.3 Graph of Cumulative Percentage of Items and Cumulative Percentage of Usage



Under the ‘just-in-time’ inventory system, a concerted effort is made to lower the ordering cost ( $F$  in the above equation) and also the safety stock by forging stronger long-term relationship with the supplier. As a result, both the components on the right hand side of the above equation decline and this means that the average inventory level is lower.

**Elements of a Programme** The firm may establish a programme of inventory monitoring and control consisting of the following elements:

- Exercise of vigilance against imbalances of raw materials and work-in-process which tends to limit the utility of stocks.
- Vigorous efforts to expedite completion of unfinished production jobs to get them into saleable condition.
- Active disposal of goods that are surplus, obsolete, or unusable.
- Shortening of the production cycle.

- Change in design to maximise the use of standard parts and components which are available off-the-shelf.
- Strict adherence to production schedules.
- Special pricing to dispose of unusually slow-moving items.
- Evening out of seasonal sales fluctuations to the extent possible.

## 26.6 ■ INVENTORY MANAGEMENT IN INDIA

In addition to inventory models and ABC analysis, the most important approaches to inventory management in India are:

- Enterprise resource planning system
- Sales forecasting
- Materials requirement planning
- Supply chain management
- Inventory models
- Just in time system
- ABC analysis
- FSN analysis

**Enterprise Resource Planning (ERP)** A central feature of an ERP system is a shared data base that supports multiple functions in different business units.

**Sales Forecasting** The sales forecast is typically the starting point of the entire planning process. Given the importance of sales forecasting, companies are using time series projection methods and causal models, in addition to qualitative techniques that rely on expert judgement.

**Material Requirement Planning** Material requirements planning is a production planning, scheduling, and inventory control system meant to ensure that materials are available for production and products are available for delivery to customers, while the lowest possible levels of inventories are maintained at various stages.

**Supply Chain Management** Supply chain management has been defined as the “design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronising supply and demand and measuring performance globally.”

**Just in Time (JIT) System** The JIT inventory control simply implies that the firm should maintain a minimal level of inventory and rely on supplies to provide parts and components “just-in-time” to meet its assembly requirements.

**FSN Analysis** For purposes of control, companies classify items into fast moving (F), slow moving (S), and non-moving (N) categories.

## SUMMARY

- ‘**Process or movement**’ inventories are required because it takes time to complete a process/operation. ‘**Organisation inventories**’ are maintained to widen the latitude in planning and scheduling operations.
- According to the Economic Order Quantity model, the optimal order quantity is:

$$Q = \sqrt{2FU/PC}$$

- **ABC analysis** advocates a selective approach to inventory control which calls for a greater concentration of effort on inventory items accounting for the bulk of usage value.
- While the decisions relating to inventories are taken primarily by purchasing, production, and marketing executives, the financial manager should try to ensure that inventories are properly monitored and controlled.
- **ABC analysis, FSN analysis, and inventory turnover analysis** are the most commonly used tools of inventory management in India.

## QUESTIONS

1. Distinguish between ‘process or movement’ inventories and ‘organisation’ inventories.
2. What purpose is served by inventories?
3. What costs are incurred in the context of inventory management?
4. What assumptions underlie the basic EOQ model?
5. What is the formula for EOQ?
6. How would you go about determining the optimal order size when quantity discount is available? Illustrate your approach with a suitable example.
7. What modification is required in the basic EOQ analysis to cope with the problem of inflation?
8. How would you establish the reorder level?
9. Discuss the procedure for ABC analysis.
10. Describe the various methods of pricing raw materials.
11. Describe the difference between direct costing and absorption costing.
12. Discuss the concept of ‘just-in-time’ inventory control.
13. Describe the important components of a programme for inventory planning and control.
14. What are the shortcomings of inventory management in India? What can be done to improve it?

## SOLVED PROBLEMS

26.1 The finance department of Prashanth Textile Corporation gathered the following information:

- The carrying costs per unit of inventory are ₹ 10.
- The fixed costs per order are ₹ 20.
- The number of units required is 30,000 per year.
- The variable costs per unit ordered are ₹ 2.
- The purchase cost price per unit is ₹ 30.

Determine the economic order quantity (*EOQ*), total number of orders in a year, and the time-gap between two orders.

*Solution*

$$\text{Annual usage } (U) = 30,000$$

$$\text{Fixed cost per order } (F) = ₹ 20$$

$$\begin{aligned}\text{Price per unit } (P) &= \text{Purchase price per unit} + \text{Variable cost per unit ordered} \\ &= ₹ 30 + ₹ 2 = ₹ 32\end{aligned}$$

$$\text{Percent carrying cost } (C) = \frac{\text{Carrying cost per unit}}{\text{Price per unit}} = \frac{₹ 10}{₹ 32} = 0.3125$$

$$EOQ = \sqrt{\frac{2FU}{PC}} = \sqrt{\frac{2 \times 20 \times 30,000}{30 \times 0.3125}} = 346 \text{ units}$$

$$\text{Total number of orders in a year} = \frac{30,000}{346} = 87$$

$$\text{Time-gap between two orders} = \frac{365}{87} = \text{about 4 days}$$

26.2 Modern Enterprises requires 90,000 units of a certain item annually. It costs ₹ 3 per unit. The cost per purchase order is ₹ 300 and the inventory carrying cost is 20 percent per year.

- What is the Economic Order Quantity, if there is no quantity discount.
- What should the firm do if the supplier offers discounts as below, viz.

<i>Order Quantity</i>	<i>Discount (%)</i>
4,500 – 5,999	2
6,000 and above	3

*Solution*

- |                                      |                     |
|--------------------------------------|---------------------|
| Annual usage ( <i>U</i> )            | = 90,000            |
| Purchase cost per unit ( <i>P</i> )  | = ₹ 3               |
| Cost per purchase order ( <i>F</i> ) | = ₹ 300             |
| Carrying cost                        | = 0.6 per unit      |
|                                      | 20 percent per year |

$$EOQ = \sqrt{\frac{2FU}{PC}} = \sqrt{\frac{2 \times 300 \times 90000}{0.6}} = 9487 \text{ units}$$

(b) If the supplier offers discount for higher order quantities the optimal order quantity may be arrived at as follows:

<i>Order qty.</i>	<i>Price per unit</i>	<i>Annual requirement</i>	<i>Purchase cost (2) × (3)</i>	<i>Average inventory (1)/2</i>	<i>Carrying cost (2) × (5) × 0.20</i>	<i>No. of orders (3) × (1)</i>	<i>Total ordering cost (7) × 300</i>	<i>Total cost (4) + (6) + (7)</i>
1	2	3	4	5	6	7	8	9
3000	₹ 3.00	90,000	270,000	1500	900	30	9,000	279,900
4500	₹ 2.94	90,000	264,600	2250	1323	20	6,000	271,923
6000	₹ 2.91	90,000	261,900	3000	1746	15	4,500	268,146

Since the total cost is minimised when the order quantity is 6000, Modern Enterprises is advised to order 6000 units and avail of 3 percent discount.

- 26.3 Cheran Corporation requires 2,000 units of a certain item per year. The purchase price per unit is ₹ 30, the carrying cost of inventory is 25 percent of the inventory value, and the fixed cost per order is ₹ 1,000.

- (a) Determine the economic order quantity.
- (b) What will be the total cost of carrying and ordering inventories when 4 orders of equal size are placed?

*Solution*

- (a) The economic order quantity is equal to:

$$Q = \sqrt{\frac{2FU}{PC}}$$

$$= \sqrt{\frac{2 \times 1,000 \times 2,000}{30 \times 0.25}} = 730 \text{ units}$$

- (b) If four orders of 500 units each are placed the total cost of carrying and ordering inventories will be:

$$TC = \frac{U}{Q} \times F + \frac{Q}{2} \times P \times C = \frac{2,000}{500} \times 1,000 + \frac{500}{2} \times 30 \times 0.25$$

$$= 4,000 + 1,875$$

$$= ₹ 5,875$$

- 26.4 Krishna Cables requires aluminium for its factory. The probability distributions of the daily usage rate and the lead time for procurement are given below. (These distributions are independent.)

<i>Daily Usage Rate in Tonnes</i>		<i>Lead Time in Days</i>	
	<i>Probability</i>		<i>Probability</i>
2	0.2	25	0.2
3	0.6	35	0.5
4	0.2	45	0.3

The stockout cost is estimated at ₹ 8,000 per ton and the carrying cost in ₹ 2,000 per ton per year.

*Required:* (a) What is the optimal level of safety stock? (b) What is the probability of stock out?

*Solution*

(a) The normal usage is:

$$\begin{aligned} & [\text{Average daily usage}] [\text{Average lead time in days}] \\ & [2(0.2) + 3(0.6) + 4(0.2)] [25(0.2) + 35(0.5) + 45(0.3)] \\ & = [3.0] [36.0] = 108 \text{ tons} \end{aligned}$$

The possible levels of usage which are higher than 108 tonnes are underlined in the third column of the following table. The safety stock required to meet these levels of usage is shown in the last column of the following table.

The possible levels of usage are shown below:

Daily usage rate	Lead time in days	Possible levels of usage	Safety stock
2	25	50	
	35	70	
	45	90	
3	25	75	
	35	105	27
	45	135	
4	25	100	
	35	140	32
	45	180	72

The stockout cost, carrying cost, and total cost for different levels of safety stock are shown below:

Safety stock (tonnes)	Stockout	Stockout cost (₹)	Probability	Expected stockout cost	Carrying cost	Total cost
72	0	0	0	0	₹ 144,000	₹ 144,000
32	40	₹ 320,000	0.06	₹ 19,200	64,000	83,200
27	45	₹ 360,000	0.06	₹ 21,600	54,000	79,600
0	5	₹ 40,000	0.10	₹ 4,000		
				25,600		
	72	₹ 576,000	0.06	34,560	0	99,040
	32	₹ 256,000	0.10	25,600		
	27	₹ 216,000	0.18	38,880		
				99,040		

The optimal level of safety stock is 27 tons because at that level the cost is minimised.

(b) The probability of stockout when the safety stock is 27 tons is:  $(0.06 + 0.10) = 0.16$

## PROBLEMS

**26.1 EOQ** Modern Electrical Stores is trying to determine the economic order quantity for a certain type of transformer. The firm sells 250 numbers of this transformer annually at a price of ₹ 200 per piece. The purchase price per transformer to the firm is, however, ₹ 150. The cost of carrying a transformer is ₹ 30 per year and the cost of placing an order is ₹ 200.

- (a) What is the total cost associated with placing one, two, five, and ten orders per year?
- (b) What is the economic order quantity?

**26.2 EOQ** Harilal Company requires 10,000 units of a certain item per year. The purchase price per unit is ₹ 25; the carrying cost per year is 25 percent of the inventory value; and the fixed cost per order is ₹ 300.

- (a) Determine the economic order quantity.
- (b) How many times per year will inventory be ordered, if the size is equal to the EOQ?
- (c) What will be the total cost of carrying and ordering inventories when 10 orders are placed per year?

**26.3 EOQ and Quantity Discount** Consider the following data for a certain item purchased by M Limited.

Annual usage	= 6,000 units
Fixed cost per order	= ₹ 400
Purchase price per unit	= ₹ 100
Carrying cost	= 20 percent of inventory value

What is the economic order quantity?

Now, assume that a discount of ₹ 5 per unit is offered if the order size is 1,000 units. Should Magnovex seek the quantity discount?

**26.4 Quantity Discount** Nutan Enterprises requires 5,000 units of a certain item annually. The cost per unit is ₹ 30, the fixed cost per order is ₹ 300, and the inventory carrying cost is ₹ 6 per unit per year.

The supplier offers quantity discount as follows:

Order Quantity	Discount Percentage
1,000	5
2,000	10

What should Nutan Enterprises do?

**26.5 Optimal Safety Stock** Zenith Fabrication Company requires steel for its fabrication work. The probability distributions of the daily usage rate and the

lead time for procurement are given below. These distributions are independent.

<i>Daily usage rate in tonnes</i>	<i>Probability</i>	<i>Lead time in days</i>	<i>Probability</i>
4	.3	5	.6
6	.5	10	.2
8	.2	15	.2

The stockout cost is estimated to be ₹ 4,000 per ton. The carrying cost is ₹ 1,000 per ton per year.

Required: (a) What is the optimal level of safety stock? (b) What is the probability of stockout?

**26.6 ABC Analysis** The information about annual usage and price for 10 items used by a firm is as given here.

<i>Item</i>	<i>Annual Usage (Number of Units)</i>	<i>Price per Unit (₹)</i>	<i>Item</i>	<i>Annual Usage (Number of Units)</i>	<i>Price per Unit (₹)</i>
1	400	20.00	6	1,500	4.00
2	15	150.00	7	1,300	20.00
3	6,000	2.00	8	900	2.00
4	750	18.00	9	1,600	15.00
5	1,200	25.00	10	600	7.50

Required: (a) rank the items on the basis of annual usage value, (b) record the cumulative percentage usage, and (c) classify them into A, B, and C.

## MINICASE

Jitender, a young engineer, is the production manager at RS Castings. The year before last, he had, in anticipation of rising prices, stored quite a lot of the raw material, aluminum utensil scrap. That year the company's profitability had hit a new low and quite a few eyebrows had been raised on his seemingly large holding of raw materials. Last year, the situation was worse, with their incurring a loss due to cancellation of some large orders for which they could not deliver the goods in time. On a few occasions they had to shell out heavy discounts to obtain extra time for delivery. They had then singled him out as the person solely responsible for the whole mess as shortage of the scrap had led to the schedules going astray. Of course, he had been frugal in stocking the raw material, as he had with him expert opinion on impending crash in commodity prices due to the global financial crisis. But none had the time to listen to his explanations. Didn't he know how the marketing boys had to struggle to clinch each order? Didn't he know that the margins were very low and so each order was precious? Ram Saran, the senior partner, however was too experienced to be harsh on poor Jitender as he knew him to be an earnest officer. So he sent him to attend a workshop on inventory management.

Based on his newfound knowledge, Jitender decided to prepare an inventory strategy.

The probability distributions of the daily usage rate and the lead time for procurement are as given below. (These distributions are independent.)

Annual usage = 1,300 tonnes, Fixed cost per order = ₹ 30,000, Purchase price per unit = ₹ 80,000

Daily Usage Rate in Tonnes		Lead Time in Days	
	Probability		Probability
4	0.3	15	0.4
5	0.5	20	0.3
6	0.2	28	0.3

The stockout cost is estimated at ₹ 6,000 per ton and the carrying cost at ₹ 3,000.

He intends to frame his report based on calculations along the following lines:

- (a) What are the possible levels of usage when stockouts are likely to occur?
- (b) What is the optimal level of the safety stock? What is the probability of stockout occurring at that level of safety stock? Will the findings help him to defend himself in any way on his past actions?
- (c) What is the best estimate of the average level of inventory that may be maintained?

What according to you should his report look like?

<sup>1</sup> In-process inventory here refers to work-in-process inventory. It may be distinguished from process or movement inventory mentioned earlier, though a part of work-in-process inventory may represent process or movement inventory.

<sup>2</sup> The basic EOQ model is one of the simplest inventory models. The literature on inventory models is vast. A discussion of the wide range of inventory models based on various assumptions about the state of the world is beyond the scope of this text.

<sup>3</sup> In the basic EOQ model it is assumed that inventory can be obtained without time lag. Hence the possibility of stockout and the costs related thereto do not arise.

<sup>4</sup> To obtain Eq. (26.2) we use the following steps:

$$\frac{dTC}{dQ} = -\frac{UF}{Q^2} + \frac{PC}{2} = 0 \quad (1)$$

$$-2UF + Q^2PC = 0 \quad (2)$$

$$Q^2PC = 2UF \quad (3)$$

$$Q^2 = \frac{2UF}{PC} \quad (4)$$

$$Q = \sqrt{\frac{2UF}{PC}} \quad (5)$$

<sup>5</sup> Order level and reorder level refer to the same thing.

## **Online Resources**

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter26/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter26/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Working Capital Financing

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Measure the cost of trade credit.
- ✓ Describe the ways in which commercial banks provide working capital advance.
- ✓ Calculate the maximum permissible bank finance as per the second method suggested by the Tandon committee.
- ✓ Discuss the features of public deposits, inter-corporate deposits, commercial paper, and factoring.

The investment in raw materials, stock-in-process, finished goods, and receivables (the principal constituents of current assets) often varies a great deal during the course of the year. Hence, the financial manager has to monitor the level of investment in current assets and arrange for the financing of the same.

Typically, current assets are supported by a combination of long-term and short-term sources of finance. Long-term sources of finance, discussed elsewhere in this book, primarily support fixed assets and secondarily provide the margin money for working capital. Short-term sources of finance more or less exclusively support the current assets.

The principal sources of finance for current assets are accruals, trade credit, working capital advance by commercial banks, public deposits, inter-corporate deposits, commercial paper, and factoring. This chapter discusses the characteristics of these sources of finance.

## 27.1 ■ ACCRUALS

The major accrual items are wages and taxes. These are simply what the firm owes to its employees and to the government. Wages are usually paid on a weekly, fortnightly, or monthly basis - between payments, the amounts owed but not yet paid are shown as accrued wages on the balance sheet. Income tax is payable quarterly and other taxes may be payable half-yearly or annually. In the interim, taxes owed but not paid may be shown as accrued taxes on the balance sheet.

Accruals vary with the level of activity of the firm. When the activity level expands, accruals increase and when the activity level contracts accruals decrease. As they respond more or less automatically to changes in the level of activity, accruals are treated as part of spontaneous financing.

Since no interest is paid by the firm on its accruals, they are often regarded as a 'free' source of financing. However, a closer examination would reveal that this may not be so. When the payment cycle is longer, wages may be higher. For example, an employee earning ₹ 2000 per week and receiving weekly payment may ask for a slightly higher compensation if the payment is made monthly. Likewise, when the payment period is longer, tax authorities may raise the tax rates to some extent. Even when such adjustments are made, the fact remains that between established payment dates accruals do not carry any explicit interest burden.

While accruals are a welcome source of financing, they are typically not amenable to any significant control by management. The payment period for employees is determined by the practice in industry and provisions of law. Similarly, tax payment dates are given by law and postponement of payment normally results in penalties.

## 27.2 ■ TRADE CREDIT

Trade credit represents the credit extended by the suppliers of goods and services. It is a spontaneous source of finance in the sense that it arises in the normal transactions of the firm without specific negotiations, provided the firm is considered creditworthy by its supplier. It is an important source of finance representing 25 percent to 50 percent of short-term financing.

**Obtaining Trade Credit** The confidence of suppliers is the key to securing trade credit. What do suppliers look for in granting trade credit? Among the things that suppliers consider are:

- *Earnings record over a period of time* If the firm has a fairly good earnings record with a good portion of it ploughed back in the business, it is looked upon favourably.
- *Liquidity position of the firm* Suppliers naturally look at the ability of the firm to meet its obligations in the short run. Such ability is usually measured by the current ratio and the acid-test ratio.
- *Record of payment* If the firm has been prompt and regular in paying the bulk of the suppliers in the past, it is deemed to be creditworthy.

**Cultivating Good Supplier Relationships** While a well-established, successful enterprise may have no difficulty in obtaining trade credit, a new company or one with financial problems will probably face difficulty in obtaining it. The confidence of suppliers, a pre-condition for obtaining trade credit, can be earned by discussing the financial situation, by showing realistic plans, and, more important, by honouring commitments. The last point, namely, honouring commitments is very important. Broken promises erode confidence more than poor operating results. It is better to make modest commitments which may not be fully satisfying to the supplier and honour them rather than make tall promises, that gratify the supplier, and fail to honour them.

**Cost of Trade Credit** The cost of trade credit depends on the terms of credit offered by the supplier. If the terms are, say, 30 days net, then trade credit is cost-free because the amount payable is the same whether the payment is made on purchase or on the 30th day. However, if the supplier offers discount for prompt payment and the terms are, say, 2/10 net 30, there is a cost associated with trade credit availed beyond the discount

period. In such a case, we may divide the 30-day period into two parts as follows:

10 days	20 days
Discount period	Non-discount period

The cost of trade credit during the discount period is nil. However, if the firm decides to take the additional 20 days credit, it has to pay a finance charge equal to the 2% discount it foregoes. So, the nominal cost, on an annual basis, of not taking discounts, when the terms 2/10, net 30 apply, is:

$$\begin{aligned}\text{Nominal annual cost} &= \frac{\text{Discount percent}}{100 - \text{Discount percent}} \times \frac{365}{\text{Days credit} - \text{Discount period}} \\ &= \frac{2}{98} \times \frac{365}{20} = 2.04\% \times 18.25 = 37.2\%\end{aligned}$$

The nominal annual cost formula does not consider compounding. So, the cost of trade credit in terms of the effective annual interest rate is even higher. In our example, the periodic interest rate is  $.02/0.98 = .0204$  and there are  $365/20 = 18.25$  "interest periods" per year. So the effective annual cost of trade credit is:

$$\text{Effective annual rate} = (1.0204)^{18.25} - 1.0 = 1.4459 - 1.0 = 44.6\%$$

So far we assumed that if the firm does not avail of discount it will pay by the 30th day. What happens if the firm pays late, say on the 50<sup>th</sup> day. In this case the effective interest period would become  $50 - 10 = 40$  and the number of times discount would be foregone in a year would fall to  $365/40 = 9.13$ . Hence, the nominal cost would fall from 37.2% to  $2.04\% \times 9.13 = 18.6\%$ . And the effective annual rate would fall from 44.6% to 20.3%.

$$\text{Effective annual rate} = (1.0204)^{9.13} - 1 = 0.203 \text{ or } 20.3\%$$

From the foregoing discussion two things are clear:

1. In general the cost of trade credit is very high beyond the discount period and unless the firm is hard pressed financially it should not forego the discount for prompt payment.
2. If the firm is unable to avail of the discount for prompt payment, it should delay the payment till the last day of the net period, and even beyond if such an action does not impair the credit worthiness of the firm.

## 27.3 ■ WORKING CAPITAL ADVANCE BY COMMERCIAL BANKS

Working capital advance by commercial banks represents the most important source for financing current assets. This section discusses the following aspects of this source of finance: (i) application and processing, (ii) sanction and terms and condition, (iii) forms of bank finance, (iv) nature of security, and (v) margin amount.

**Application and Processing** A customer seeking an advance is required to submit an appropriate application form and there are different types of application forms for different categories of advances. The information furnished in the application covers, *inter alia*, the following: the name and address of the borrower and his establishment; the details of the borrower's business; the nature and the amount of security offered. The application form has to be supported by various ancillary statements like financial statements and financial projections of the firm.

The application is processed by the credit department of the bank. This primarily involves an examination of the following factors: (i) ability, integrity, and experience of the borrower in the particular business, (ii) general prospects of the borrower's business, (iii) purpose of advance, (iv) requirement of the borrower and its reasonableness, (v) adequacy of the margin, (vi) provision of security, and (vii) period of repayment.

**Sanction and Terms and Conditions** Once the application is duly processed, it is put up for sanction to the appropriate authority. The sanctioning powers of various officials—like Branch Manager, Regional Manager, General Manager, etc—are defined by virtue of the position they occupy.

If the sanction is given by the appropriate authority, along with the sanction of advance the bank specifies the terms and conditions applicable to the advance. These usually cover the following: (i) the amount of loan or the maximum limit of the advance, (ii) the nature of the advance, (iii) the period for which the advance will be valid, (iv) the rate of interest applicable to the advance, (v) the primary security to be charged, (vi) the insurance of the security, (vii) the details of collateral security, if any, to be provided, (viii) the margin to be maintained, and (ix) other restrictions or obligations on the part of the borrower. It is a common banking practice to incorporate

important terms and conditions on a stamped security document to be executed by the borrower. This helps the bank to create the required charge on the security offered and also obligates the borrower to observe the stipulated terms and conditions.

**Forms of Bank Finance** Working capital advance is provided by commercial banks in three primary ways: (i) cash credits/overdrafts, (ii) loans, and (iii) purchase/discount of bills. In addition to these forms of direct finance, commercial banks help their customers in obtaining credit from other sources through the letter of credit arrangement.

**Cash Credits/Overdrafts** Under a cash credit or overdraft arrangement, a pre-determined limit for borrowing is specified by the bank. The borrower can draw as often as required provided the outstanding do not exceed the cash credit/overdraft limit. The borrower also enjoys the facility of repaying the amount, partially or fully, as and when he desires. Interest is charged only on the running balance, not on the limit sanctioned. A minimum charge may be payable, irrespective of the level of borrowing, for availing this facility. This form of advance is highly attractive from the borrower's point of view because while the borrower has the freedom of drawing the amount in installments as and when required, interest is payable only on the amount actually outstanding. This facility, typically sanctioned for a period of one year, is usually renewed each year subject to satisfactory conduct of the account.

**Loans** These are advances of fixed amounts which are credited to the current account of the borrower or released to him in cash. The borrower is charged with interest on the entire loan amount, irrespective of how much he draws. In this respect this system differs markedly from the overdraft or cash credit arrangement wherein interest is payable only on the amount actually utilised. Loans are payable either on demand or in periodical installments. When payable on demand, loans are supported by a demand promissory note executed by the borrower. There is often a possibility of renewing the loan.

**Purchase/Discount of Bills** Bills are of two types : commercial bills and accommodation bills. A commercial bill arises out of a trade transaction, whereas an accommodation bill is created to raise short-term funds and is not backed by a trade transaction. Our discussion relates to commercial bills. A bill arises out of a trade transaction. The seller of goods draws the bill on the purchaser. The bill may be either clean or documentary (a

documentary bill is supported by a document of title to goods like a railway receipt or a bill of lading) and may be payable on demand or after a usance period. Unless the buyer is a top rated party, the usual procedure is as follows: The seller's bank purchases/discounts the bill and sends it to the buyer's bank for collection. The buyer's bank releases the documents to the buyer on receipt of payment in case of a demand bill or on the buyer accepting to pay on due date, in case of a usance bill, which does not usually exceed 90 days. On acceptance of the bill by the purchaser, the seller offers it to the bank for discount/purchase. When the bank discounts/purchases the bill it releases the funds to the seller. The bank presents the bill to the purchaser (the acceptor of the bill) on the due date and gets its payment.

**Letter of Credit** A letter of credit is an arrangement whereby a bank helps its customer to obtain credit from its (customer's) suppliers. When a bank opens a letter of credit in favour of its customer for some specific purchases, the bank undertakes the responsibility to honour the payment obligation of its customer, should the customer fail to do so. To illustrate, suppose a bank opens a letter of credit in favour of A for some purchases that A plans to make from B. If A does not make payment to B within the credit period offered by B, the bank assumes the liability of A for the purchases covered by the letter of credit arrangement. Naturally, B would have less hesitation to extend credit to A when a bank opens a letter of credit in favour of A. It is clear from the preceding discussion that under a letter of credit arrangement the credit is provided by the supplier but the risk is assumed by the bank which opens the letter of credit. Hence, this is an indirect or non-fund based form of financing as against overdraft, cash credit, loans, and bill purchasing/discounting which are direct forms of financing. Note that in direct financing the bank assumes risk as well as provides financing.

**Bank Guarantee** A bank guarantee, like a letter of credit, is a non-fund based form of working capital financing. A bank guarantee is obtained by a buyer or seller to reduce the risk of loss to the opposite party due to non-performance of the agreed task. For example a buyer (B1), who is buying some product from a seller (S1), may obtain a bank guarantee and give to the seller (S1) to protect the seller from the risk of nonpayment. Likewise the seller (S1) may obtain a bank guarantee and give it to the buyer (B1) and protect him from the risk of getting lower quality goods or delayed delivery of goods. A bank guarantee can be revoked by the holder only in

the event of non-performance by the counter-party. To provide the bank guarantee, the bank charges a commission and may also ask for security.

**Security** For working capital advances, commercial banks seek security either in the form of hypothecation or in the form of pledge.

- *Hypothecation* Under this arrangement, the owner of the goods borrows money against the security of movable property, usually inventories. The owner does not part with the possession of property. The rights of the lender (hypothecatee) depend upon the agreement between the lender and the borrower (hypothecator). Should the borrower default in paying his dues, the lender (hypothecatee) can file a suit to realise his dues by selling the goods hypothecated.
- *Pledge* In a pledge arrangement, the owner of the goods (pledgor) deposits the goods with the lender (pledgee) as security for the borrowing. Transfer of possession of goods is a precondition for pledge. Possession of goods could be actual or constructive. An example of constructive possession is when the goods are stored in a secure godown of the borrower but the same is locked by the bank with its own locks. The lender (pledgee) is expected to take reasonable care of goods pledged with him. The pledge contract gives the lender (pledgee) the right to sell goods and recover dues, should the borrower (pledgor) default in paying debt.

**Margin Amount** Banks do not provide hundred percent finance. They insist that the customer should bring a portion of the required finance from own sources. This portion is known as the margin amount. How is the margin amount established? While there is no fixed formula for determining the margin amount, the following guideline is broadly observed: ‘Usually the margin is kept higher for raw materials and lower for accounts receivable.’

## 27.4 ■ REGULATION OF BANK FINANCE

Concerned about such a distortion in credit allocation, the Reserve Bank of India (RBI) has been trying, particularly from the mid-1960s onwards, to bring a measure of discipline among industrial borrowers and to redirect credit to the priority sectors of the economy. From time to time, the RBI has been issuing guidelines and directives to the banking sector toward this end. These have stemmed from the recommendations of specially constituted groups. The following committees have significantly shaped the regulation of bank finance for working capital in India: the Dahejia Committee, the Tandon Committee, the Choure Committee, and the Marathe Committee. The key elements of regulation are discussed below.

**Norms for Inventory and Receivables** In the mid-1970s, the RBI accepted the norms for raw materials, stock-in-progress, finished goods, and receivables that were suggested by the Tandon Committee for fifteen major industries. These norms were based, *inter alia*, on company finance studies made by the Reserve Bank of India, process periods in different industries, discussions with industry experts, and feedback received on the interim reports. These norms represented the maximum levels for holding inventory and receivables in each period.

From the mid-1980s onwards, special committees were set up by the RBI to prescribe norms for several other industries and revise norms for some industries covered by the Tandon Committee. However, in the wake of liberalisation, banks have been freed from RBI-prescribed norms. Nevertheless, most banks seem to take into account the maximum permissible bank finance under the second method of Tandon Committee.

**Maximum Permissible Bank Finance** The Tandon Committee had suggested three methods for determining the maximum permissible bank finance (MPBF). To describe these methods, the following notation is used.

CA = current assets as per the norms laid down

CL = non-bank current liabilities like trade credit and provisions

CCA = core current assets - this represents the permanent component of working capital

The methods for determining the MPBF are described below:

Method 1	$MPBF = 0.75 (CA - CL)$
Method 2	$MPBF = 0.75 (CA) - CL$
Method 3	$MPBF = 0.75 (CA - CCA) - CL$

To illustrate the calculation of the MPBF under the three methods, consider the data for Ambex Company:

<i>Current Assets<sup>1</sup></i>	₹ (in millions)
Raw material	18
Work-in-process	5
Finished goods	10
Receivables (including bills discounted)	15
Other current assets	2
<b>Total</b>	<b>50</b>

<i>Current Liabilities</i>	
Trade creditors	12
Other current liabilities	3
Bank borrowings (including bills discounted)	25
<b>Total</b>	<b>40</b>

The MPBF for Ambex Company as per the three methods is as follows:

Method 1	$0.75 (CA - CL) = 0.75 (50 - 15)$	= ₹ 26.25 million
Method 2	$0.75 (CA) - CL = 0.75 (50) - 15$	= ₹ 22.5 million
Method 3	$0.75 (CA - CCA) - CL = 0.75 (50 - 20)$	= ₹ 7.5 million

The second method is informally followed by many banks. Note that under this method the minimum current ratio works out to be 1.33. An example will illustrate this point. Suppose the current assets and current liabilities (excluding bank finance) for a firm are 100 and 50 respectively. The MPBF will be:

$$0.75 (CA) - CL = 0.75 (100) - 50 = 25$$

This means that the current liabilities including MPBF will be:  $50 + 25 = 75$ . Hence, the current ratio works out to  $100/75 = 1.33$ .

## **Other Methods for Assessing Working Capital Requirements**

Apart from the maximum permissible bank finance (MPBF) method, two other methods are used for assessing the working capital financing need: turnover method and cash flow method.

**Turnover Method** The experience with the MPBF method suggested that small scale industries (SSIs) were not able to get adequate bank finance as many of them were not able to bring in 25 percent of their current asset requirement from long-term sources of finance. To address their problems, the turnover method was introduced, on the recommendations of the Nayak Committee. Under this method, the working capital requirement is assessed at 25 percent of the annual turnover (sales) and the borrower is expected to bring in 5 percent of the turnover. For example, if a company projects a turnover of ₹ 20 crore for the following year, the working capital requirement is estimated at ₹ 5 crore (25% of ₹ 20 crore) and the borrower is required to bring in ₹ 1 crore (5% of ₹ 20 crore). The working capital finance by the banks is limited to ₹ 4 crore (20% of the projected turnover).

**Cash Budget Method** A cash budget shows the projected opening cash balance, inflows, outflows, and closing cash balance, month by month, for the next year. It indicates when cash deficits would occur. Based on this, the bank may set the working capital limit equal to the peak deficit. However, the amount allowed to be drawn is limited to the actual deficit.

**Forms of Assistance** Traditionally, bank credit to industry has been mainly in the form of cash credit which was introduced by the Scottish bankers. Under the cash credit system, the bank bears the responsibility of cash management because the borrowers have the freedom to determine their drawals within the cash credit limit provided by the bank.

With a view to bringing about a better discipline in the utilisation of bank credit, in 1995 a “loan” system for delivery of bank credit was introduced. Under the new dispensation, within the MPBF so arrived at in terms of the extant guidelines, banks/consortia/syndicates are required to restrict sanction of cash credit limits to borrowers up to a certain portion (which is currently 25 percent)<sup>3</sup> of the MPBF. Where borrowers desire to avail of bank credit for the balance portion (which is currently 75 percent) of the MPBF, or any part thereof, this will be considered on merit by banks/consortia/syndicates in the form of a short-term loan (or loans) repayable on demand for working capital purpose for a stipulated period. Banks/consortia/syndicates will have the discretion to stipulate repayment of the short-term loan for working capital purposes by a borrower in instalments or by way of a “bullet” or “balloon” payment. In case the loan is repaid before the due date, it will be credited to the cash credit account.

**Information and Reporting System** The current information and reporting system followed by banks has been shaped largely by the Chore Committee recommendations. Its key components are as follows:

1. *Quarterly Information System—Form I* This gives (i) the estimates of production and sales for the current year and the ensuing quarter, and (ii) the estimates of current assets and liabilities for the ensuing quarter.
2. *Quarterly Information System—Form II* This gives (i) the actual production and sales during the current year and for the latest completed year, and (ii) the actual current assets and liabilities for the latest completed quarter.
3. *Half-yearly Operating Statements—Form III* This gives the actual operating performance for the half-year ended against the estimates for the same.
4. *Half-yearly Funds Flow Statement—Form IIIB* This give the sources and uses of funds for the half-year ended against the estimates for the same.

The thrust of the information and reporting system is (i) to strengthen the partnership between the borrower and the banker, (ii) to give the banker a deeper insight into the operations and funds requirements of the borrower, and (iii) to enable the banker to monitor closely the performance and efficiency of the borrower.

**Credit Monitoring** Based largely on the recommendations of the Marathe Committee, the RBI replaced its Credit Authorisation Scheme by its Credit Monitoring Arrangement in 1988. Under this, the RBI does post-sanction scrutiny of working capital limits provided by banks beyond the prescribed cut-off levels. The key issues examined in this scrutiny are:

- Whether the minimum current ratio is 1.33?
- Whether the estimate of sales, production, profit, current assets, and current liabilities are in line with past trends? If they differ, what is the justification for the deviation?
- Whether the unit has complied with the Chore Committee information system requirements?
- Whether the renewals of limits is in time?
- Whether the bank is following the norms for inventory and receivables prescribed by the RBI Standing Committee? If the bank has a different set of norms, what is the justification for the same?

## 27.5 ■ PUBLIC DEPOSITS

Many firms, large and small, have solicited unsecured deposits from the public in recent years, mainly to finance their working capital requirements.

**Cost** The interest rate payable on public deposits was subject to a ceiling till mid-1990s. Just before the ceiling was withdrawn, it was 15 percent. Companies typically offer an interest rate varying between 8 to 12 or even more percent depending on the tenor of the deposit.

**Regulation** The regulation of public deposits underwent an overhaul with the introduction of stringent regulations under The Companies Act 2013. Chapter V of the new Act under Section 73 provides for several new requirements read with the rules framed thereunder. The important features of this regulation are:

1. Public deposits cannot exceed 25 percent of share capital and free reserves.
2. The maximum maturity period allowed for public deposits is 3 years and the minimum is 6 months. For Non-banking Financial Corporations (NBFCs), however, the maximum permitted maturity period is 5 years.
3. A company which has public deposits is required to set aside, as deposit or investment, by 30<sup>th</sup> April of each year, an amount equal to 15 percent of the deposits maturing by 31<sup>st</sup> March of the following year. The amount which shall be called a deposit reserve shall be deposited in a scheduled bank and can be used only for repaying such deposits.
4. A company inviting deposits from the public is required to disclose certain facts about its financial performance and position.
5. The company has to issue a circular to all its members disclosing its financial position, credit rating, details regarding existing deposits and other particulars as prescribed.
6. The company has to provide for deposit insurance.
7. The company has to provide security, if any, to secure the repayment of the deposits.

**Evaluation** From the point of view of the company, public deposits offer the following advantages:

- The procedure for obtaining public deposits is fairly simple.
- No restrictive covenants are involved.
- No security is offered against public deposits. Hence the mortgageable assets of the firm are conserved.
- The post-tax cost is fairly reasonable.

The demerits of public deposits are:

- The quantum of funds that can be raised by way of public deposits is limited.
- The maturity period is relatively short.

From the point of view of investors, public deposits have the following advantages:

- The rate of interest is higher than several alternative forms of financial investment.
- The maturity period is fairly short - one to three years.

The disadvantages of public deposits are as follows:

- There is no security offered by the company.
- The interest on public deposits is not exempt from taxation.

## 27.6 ■ INTER-CORPORATE DEPOSITS

A deposit made by one company with another, normally for a period up to six months, is referred to as an inter-corporate deposit. Such deposits are usually of three types:

*Call Deposits* In theory, a call deposit is withdrawable by the lender on giving a day's notice. In practice, however, the lender has to wait for at least three days.

*Three-months Deposits* More popular in practice, these deposits are taken by borrowers to tide over a short-term cash inadequacy that may be caused by one or more of the following factors : disruption in production, excessive imports of raw material, tax payment, delay in collection, dividend payment, and unplanned capital expenditure.

*Six-months Deposits* Normally, lending companies do not extend deposits beyond this time frame. Such deposits, usually made with first-class borrowers, carry an interest rate that is higher.

**Characteristics of the Inter-Corporate Deposit Market** It may be of interest to note the following characteristics of the inter-corporate deposit market.

*Lack of Regulation* The lack of legal hassles and bureaucratic red tape makes an inter-corporate deposit transaction very convenient. In a business environment otherwise characterised by a plethora of rules and regulations, the evolution of the inter-corporate deposit market is an example of the ability of the corporate sector to organise itself in a reasonably orderly manner.

*Secrecy* The inter-corporate deposit market is shrouded in secrecy. Brokers regard their lists of borrowers and lenders as guarded secrets. Tightlipped and circumspect, they are somewhat reluctant to talk about their business. Such disclosures, they apprehend, would result in unwelcome competition and undercutting of rates.

*Importance of Personal Contacts* Brokers and lenders argue that they are guided by a reasonably objective analysis of the financial situation of the borrowers. However, the truth is that lending decisions in the inter-corporate deposit markets are based on personal contacts and market information

which may lack reliability. Given the secrecy that shrouds this operation and the non-availability of hard data, can it be otherwise?

## **27.7 ─ WORKING CAPITAL FINANCE BY FINANCIAL INSTITUTIONS**

Financial institutions extend working capital finance on a very selective basis to borrowers enjoying credit limits with banks, whether under a consortium or under multiple banking arrangement, when the banks are not in a position to meet the credit requirements of the borrowers concerned on account of temporary liquidity constraints.

## **27.8 ■ RIGHTS DEBENTURES FOR WORKING CAPITAL**

Public limited companies can issue “rights” debentures to their shareholders with the object of augmenting the long-term resources of the company for working capital requirements. The key guidelines applicable to such debentures are as follows:

- The amount of the debenture issue should not exceed (a) 20 percent of the gross current assets, loans, and advances minus the long-term funds presently available for financing working capital, or (b) 20 percent of the paid-up share capital, including preference capital and free reserves, whichever is the lower of the two.
- The debt equity ratio, including the proposed debenture issue, should not exceed 1:1.
- The debentures shall first be offered to the existing Indian resident shareholders of the company on a pro rata basis.

## 27.9 ■ COMMERCIAL PAPER

Commercial paper represents short-term unsecured promissory notes issued by firms which enjoy a fairly high credit rating. Generally, large firms with considerable financial strength are able to issue commercial paper. The important features of commercial paper are as follows:

- The maturity period of commercial paper ranges from 90 to 180 days.
- Commercial paper is sold at a discount from its face value and redeemed at its face value. Hence the implicit interest rate is a function of the size of the discount and the period of maturity.
- Commercial paper is generally placed with investors who intend holding it till its maturity. Hence there is no well developed secondary market for commercial paper.

**Regulation** Since commercial paper represents an unsecured instrument of financing, the Reserve Bank of India has stipulated certain conditions meant primarily to ensure that only financially strong companies can issue commercial paper. According to these conditions, a company can issue commercial paper provided:

- It has a tangible net worth of at least ₹ 40 million.
- It can be issued in denominations of ₹ 5 Lakh or multiples thereof.
- The issuer should have working capital limits sanctioned by financing bank/institution/s.
- Its equity is listed on a stock exchange.
- Its commercial paper receives a minimum rating of P2 from CRISIL or equivalent thereof.
- It is classified as a standard asset by the financing bank/institution.
- The minimum maturity period is 7 days and the maximum one year.

**Effective Cost** Commercial paper is sold at a discount from its face value and redeemed at its face value. Hence, the effective pre-tax cost of commercial paper is:

$$\left( \frac{\text{Face value} - \text{Net amount realised}}{\text{Net amount realised}} \right) \left( \frac{360}{\text{Maturity period}} \right)$$

To illustrate the calculation consider the following example:

Face value	: ₹
	500,000

Maturity period : 180 days  
Net amount realised : ₹  
480,000

The pre-tax effective cost of commercial paper in this case works out to:

$$\left( \frac{500,000 - 480,000}{480,000} \right) \left( \frac{360}{180} \right) = 8.33 \text{ percent}$$

## 27.10 ■ FACTORING

A factor is a financial institution which offers services relating to management and financing of debts arising from credit sales. While factoring is well-established in Western countries, only a few banks/institutions are offering this facility in India.

**Features of a Factoring Arrangement** The key features of a factoring arrangement are as follows:

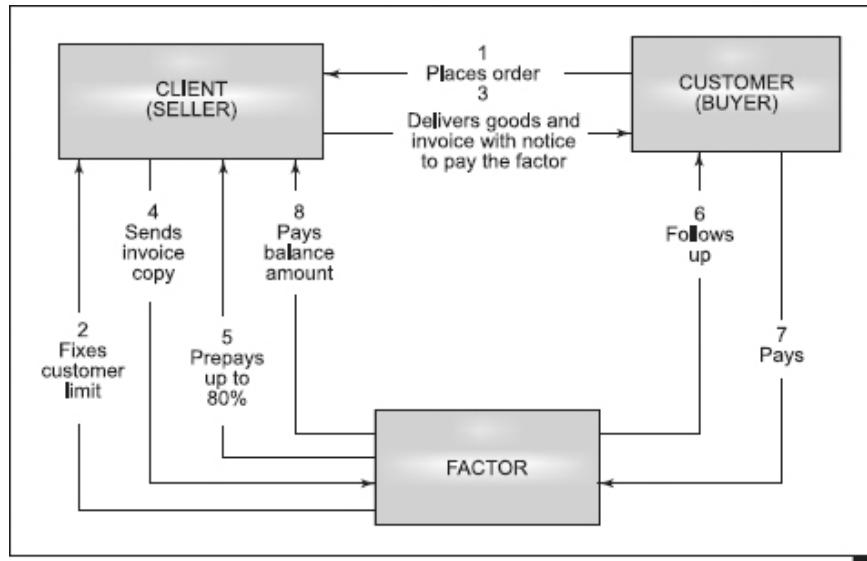
- The factor selects the accounts of the client that would be handled by it and establishes, along with the client, the credit limits applicable to the selected accounts.
- The factor assumes responsibility for collecting the debt of accounts handled by it. For each account, the factor pays to the client at the end of the credit period or when the account is collected, whichever comes earlier.
- The factor advances money to the client against not-yet-collected and not-yet-due debts. Typically, the amount advanced is 70 to 80 percent of the face value of the debt and carries an interest rate which may be equal to or marginally higher than the lending rate of commercial banks.
- Factoring may be on a recourse basis (this means that the credit risk is borne by the client) or on a non-recourse basis (this means that the credit risk is borne by the factor). Generally, factoring in India is done on a recourse basis.
- Besides the interest on advances against debt, the factor charges a commission which may be 1 to 2 percent of the face value of the debt factored.

The mechanics of factoring are illustrated in [Exhibit 27.1](#).

**Evaluation** Factoring offers the following advantages which makes it quite attractive: (i) Factoring ensures a definite pattern of cash inflows from credit sales. (ii) Continuous factoring may virtually eliminate the need for the credit and collection department. As against these advantages, the limitations of factoring are: (i) The cost of factoring tends to be higher than the cost of other forms of short-term borrowing. (ii) Factoring of debt may be perceived as a sign of financial weakness.

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## Exhibit 27.1 | Mechanics of Factoring



## SUMMARY

- Typically, the current assets of the firm are supported by a combination of long-term and short-term sources of financing. The following sources of finance more or less exclusively support current assets: **accruals, trade credit, working capital advance** by commercial banks, **public deposits, inter-corporate deposits, short-term loans** from financial institutions, **rights debentures for working capital, commercial paper, and factoring**.
- The major **accrual items** are **wages** and **taxes**.
- The **cost of trade credit** depends on the terms of credit offered by the supplier. When the supplier offers discount for prompt payment, trade credit availed beyond the discount period is quite costly.
- Working capital advance by commercial banks is provided in three primary ways: (i) **cash credits/overdrafts**, (ii) **loans**, and (iii) **purchase/discount of bills**. For working capital advances, commercial banks seek security either in the form of **hypothecation** or in the form of **pledge**.
- In the wake of financial liberalisation, the RBI has given freedom to the boards of individual banks in all matters relating to working capital financing. Notwithstanding this freedom, the practices in most of the banks are still based largely on the erstwhile regulatory framework of RBI.
- **Commercial paper** represents short-term unsecured promissory notes issued by firms which enjoy a fairly high credit rating. **Factoring** involves sale of accounts receivable to a factor who charges a commission and may or may not bear the credit risks associated with the accounts receivable purchased by it.

## QUESTIONS

1. Enumerate the various sources of finance which more or less exclusively support current assets.
2. Accruals are a free source of finance. Comment.
3. What do suppliers look for in granting trade credit?
4. How would you calculate the cost of trade credit?
5. What are the factors examined by a bank while processing an application for working capital advance?
6. Discuss the important forms of working capital advance given by banks.
7. Explain the letter of credit arrangement.
8. What is the kind of security usually required by banks for working capital advance?
9. What is the main feature of the “loan” system for bank credit?
10. Describe the key components of the information and reporting system followed by banks.
11. What issues are examined in the post-sanction scrutiny done by the RBI under the Credit Monitoring Arrangement?
12. What regulations apply to public deposits?

## SOLVED PROBLEMS

- 27.1 What is the annual percentage interest cost associated with the following credit terms?
- (i) 2/20 net 50
  - (ii) 2/15 net 40
  - (iii) 1/15 net 30
  - (iv) 1/10 net 30

Assume that the firm does not avail of the cash discount but pays on the last day of the net period. Assume 360 days to a year.

*Solution*

$$\text{Cost} = \frac{\text{Discount \%}}{1 - \text{Discount \%}} \times \frac{360}{\text{Credit period} - \text{Discount period}}$$

$$(i) \quad \frac{0.02}{0.98} \times \frac{360}{50 - 20} = 24.5\% \quad (ii) \quad \frac{0.02}{0.98} \times \frac{360}{40 - 15} = 29.4\%$$

$$(iii) \quad \frac{0.01}{0.99} \times \frac{360}{30 - 15} = 24.2\% \quad (iv) \quad \frac{0.01}{0.99} \times \frac{360}{30 - 10} = 18.2\%$$

- 27.2 Consider the data for Amit & Co.

<i>Current Liabilities</i>		<i>Current Assets</i>	<i>₹ (in million)</i>
Trade creditors	40	Inventories	70
Provisions	20	Debtors	60
	<u>60</u>	Cash	<u>15</u>
		Others	<u>145</u>

What is the maximum permissible bank finance (MPBF) for Amit & Co. under the second method suggested by the Tandon Committee? Assume that the core current assets (CCA) for Amit & Co. are ₹ 60 million.

*Solution*

$$\text{MPBF} = 0.75(\text{CA}) - \text{CL} = 0.75(145) - 60 = ₹ 48.75 \text{ million}$$

## PROBLEMS

**27.1 Interest Cost** What is the annual percentage interest cost of the following credit terms?

- (a) 1/10 net 30    (b) 2/10 net 30    (c) 3/10 net 45    (d) 1/5 net 15

Assume that the firm does not avail of the cash discount but pays on the last day of the net period.

**27.2 Interest Cost** Calculate the annual percentage interest cost of various terms in problem 1 above, assuming that it is possible to stretch payment 15 days beyond the net period.

**27.3 Maximum Permissible Bank Finance** Consider the data for Dattatreya Company.

<i>Current assets</i>	<i>₹ (in million)</i>
Raw material	16
Work-in-process	6
Finished goods	12
Other current assets	2
	36

### *Current liabilities*

Trade creditors	10
Bank borrowing (including Bills Discounted)	18
Other current liabilities	2
	30

What is the maximum permissible bank finance for Dattatreya Company under the three methods suggested by the Tandon Committee? Assume that the core current assets for Dattatreya Company are ₹ 18 million.

## MINICASE

For the young Suresh Pai, it couldn't have been more hectic than what had happened in the last one week. Within two days of completing his management course in finance he had attended an interview at a leading commercial bank, got selected on the spot, and got orders to immediately report to a mid sized branch at Kanpur as a credit officer. On reporting there he had hoped to get at least some brief training or guidance on bank credit matters. But to his utter surprise, even before he had finished admiring his new executive chair, a customer has hurried up to him with his business concerns. It has taken a few minutes for Suresh to gather his wits, and go through a very short and silent prayer before he could focus on what the customer was talking about!

The customer has submitted a letter seeking an immediate enhancement of his working capital limit from the current ₹ 140 lacs to ₹ 200 lacs. The letter is accompanied by financial statements with figures for the last two years and projections for the current year as shown in the exhibits below. When he tells him that it would take at least a week for him to process the request, the borrower gives signs of losing his patience. He comes to know that his predecessor had been delaying the processing of the borrower's request on one pretext or the other. A man for all occasions, Suresh gets ready for the challenge. He assures the borrower that he would look into the papers and that he could call on him the next day for an update on this matter. Soon he finds out that there is none he could ask for any guidance on the processing as all others including the branch head are only marketing people. In the evening he carries with him the file on the borrower and also the recent bank circulars issued by the credit department. In the quiet of his hotel room he goes through these and also refers to his old text book which he has carried with him as if on premonition! He finds that it is the policy of the bank to use only the second method of lending (as suggested by Tandon Committee) for appraisal of requests for working capital advances of over rupees one crore to a manufacturing concern. It is also mentioned that any exceptions thereto should be made only if the value of the customer dictates otherwise and even in such cases approval has to be obtained from their head office.

From the borrower's file he finds that the limits sanctioned to him are subject to the following norms:

'In assessing the working capital advance the bank will follow the average holding levels prevalent in their industry, which as updated on 1-4-20X1 are as follows:

Maximum holding level for raw materials and stores: 3 months of consumption, for work-in-process: 0.5 months of cost of production, for finished goods: 2 months of cost of sales, for receivables: 3 months of net sales. As to trade credit, the norm is 2 months purchase or the actual credit period enjoyed, whichever is higher. The level of other current assets may be set at 3 percent of the rest of the current assets.'

He also notes a recent remark in the file by the branch head that while all the borrowings of this customer is with their bank, all his family deposits continue to be maintained with another bank.

He decides to work out the following, to enable him to make suitable recommendations to the branch head:

1. The holding levels for raw materials, work-in-process, finished goods, debtors and creditors as seen from the borrower's own projections.
2. MPBF under the second method of lending as per the norms set by the bank.
3. Whether to recommend any increase in the present working capital limit of ₹ 140 lacs or not and if the latter, how to explain the reasons to the customer and the course of action desired by the bank.

Show his calculations and recommendations.

Balance Sheet <i>Liabilities</i> ₹ in Lakhs)			Profit and Loss Account ₹ in Lakhs)				
	31/3/20X0	31/3/20X1	31/3/20X2 (Projected)	For the year ending	31/3/20X0	31/3/20X1	31/3/20X2 (Projected)
Share capital	300	300	300	Net sales	540	600	700
Reserves	100	160	200	Cost of goods sold	270	320	380
Term loans	130	140	160	RM and stores consumed	120	150	180
Trade creditors	80	90	130	Power and fuel	35	42	50
Bank borrowings	120	140	200	Repairs and maintenance	33	26	20
	730	830	990	Direct labour	50	64	80
				Depreciation	20	22	30
				Other manufacturing expenses	12	16	20
Assets			Gross Profit	270	280	320	
	31/3/20X0	31/3/20X1	31/3/20X2 (Projected)	General administration and selling expenses	20	28	40
Fixed assets	470	530	600	Operating profit	250	252	280
Receivables	140	170	240	Non-operating surplus/deficit	(2)	(8)	---
Inventory	110	120	130	Profit before interest and tax	248	244	280
Raw materials	40	50	60	Interest	20	30	50
Work-in-process	10	10	20	Profit before tax	228	214	230
Finished goods	60	60	50	Provision for tax	68	64	70
Other current assets	10	10	20	Profit after tax	160	150	160
	730	830	990	Dividends	120	90	120

## Appendix 27A

### Bank Lending Rates in India

In 1994, when the lending interest rates were deregulated, RBI prescribed that banks should disclose their prime lending rate (PLRs), the interest rate charged for the most creditworthy borrowers.

Based on the request received from banks that the PLR should be converted into a reference or benchmark rate, RBI advised banks in April 2003 to announce a Benchmark PLR (BPLR) with the approval of their boards. Due to the dominance of sub-PLR lending, the very purpose for which the BPLR was introduced was defeated.

In July 2010, RBI replaced the BPLR system with the base rate system, under which the actual lending rate charged to borrowers was the base rate plus borrower-specific charges.

To improve the transmission of monetary policy, effective April 1, 2016, RBI instituted a new lending rate system for banks, the marginal cost based lending rate (MCLR) system. Unlike the BPLR and the base rate which were internal benchmarks set by each bank, the formula for computing the MCLR was prescribed by the RBI. A comparison of the base rate system and MCLR system follows:

<b>Base Rate System (effective July 1, 2010)</b>	<b>MCLR System (effective April 1, 2016)</b>
(a) Cost of (Borrowed) Funds	(a) Marginal Cost of Funds [= 92% of Marginal Cost of Deposits and Other Borrowings + 8% of Return on Net Worth]
(b) Negative Carry on cash reserve ratio (CRR)/statutory liquidity ratio (SLR)	(b) Negative Carry on CRR
(c) Unallocatable Overhead Cost	(c) Operating Cost
(d) Average Return on Net Worth	(d) Tenor Premium/Discount
<b>Base Rate = a + b + c + d</b>	<b>MCLR = a + b + c + d</b>
■ One base rate for each bank	■ Tenor-linked benchmark
■ Any benchmark could be used	■ No discretion allowed on benchmark

■ Frequency: Quarterly review with Board's approval	■ Frequency: Monthly on a pre-announced date
■ No prescribed reset period	■ Reset period indicated in contract. Maximum one year reset period for floating rate loans
■ Fixed rate loan – not below base rate	■ Fixed rate loan over 3 year tenor – exempt from MCLR

- 
- 1 Calculated on the basis of the study group norms or past levels, whichever are lower.
- 2 The core current assets for Ambex Company are assumed to be ₹ 20 million.
- 3 The intent of RBI is to lower this further in the future.

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter27/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter27/index.html)

- Additional Self-Test Problems
- Additional Solved Problems
- Excel on Solved Problems
- Answer Key



## Working Capital Management: Extensions

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe the procedure for cash budget simulation.
- ✓ Do discriminant analysis for customer classification.
- ✓ Explain the concept of working capital leverage.

A variety of advanced concepts and techniques have been suggested for managing different facets of the working capital. These have emanated in different disciplines like economics, operations research, production management, statistics, and computer sciences.

A comprehensive exposition of these concepts and techniques is beyond the scope of this book (as well as the competence of the author). However, what is attempted here is a discussion of some selected topics which are relatively more important from the practical point of view.

## **28.1 ■ CASH BUDGET SIMULATION**

Typically, the cash budget prepared by a business firm is based on single value estimates of various factors like sales, distribution of sales between cash and credit sales, collection pattern of receivables, purchases, distribution of purchases between cash and credit purchases, payment terms for credit purchases, expenses relating to labour and overheads, payment on account of dividends and taxes, borrowings, capital expenditure outlays, etc.

The financial manager, responsible for the preparation of the cash budget, is aware that some of these factors are subject to considerable variability. Hence, realism demands that the impact of variability characterising these factors is properly examined. For this purpose, the technique of simulation may be employed.

## Procedure for Simulation

The procedure for simulation consists of three broad phases:

1. *Model Development* In this phase the model showing how the cash balances are determined by the parameters and exogenous variables is developed. (Parameters are input variables which are held constant over all simulation runs. Exogenous variables are input variables which are stochastic in nature and beyond the control of the firm.)
2. *Specification of Probability Distributions of Exogenous Variables*  
The probability distributions of exogenous variables are essentially based on the judgment of experts — it must be borne in mind that often it is impossible to find the true distributions.
3. *Running the Model* Once the model is developed and the probability distributions of exogenous variables specified, simulation can be carried out. It involves choosing values at random from the probability distributions of exogenous variables and calculating their effect on the cash balance. This is normally done many times — three hundred to one thousand times. Naturally, such tedious and cumbersome computations are done on the computer.

## **Advantages of Simulation**

Simulation offers several advantages to the financial manager:

1. It helps the financial manager to develop an informed judgment about the expected value and the variability of cash balance at the end of each period. This information enables the financial manager to plan for raising/deploying of cash.
2. It may be used to evaluate the consequences of alternative financial policies. Simulation helps in learning about the impact of different financial policies on the cash balances fairly efficiently and quickly. The financial manager can obtain answers to questions like:
  - What happens if all sales are made on a 'cash and carry' basis?
  - What happens if only 25 percent of the sales are made on a 'credit' basis?
3. It is a powerful tool to assess the outcome of changes in exogenous variables.
4. It aids the financial manager in assessing the value of information. For running the simulation model, several inputs like the probability distribution of sales, estimated selling price, proportion of cash and credit sales, and pattern of collection of receivables are required. How much time and effort should be spent in generating estimates for these inputs? This question can be answered intelligently only when we know how sensitive the cash balances are to variations in the values of these inputs. Through simulation, the sensitivity of the cash balances to variations in the values of these inputs can be assessed and, as a result, the critical inputs may be separated from the non-critical inputs. Clearly, greater resources must be allocated for obtaining better estimates of the critical inputs because of the higher informational value associated with them.

## **28.2 ■ DISCRIMINANT ANALYSIS AND CUSTOMER CLASSIFICATION**

Discriminant analysis is a statistical tool helpful for classification purposes. It has applications in several areas of financial analysis. For example, it can be used for:

- Classifying customers into two categories, good or bad, on the basis of certain financial ratios.
- Classifying firms into two categories, sick or non-sick, on the basis of certain financial characteristics.

To convey a basic understanding of discriminant analysis, we shall employ the following assumptions:

- There are two discrete groups (group 1 and group 2).
- Two variables combined in a linear manner would be used for discriminating between the two discrete groups (This means that the discriminant function will be  $Z_i = aX_i + bY_i$ ).
- These two variables arise from multivariate normal populations. While the means of the two variables in each group are different, their variance/covariance matrix is identical for each group.

## Procedure for Discriminant Analysis

Given the above assumptions, the steps involved in discriminant analysis are as follows:

1. Estimation of the discriminant function
2. Choice of the cutoff point for the discriminant function
3. Examination of the predictive ability of the discriminant function

**Estimation of the Discriminant Function** The discriminant function ( $Z_i = aX_i + bY_i$ ) which best distinguishes between the two groups (group 1 and group 2) is obtained by maximising the following ratio:

$$G = \frac{(\bar{Z}_1 - \bar{Z}_2)^2}{\sum_{i=1}^{n_1} (Z_i - \bar{Z}_1)^2 + \sum_{i=1}^{n_2} (Z_i - \bar{Z}_2)^2} \quad (28.1)$$

where  $\bar{Z}_1$  is the mean value of the Z scores in group 1,  $\bar{Z}_2$  is the mean value of the Z scores in group 2,

$\sum_{i=1}^{n_1} (Z_i - \bar{Z}_1)^2$  is the sum of squares of deviations in group 1 and,

$\sum_{i=1}^{n_2} (Z_i - \bar{Z}_2)^2$  is the sum of squares of deviations in group 2

In the ratio given in Eq. (28.1), the numerator represents the ‘between’ group sum of squares of  $Z_i$  scores and the denominator represents the ‘within’ group sum of squares of the  $Z_i$  scores. For maximising the ratio, given in Eq. (28.1), we set its partial derivatives with respect to  $a$  and  $b$  (the two parameters of the discriminant function) equal to 0. By doing this, we get the following normal equations:

$$a \cdot \sigma_x^2 + b \cdot \sigma_{xy} = dx \quad (28.2)$$

$$a \cdot \sigma_{xy} + b \cdot \sigma_y^2 = dy \quad (28.3)$$

where  $\sigma_x^2$  is the variance of  $X$ ,  $\sigma_{xy}$  is the covariance of  $X$  and  $Y$ ,  $\sigma_y^2$  is the variance of  $Y$ ,  $dx$  is the difference between the mean values of  $X$  for the two groups (group 1 and group 2), and  $dy$  is the difference between the mean values of  $Y$  for the two groups.

Solving the above normal equations, we get

$$a = \frac{\sigma_y^2 \cdot dx - \sigma_{xy} \cdot dy}{\sigma_x^2 \cdot \sigma_y^2 - \sigma_{xy} \cdot \sigma_{xy}} \quad (28.4)$$

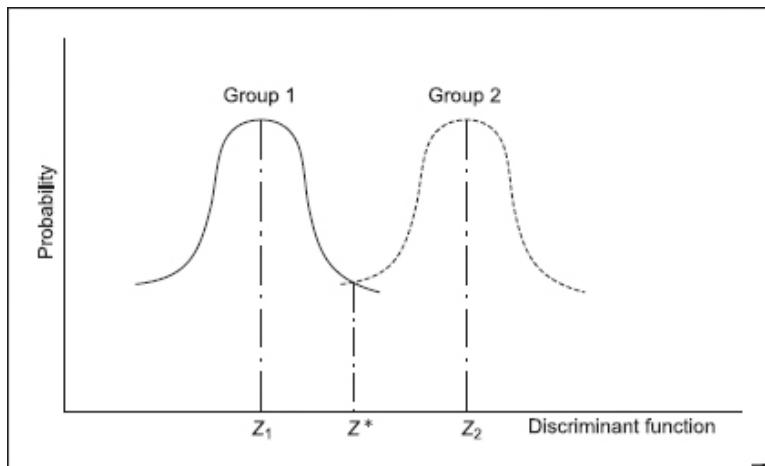
$$b = \frac{\sigma_x^2 \cdot dy - \sigma_{xy} \cdot dx}{\sigma_x^2 \cdot \sigma_y^2 - \sigma_{xy} \cdot \sigma_{yx}} \quad (28.5)$$

**Choice of the Cut-off Point for the Discriminant Function** The cutoff value which is supposed to separate the two groups, should be chosen in such a way that it minimises the probability of misclassification. In theory, the cutoff value is represented by the point  $Z^*$  (as shown in [Exhibit 28.1](#)) because it results in minimal misclassification.

In practice, the cut-off point is chosen in such a way that it results in a minimal misclassification in the estimation sample. For defining this cut-off value, we may proceed in the following manner.

- (i) Calculate the  $Z_i$  value for the observations and arrange them in an ascending order.
- (ii) Consider the mid-points of adjacently ranked observations, in the area where the observations from the two groups overlap, as possible cut-off levels.
- (iii) Choose that cut-off point which minimises the total number of misclassifications.

### Exhibit 28.1 Probability Distributions and Cut-off Level



**Examination of the Predictive Ability of the Discriminant Model** The estimates of  $a$  and  $b$  reflect basic differences between the two groups and also the specific characteristics of the observations in the estimation sample. Further, the variables included in the discriminant function are often selected on the basis of some search from a larger set of variables. Hence, it is desirable to examine the predictive ability of the

discriminant function with reference to a new sample which may be referred to as a validation or holdout sample. This involves comparing the classification of observations based on their discriminant function scores with their actual classification. For this purpose the following classification matrix (confusion matrix) is prepared:

		<i>Actual Classification</i>	
		<i>Group 1</i>	<i>Group 2</i>
<i>Predicted Classification</i>	<i>Group 1</i>	$C_{11}$	$C_{12}$
	<i>Group 2</i>	$C_{21}$	$C_{22}$

If the discriminant model correctly predicts the group to which each observation belongs, all observations will be on the main diagonal of the matrix, i.e. in the  $C_{11}$  and  $C_{22}$  elements. The percentage of correct predictions is:

$$\frac{C_{11} + C_{22}}{C_{11} + C_{12} + C_{21} + C_{22}} \quad (28.6)$$

## Illustration

To illustrate the application of discriminant analysis, let us consider the problem of a firm which wants to find a way of discriminating between good accounts (customers) and bad accounts (customers). The firm defines a good account as one who pays on or before the due date and a bad account as one who does not pay on or before the due date. The financial manager of the firm thinks that the two most important ratios helpful in discriminating between the good accounts ( $G$ ) and the bad accounts ( $B$ ) are: current ratio (current assets/current liabilities) represented hereafter by variable  $X$ , and earning power (EBIT/total assets), represented hereafter by the variable  $Y$ .

Data relating to twenty accounts – ten of which happened to be good and ten bad – is given below:

Good accounts			Bad accounts		
Account number	$X_i$	$Y_i$	Account number	$X_i$	$Y_i$
1	1.10	13	11	0.70	11
2	1.50	15	12	0.90	-4
3	1.20	17	13	0.80	6
4	0.90	21	14	1.30	2
5	1.60	7	15	1.10	6
6	2.20	8	16	0.50	8
7	0.90	16	17	0.30	8
8	1.00	13	18	1.40	6
9	1.30	8	19	0.90	3
10	1.30	2	20	1.10	14

**Estimation of the Discriminant Function** The discriminant function is

$$Z_i = a X_i + b Y_i \quad (28.7)$$

where  $Z_i$  is the discriminant score for the  $i$ th account,  $X_i$  is the current ratio for the  $i$ th account, and  $Y_i$  is the earning power for the  $i$ th account.

The estimates for  $a$  and  $b$  are:

$$a = \frac{\sigma_y^2 \cdot dx - \sigma_{xy} \cdot dy}{\sigma_x^2 \cdot \sigma_y^2 - \sigma_{xy} \cdot \sigma_{xy}} \quad (28.8)$$

$$b = \frac{\sigma_x^2 \cdot dy - \sigma_{xy} \cdot dx}{\sigma_x^2 \cdot \sigma_y^2 - \sigma_{xy} \cdot \sigma_{xy}} \quad (28.9)$$

Drawing on the information in [Exhibit 28.2](#), we find that:

$$\begin{array}{lllll} \Sigma X_i = 22.00 & \Sigma Y_i = 180 & \Sigma(X_i - \bar{X})^2 = 3.26 & \Sigma(Y_i - \bar{Y})^2 = 692 & \Sigma(X_i - \bar{X})(Y_i - \bar{Y}) = -1.7 \\ \bar{X} = 1.10 & \bar{Y} = 9 & & & \end{array}$$

## Exhibit 28.2 Basic Calculations

<i>Account Number</i>	$(X_i)$	$(Y_i)$	$(X_i - \bar{X})$	$(Y_i - \bar{Y})^2$	$(X_i - \bar{X})^2$	$(Y_i - \bar{Y})^2$	$\Sigma(X_i - \bar{X})(Y_i - \bar{Y})$	
G	1	1.10	13	0.00	4	0.00	16	0.00
	2	1.50	15	0.40	6	0.16	36	2.40
	3	1.20	17	0.10	8	0.01	64	0.80
	4	0.90	21	-0.20	12	0.04	144	-2.40
	5	1.60	7	0.50	-2	0.25	4	-1.00
	6	2.20	8	1.10	-1	1.21	1	-1.10
	P	0.90	16	-0.20	7	0.04	49	-1.40
	8	1.00	13	-0.10	4	0.01	16	-0.40
	9	1.30	8	0.20	-1	0.04	1	-0.20
	1	1.30	2	0.20	-7	0.04	49	-1.40
R	11	0.70	11	-0.40	2	0.16	4	-0.80
	G	0.90	-4	-0.20	-13	0.04	169	2.60
	12	0.80	6	-0.30	-3	0.09	9	0.90
	13	1.30	2	-0.20	-7	0.04	49	-1.40
	O	1.10	6	0.00	-3	0.00	9	0.00
	15	0.50	8	-0.60	-1	0.36	1	0.60
	16	0.30	8	-0.80	-1	0.64	1	0.80
	17	1.40	6	0.30	-3	0.09	9	-0.90
	U	0.90	3	-0.20	-6	0.04	36	1.20
	2	1.10	14	0.00	5	0.00	25	0.00

$$\bar{X}_1 = \frac{\text{Sum of } X_i \text{ for group 1}}{10} = \frac{13}{10} = 1.3$$

$$\bar{X}_2 = \frac{\text{Sum of } X_i \text{ for group 2}}{10} = \frac{9}{10} = 0.9$$

$$\bar{Y}_1 = \frac{\text{Sum of } Y_i \text{ for group 1}}{10} = \frac{120}{10} = 12.0$$

$$\bar{Y}_2 = \frac{\text{Sum of } Y_i \text{ for group 2}}{10} = \frac{60}{10} = 6.0$$

$$\sigma_x^2 = \frac{1}{n-1} \sum (X_i - \bar{X}_i)^2 = \frac{3.26}{20-1} = 0.172$$

$$\sigma_y^2 = \frac{1}{n-1} \sum (Y_i - \bar{Y}_i)^2 = \frac{692}{20-1} = 36.4$$

$$\sigma_{xy} = \frac{1}{n-1} \sum (X_i - \bar{X}_i)(Y_i - \bar{Y}_i) = \frac{-1.7}{20-1} = -0.089$$

$$dx = \bar{X}_1 - \bar{X}_2 = 0.40 \quad dy = \bar{Y}_1 - \bar{Y}_2 = 6.00$$

Substituting these values in [Eqs. \(28.8\) and \(28.9\)](#) we get:

$$a = \frac{36.4 \times 0.40 - (-0.089) \times 6.00}{0.172 \times 36.4 - (-0.089) \times (-0.089)} = 2.414$$

$$b = \frac{0.172 \times 6.0 - (-0.089) \times 0.40}{0.172 \times 36.4 - (-0.089) \times (-0.089)} = 0.171$$

Hence, the discriminant function is:

$$Z_i = 2.414 X_i + 0.171 Y_i$$

**Choice of the Cut-off Point for the Discriminant Function** The  $Z_i$  scores for the various accounts are shown in [Exhibit 28.3](#). The  $Z_i$  scores, arranged in an ascending order, are shown in [Exhibit 28.4](#). From this table, it is evident that a  $Z_i$  score, which represents the mid-point between the  $Z_i$  scores of account numbers 18 and 9, will result in the minimum number of misclassifications. This  $Z_i$  score is:

$$\frac{4.4056 + 4.5062}{2} = 4.4559$$

The number of misclassifications with this cut-off  $Z_i$  score is only 2.

### Exhibit 28.3 $Z_i$ Scores for Various Accounts

Account No.	$Z_i$ Score $Z_i = 2.414 X_i + 0.171 Y_i$	Account No.	$Z_i$ Score $Z_i = 2.414 X_i + 0.171 Y_i$
1	4.8784	11	3.5708
2	6.1860	12	1.4886
3	5.8038	13	2.9572
4	5.7636	14	3.4802
5	5.0594	15	3.6814
6	6.6788	16	2.5750
7	4.9086	17	2.0922
8	4.6370	18	4.4056
9	4.5062	19	2.6856
10	3.4802	20	5.0494

### Exhibit 28.4 Scores Arranged in an Ascending Order

Account No.	$Z_i$ Score	Good or Bad	Account No.	$Z_i$ Score	Good or Bad
12	1.4886	B	9	4.5062	G
17	2.0922	B	8	4.6370	G
16	2.5750	B	1	4.8784	G
19	2.6856	B	7	4.9086	G
13	2.9572	B	20	5.0494	B
10	3.4802	G	5	5.0594	G
14	3.4802	B	4	5.7636	G
11	3.5708	B	3	5.8038	G
15	3.6814	B	2	6.1860	G
18	4.4056	B	6	6.6788	G

## 28.3 ■ ADVANCES IN INVENTORY MANAGEMENT<sup>1</sup>

Many interesting advances have occurred in the field of inventory management. The more important ones among them are described below.

**Materials Requirements Planning** Materials requirements planning (MRP) is essentially a computerised planning and control system for the effective management of production and inventory in a manufacturing environment. The objective of the MRP system is to order just the right parts in the right quantity at the right time.

An MRP system is driven by the master schedule which specifies the "end items" or output of the production function. The master schedule is "exploded" into purchase orders for raw materials and shop orders for scheduling the factory. In the process of parts explosion, adjustments have to be made for parts which are already on hand.

**Just-In-Time (JIT) System** Unlike conventional systems where inventory is treated as an asset, the JIT system views inventory as the "root of all evil". In traditional organisations a high level of inventory is held to cover up the problem areas related to quality, vendor delivery, machine breakdowns etc. The JIT approach is the opposite. The inventory level is lowered to expose the real organisational problems and attempts are made to solve the problems at their points of incipience.

**Electronic Data Interchange and Bar Coding** The EDI is a direct computer-to-computer exchange of information normally provided on standard business documents such as purchase orders, invoices, etc. Bar coding identifies products using machine readable quotes.

## 28.4 ■ WORKING CAPITAL LEVERAGE

Working capital leverage reflects the sensitivity of return on investment (earning power) to changes in the level of current assets. To express the formula for working capital leverage we will use the following symbols.

CA = value of current assets (gross working capital)

$\Delta CA$  = change in the level of current assets

FA = value of net fixed assets

TA = value of total assets ( $TA = CA + FA$ )

EBIT = earnings before interest and taxes

ROI = return on investment defined as  $EBIT/TA$

Working capital leverage (WCL) is equal to:

$$\frac{\text{Percentage change in ROI}}{\text{Percentage change in CA}}$$

Let us consider the case where current assets reduce by  $\Delta CA$  without in any way impairing the earning capacity of the firm. The percentage increase in ROI in this case is equal to:

$$\frac{\frac{EBIT}{TA - \Delta CA} - \frac{EBIT}{TA}}{\frac{EBIT}{TA}} \quad (28.10)$$

This expression, on simplification, becomes:

$$\frac{\Delta CA}{TA - \Delta CA} \quad (28.11)$$

The percentage decrease in current assets is simply:

$$\frac{\Delta CA}{CA} \quad (28.12)$$

Hence,

$$WCL = \frac{\Delta CA}{TA - \Delta CA} / \frac{\Delta CA}{CA} \quad (28.13)$$

$$= \frac{CA}{TA - \Delta CA}$$

If there is an increase in current assets, rather than a decrease,

$$WCL = \frac{CA}{TA + \Delta CA} \quad (28.14)$$

## Illustration

The following information is available for two companies, Box Limited and Cox Limited.

	<i>Box Limited</i>	<i>Cox Limited</i>
Current Assets (CA)	₹ 150 million	₹ 50 million
Net Fixed Assets (FA)	₹ 50 million	₹ 150 million
Total Assets (TA)	₹ 200 million	₹ 200 million
Earnings Before Interest and Taxes (EBIT)	₹ 30 million	₹ 30 million
ROI	15%	15%

The working capital leverage, for a 20 percent reduction in current assets, is equal to:

$$WCL = \frac{CA}{TA + 0.2CA}$$

For the two companies, Box Limited and Cox Limited, the WCL values are as follows:

$$WCL (\text{Box Limited}) = \frac{150}{200 + 30} = 0.65$$

$$WCL (\text{Cox Limited}) = \frac{50}{200 + 10} = 0.24$$

Looking at the WCL values it is evident that the sensitivity of ROI to changes in the level of CA is far greater for Box Limited than for Cox Limited.

## SUMMARY

- The procedure of **cash budget simulation** consists of three broad phases: (i) model development, (ii) specification of probability distributions of exogenous variables, and (iii) running of the model.
- **Discriminant analysis**, a statistical tool helpful for classification purposes, can be used for classifying customers into two categories—good or bad—on the basis of certain financial ratios.
- The steps involved in discriminant analysis are as follows: (i) estimate the discriminant function, (ii) choose the cutoff point for the discriminant function, and (iii) examine the predictive ability of the discriminant function.

- Many interesting advances have occurred in the field of inventory management. The more important ones are: **materials requirements planning, just-in-time system**, and **electronic data interchange and bar coding**.
- **Working capital leverage** refers to the sensitivity of ROI to changes in the level of current assets.

## QUESTIONS

1. Describe briefly the procedure for simulating a cash budget.
2. Discuss the advantages of cash budget simulation.
3. How would you choose the cutoff point for the discriminant function in practice?
4. Explain what is a classification (confusion) matrix.
5. Write a note on the Materials Requirement Planning.
6. Discuss the Just-in-Time system.

## SOLVED PROBLEM

28.1 Prabhu Enterprises seeks your help in classifying the credit applicants of the company into 'good' and 'bad' categories. You believe that the two key ratios that are helpful in discriminating between the 'good' and 'bad' accounts are (i) the quick ratio [(Current assets – Inventories)/Current liabilities], represented hereafter by the variable X and (ii) the earning power [Profit before interest and tax/Total assets], represented hereafter by the variable Y. The following data is given to you about 18 accounts, ten of which happen to be good and eight of which happen to be bad.

Good Accounts			Bad Accounts		
Number	X	Y	Number	X	Y
1	0.80	18%	11	0.60	8%
2	1.00	15	12	0.75	11
3	1.20	20	13	0.70	19
4	0.75	12	14	0.65	10
5	0.65	16	15	0.80	12
6	1.10	9	16	0.70	4
7	0.85	22	17	0.55	9
8	0.65	19	18	0.65	-9
9	0.95	15			
10	1.05	24			

Estimate the discriminant function that best discriminates between the 'good' and the 'bad' applicants.

*Solution*

The discriminant function is

$$Z_i = aX_i + bY_i$$

$$a = \frac{\sigma_y^2 \cdot d_x - \sigma_{xy} \cdot d_y}{\sigma_x^2 \cdot \sigma_y^2 - \sigma_{xy} \cdot \sigma_{xy}}$$

$$b = \frac{\sigma_x^2 \cdot d_y - \sigma_{xy} \cdot d_x}{\sigma_x^2 \cdot \sigma_y^2 - \sigma_{xy} \cdot \sigma_{xy}}$$

Drawing on the information in the following table, we find that

$$\begin{array}{lllll} \Sigma X_i = 14.4 & \Sigma \bar{Y}_i = 234 & \Sigma (X_i - \bar{X})^2 & \Sigma (Y_i - \bar{Y})^2 & \Sigma (X_i - \bar{X})(Y_i - \bar{Y}) \\ \bar{X} = 0.80 & Y = 13 & = 0.595 & = 1002 & = 10.35 \end{array}$$

$$\bar{X}_1 = \frac{\text{Sum of } X_i \text{ for group 1}}{10} = \frac{9.0}{10} = 0.90$$

$$\bar{X}_2 = \frac{\text{Sum of } X_i \text{ for group 2}}{8} = \frac{5.4}{8} = 0.675$$

$$\bar{Y}_1 = \frac{\text{Sum of } Y_i \text{ for group 1}}{10} = \frac{170}{10} = 17$$

$$\bar{Y}_2 = \frac{\text{Sum of } Y_i \text{ for group 2}}{8} = \frac{64}{8} = 8$$

$$\sigma_x^2 = \frac{1}{n-1} \Sigma (X_i - \bar{X})^2 = \frac{1}{18-1} \times 0.595 = 0.035$$

$$\sigma_y^2 = \frac{1}{n-1} \Sigma (Y_i - \bar{Y})^2 = \frac{1}{18-1} \times 1002 = 58.94$$

$$\sigma_{xy} = \frac{1}{n-1} \Sigma (X_i - \bar{X})(Y_i - \bar{Y}) = \frac{1}{18-1} \times 10.35 = 0.609$$

$$dx = \bar{X}_1 - \bar{X}_2 = 0.9 - 0.675 = 0.225$$

$$dy = \bar{Y}_1 - \bar{Y}_2 = 17 - 8 = 9$$

Thus

$$a = \frac{58.94 \times 0.225 - 0.609 \times 8}{0.035 \times 58.94 - 0.609 \times 0.609} = 4.598$$

$$b = \frac{0.035 \times 8 - 0.609 \times 0.225}{0.035 \times 58.94 - 0.609 \times 0.609} = 0.105$$

Thus, the discriminant function is:  $Z_i = 4.598 X_i + 0.105 Y_i$

<i>Account Number</i>	$X_i$	$Y_i$	$X_i - \bar{X}$	$Y_i - \bar{Y}$	$(X_i - \bar{X})^2$	$(Y_i - \bar{Y})^2$	$\Sigma(X_i - \bar{X})(Y_i - \bar{Y})$	
	1	0.80	18	0.00	5	0.00	25	0
	2	1.00	15	0.20	2	0.04	4	0.40
	3	1.20	20	0.40	7	0.16	49	2.8
G	4	0.75	12	-0.05	-1	0.0025	1	0.05
R	5	0.65	16	-0.15	3	0.0225	9	-0.45
O	6	1.10	9	0.30	-4	0.09	16	-1.2
U	7	0.85	22	0.05	9	0.0025	81	0.45
P	8	0.65	19	-0.15	6	0.0225	36	-0.90
	9	0.95	15	0.15	2	0.0225	4	0.30
1	10	1.05	24	0.25	11	0.0625	121	2.75
	11	0.60	8	-0.20	-5	0.04	25	1.0
G	12	0.75	11	-0.05	-2	.0025	4	0.10
R	13	0.70	19	-0.10	6	.01	36	-0.6
O	14	0.65	10	-0.15	-3	.0225	9	0.45
U	15	0.80	12	0.00	-1	0	1	0
P	16	0.70	4	-0.10	-9	.01	81	0.9
	17	0.55	9	-0.25	-4	.0625	16	1.0
2	18	0.65	-9	-0.15	-22	.0225	484	3.3

$$\Sigma X_i = 14.4 \quad \Sigma Y_i = 234$$

$$\bar{X} = 0.80 \quad \bar{Y} = 13$$

$$\Sigma(\bar{X}_i - \bar{X})^2 \quad \Sigma(\bar{Y}_i - \bar{Y})^2 \quad \Sigma(\bar{X}_i - \bar{X})(\bar{Y}_i - \bar{Y})$$

$$= 0.595 \quad = 1002 \quad = 10.35$$

## PROBLEMS

- 28.1** Mr Rajan, the financial manager of Vidhaata Limited, believes that the two most important ratios helpful in discriminanting between the ‘good’ and ‘bad’ accounts are: (i) the quick ratio, represented hereafter by the variable  $X$ , and (ii) the EBDIT/sales ratio, denoted hereafter by the variable  $Y$ . Based on the following data relating to 25 accounts, 15 of which happen to be good and 10 bad. (a) Estimate the discriminant function for the ‘good’ and the bad applicants. (b) Choose the cutoff point for the discriminant function.

Good Accounts			Bad Accounts		
Account No.	X	Y	Account No.	X	Y
1	0.90	15%	16	0.76	10
2	0.75	20	17	0.68	12
3	1.05	10	18	0.56	4
4	0.85	14	19	0.62	18
5	0.65	16	20	0.92	-4
6	1.20	20	21	0.58	20
7	0.90	24	22	0.70	8
8	0.84	26	23	0.52	15
9	0.93	11	24	0.45	6
10	0.78	18	25	0.60	7
11	0.96	12			
12	1.02	25			
13	0.81	26			
14	0.76	30			
15	1.02	28			

**28.2** The working capital leverage for Praveen Company for a reduction of 20 percent in current assets is equal to 1. What is the ratio of net fixed assets to current assets?

**28.3** Based on the following information on return on equity (ROE) and debt-equity ratio (DER) for 'good' and 'bad accounts', estimate the discriminant function that separates the two.

Good Accounts			Bad Accounts		
Account No.	ROE (%)	DER	Account No.	ROE (%)	DER
1	20	0.5	9	-6	2.0
2	18	0.6	10	4	1.5
3	24	0.8	11	2	0.9
4	15	0.9	12	-5	1.8
5	12	0.8	13	11	1.6
6	9	0.5	14	7	0.8
7	19	1.0	15	3	1.2
8	16	1.2	16	-10	1.9

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<sup>1</sup> This section has been contributed by Dr. Janat Shah of IIM Udaipur.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter28/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter28/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems





## **PART-VIII**

### **Debt and Hybrid Financing**

**29**

Debt Analysis and Management

**30**

Leasing, Hire-Purchase, and Project Finance

**31**

Hybrid Financing

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## Debt Analysis and Management

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Explain the risks characterising debt instruments.
- ✓ Discuss the rating of debt securities.
- ✓ Understand the key dimensions of a debt issue.
- ✓ Describe the important innovations in debt securities.
- ✓ Show how debt securities add value.
- ✓ Explain the key steps in securitisation.
- ✓ Discuss bond covenants.
- ✓ Explain how a bond refunding decision should be analysed.
- ✓ Discuss the concept and measurement of duration.
- ✓ Explain the term structure of interest rates.

The choice of debt-equity mix or capital structure is an important issue that has been addressed elsewhere in this book. The focus of this chapter is on how to analyse debt and manage debt, given a certain capital structure. The goal of debt management is to contribute to shareholder wealth by minimising the after-tax cost of debt.

Historically, the market for corporate debt instruments remained small and under developed due to the following reasons: (i) The bulk of long-term debt required by the corporate sector was provided by financial institutions and commercial banks in the form of term loans. (ii) There were severe restrictions on the design of debt instruments and the interest rates payable on them. (iii) Tax-free PSU bonds marred the prospects of the debenture issues of the private sector companies. (iv) The principal buyers of debenture issued by companies were the investment institutions. Typically, debentures were privately placed at a discount with them. The investment institutions bought these debentures with a view to keeping them till maturity.

The market for corporate debt has been enlivened since the middle of 1993. The following changes, which have come about gradually, suggest that it is poised for substantial growth in the years to come: (i) Financial institutions are currently providing lesser support to industrial projects by way of term loans. (ii) Companies now enjoy complete freedom in designing debt instruments. (iii) The interest rate ceilings on debt instruments have been withdrawn. (iv) Various credit rating agencies have been established. (v) A certain amount of provident fund money can be invested in approved corporate debentures. (vi) The National Stock Exchange has set up a 'Wholesale Debt Market' segment. (vii) There is a growing realisation that the corporate debt market must be brought up to speed. It needs to be transformed the way equity market has been transformed. Several committees have uniformly endorsed this view. (viii) Massive investments are expected in the infrastructure sector and core sector and these sectors depend heavily on debt finance. (ix) The volatility of equities has stimulated investor interest in debt instruments.

A financial manager should understand various analytical concepts and ideas to appreciate the subtleties of debt instruments.

## 29.1 ■ RISK IN DEBT

Debt instruments are subject to diverse risks, such as interest rate risk, inflation risk, real interest rate risk, and default risk.

**Interest Rate Risk** Interest rates tend to vary over time, causing fluctuations in bond prices. A rise in interest rates will depress the market prices of outstanding bonds whereas a fall in interest rates will push the market prices up.

Interest rate risk, also referred to as market risk, is measured by the percentage change in the value of a bond in response to a given interest rate change. It is a function of the maturity period of the bond and its coupon interest rate. You can appreciate this easily by looking at the general formula for the current price of a bond.

$$\text{Current price of bond} = \text{Present value of interest payments} + \text{Present value of principal repayment}$$
$$B = \sum_{t=1}^n \frac{C}{(1+r)^t} + \frac{F}{(1+r)^n} \quad (29.1)$$

An examination of this formula reveals that:

Longer maturity period → Greater sensitivity of price to changes in interest rates

Larger coupon (interest) payment → Lesser sensitivity of price to changes in interest rates

Duration, a precise measure of interest rate sensitivity, is discussed later in this chapter.

**Inflation Risk** Interest rates are defined in nominal terms. This means that they express the rate of exchange between current and future rupees. For example, a nominal interest of 12 percent on a one-year loan means that ₹ 112 is payable a year hence for ₹ 100 borrowed today. However, what really matters is the real rate of interest, the rate of exchange between current and future goods and services.

Since financial contracts are typically stated in nominal terms, the real interest rate should be adjusted for the expected inflation. According to the Fisher effect, the following relationship holds between the nominal rate  $r$ , the real rate  $a$ , and the expected inflation rate,  $\alpha$ .

$$(1 + r) = (1 + a)(1 + \alpha)$$

or,

$$r = a + \alpha + a\alpha \quad (29.2)$$

For example, if the required real rate is 6 percent and the expected inflation rate is 8 percent, the nominal rate will be:

$$(0.06) + (0.08) + (0.06)(0.08) = 0.1448 \text{ or } 14.48 \text{ percent}$$

When the inflation is higher than expected, the borrower gains at the expense of the lender and vice versa. Put differently, inflation is a zero-sum game.

The impact of a change in inflation rate is similar to that of a change in interest rate. This means that inflation risk is greater for long-term bonds. Hence, in a period of volatile inflation rates, borrowers will be disinclined to issue long-term fixed-interest bonds and investors, too, will be reluctant to buy such bonds. During such times, floating rate bonds and shorter-maturity bonds become more popular.

**Real Interest Rate Risk** Even if there is no inflation risk, borrowers and lenders are still exposed to the risk of change in the real interest rate. Shifts in supply and/or demand for funds will change the real rate of interest.

To understand the implications of real interest rate risk consider an example. Suppose that the real interest rate falls from 6 to 4 percent because a combination of tax law changes and heightened competition drives down the real interest rate. In this case a firm that has borrowed funds at 6 percent real interest rate suffers. While it now earns only 4 percent on its assets, it has to pay 6 percent on its debt. Irrespective of whether it gains or loses from a change in the real rate of interest, a firm that has locked itself into a long-term debt at a fixed real cost can experience a dramatic impact whenever the real rate of interest changes. As such changes can scarcely be predicted, they represent a source of risk that borrowers and lenders have to face.

**Default Risk** Default risk refers to the risk accruing from the fact that a borrower may not pay interest and/or principal on time. Default risk, also referred to as 'credit risk', is normally gauged by the rating assigned to the debt instrument by an independent credit rating agency (like CRISIL, ICRA, or CARE).

Other things being equal, bonds which carry a higher default risk (lower credit rating) trade at a higher yield to maturity. Put differently, they sell at a lower price compared to government securities which are considered free from default risk (as the government has the power to print money, it is believed that it will not default in honouring its commitments).

Except in the case of highly risky debt instruments, referred to as junk bonds, investors seem to be more concerned with the perceived risk of default rather than the actual occurrence of default. Even though the actual default may be highly unlikely, they believe that a change in the perceived default risk of a bond would have an immediate impact on its market price.

**Reinvestment Risk** When a bond pays periodic interest there is a risk that the interest payment may have to be reinvested at a lower interest rate. This is called reinvestment risk. The reinvestment risk is greater for bonds with longer maturity and for bonds with higher interest payments.

**Foreign Exchange Risk** If a bond has payments that are denominated in a foreign currency its rupee cash flows are uncertain. The risk that the foreign currency will depreciate in relation to the Indian rupee is referred to as foreign exchange risk (or currency risk).

## 29.2 ■ RATING OF DEBT SECURITIES

Rating of the debt securities issued by companies, quasi-government organisations, and governments first originated in the U.S. where presently there are at least five firms offering such services. In recent years, rating agencies have been set up in several other countries. In India, too, several rating agencies, viz. CRISIL, ICRA, CARE, FITCH, and BRICKWORKS have been set up.

A debt rating essentially reflects the probability of timely payment of interest and principal by a borrower. The higher the debt rating, the greater the likelihood that the borrower will fulfill his obligation to pay the interest and principal.

Having described what a debt rating is we should also clarify what it is not.

- A debt rating is not a recommendation for purchasing, selling, or holding a security.
- A debt rating is not a general evaluation of the issuing organisation.
- A debt rating does not create a fiduciary relationship between the rating agency and the users of a rating since there is no legal basis for such a relationship.
- A debt rating does not imply that the rating agency performs an audit function.
- A debt rating is not a one-time evaluation of credit risk, which can be regarded as valid for the entire life of the security.

**Functions of Debt Ratings** Debt ratings (or debt rating firms) are supposed to:

- Provide superior information.
- Offer low-cost information.
- Serve as a basis for a proper risk-return tradeoff.
- Impose healthy discipline on corporate borrowers.
- Lend greater credence to financial and other representations.
- Facilitate the formulation of public policy guidelines on institutional investment.

**Rating Methodology** Despite variations across individual rating agencies, the following features appear to be common in the rating

methodology employed by different agencies.

1. Two broad types of analyses are done: (i) industry and business analysis, and (ii) financial analysis.
2. The key factors considered in industry and business analysis are: (i) growth rate of the industry and relationship with the economy, (ii) industry risk characteristics, (iii) structure of industry and nature of competition, (iv) competitive position of the issuer, and (v) managerial capability of the issuer.
3. The important factors considered in financial analysis are: (i) earning power, (ii) business and financial risks, (iii) asset protection, (iv) cash flow adequacy, (v) financial flexibility, and (vi) quality of accounting.
4. Subjective judgement seems to play an important role in the assessment of the issue/issuer on various factors.<sup>1</sup>
5. While each factor is normally scored separately, no mechanical formula is used for combining the scores on different factors to arrive at the rating conclusion. In the ultimate analysis, all variables are viewed as interdependent.
6. Industry risk characteristics are likely to set the upper limit on rating.

**Debt Rating Symbols** The debt rating symbols of various credit rating agencies are shown in [Exhibit 29.1](#).



## Exhibit 29.1 | Debt Rating Symbols

Risk Levels	CARE	CRISIL	ICRA	FITCH	BRICK WORKS
Highest safety	CARE AAA	AAA	LAAA	AAA(Ind)	BWR AAA
High safety	CARE AA	AA	LAA	AA(Ind)	BWR AA
Adequate safety	CARE A	A	LA	IA(Ind)	BWR A
Moderate safety	CARE BBB	BBB	LBBB	BBB(Ind)	BWR BBB
Inadequate safety	CARE BB	BB	LBB	BB(Ind)	BWR BB
Risk prone	CARE B	B	LB	B(Ind)	BWR B
Substantial risk	CARE C	C	LC	CCC(Ind), CC(Ind), C(Ind)	BWR C
Default	CARE D	D	LD	D(Ind)	BWR D

**Note:**

1. CRISIL may apply '+' (plus) or '-' (minus) signs for ratings from AA to D to reflect comparative standing within the category.
2. The contents within parenthesis are a guide to the pronunciation of the rating symbols.
3. Preference share rating symbols are identical to debenture rating symbols except that the letters are prefixed to the debenture rating symbols, e.g., pf AAA ("pf Triple A").

It is a common practice to classify rating symbols as follows:

**High Investment Grades** Debentures rated 'AAA' are judged to offer highest safety of timely payment of interest and principal. Though the circumstances providing this degree of safety are likely to change, such changes as can be envisaged are most unlikely to adversely affect the fundamentally strong position of such issues. Debentures rated 'AA' are judged to offer high safety of timely payment of interest and principal. They differ in safety from 'AAA' issues only marginally.

**Investment Grades** Debentures rated 'A' are judged to offer adequate safety of timely payment of interest and principal; however, changes in circumstances can adversely affect such issues more than those in the higher rated categories. Debentures rated 'BBB' are judged to offer sufficient safety of timely payment of interest and repayment of principal; however, changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal than for debentures in higher rated categories.

**Speculative Grades** Debentures rated ‘BB’ are judged to carry inadequate safety of timely payment on interest and principal; while they are less susceptible to default than other speculative grade debentures in the immediate future, the uncertainties that the issuer faces could lead to inadequate capacity to make timely interest and principal payments. Debentures rated ‘B’ are judged to have greater susceptibility to default; while currently interest and principal payments are met, adverse business or economic conditions would lead to lack of ability or willingness to pay interest or principal. Debentures rated ‘C’ are judged to have factors present that make them vulnerable to default; timely payment of interest and principal is possible only if favourable circumstances continue. Debentures rated ‘D’ are in default and in arrears of interest or principal payments and are expected to default on maturity. Such debentures are extremely speculative and return from these debentures may be realised only on reorganisation or liquidation.

**Ratings and Financial Ratios** Rating agencies claim that bond ratings express judgments and hence are not determined by a fixed formula. Yet, observers of bond market find that key financial numbers vary systematically with ratings. [Exhibit 29.2](#) shows how certain financial ratios vary with the firm’s bond rating as determined by CRISIL. So discriminant analysis can be used for predicting credit ratings. More recent models use artificial intelligence and neural estimation methods for predicting credit ratings.

### Exhibit 29.2 Bond Ratings and Financial Ratios

Ratio	AAA	AA	A	BBB	BB	B	C	D
Retained Earnings to Total Assets	0.06	0.04	0.04	0.03	0.01	-0.01	0.00	-0.02
Total Assets (natural logarithms of)	7.71	5.69	4.71	4.88	4.74	5.12	4.74	4.97
Market value of equity to book debt	4.51	1.95	1.19	0.58	0.51	0.24	0.26	0.18

Source: Sahoo, B.K. and P. Mohanty, “An alternative to CRISIL rating using discriminant analysis,” *The ICFAI Journal of Applied Finance*, January 2002.

**Bond Ratings and the Probability of Default** Bond ratings are supposed to reflect the probability of default. A CRISIL study suggests that this is empirically true. [Exhibit 29.3](#) shows that the probability of default is

much lower for investment grade bonds as compared to speculative grade bonds.

### **Exhibit 29.3 Default Rates of Corporate Bonds, 1992-2005**

Rating at the Time of Issue	Percentage Defaulting within		
	1 Year after Issue	2 Years after Issue	3 Years after Issue
AAA	0.00	0.00	0.00
AA	0.00	0.44	1.45
A	1.00	4.29	9.00
BBB	3.40	9.49	17.26
Investment Grade (BBB to AAA)	0.91	3.19	6.39
Speculative Grade	18.85	31.69	41.38

Source: CRISIL's Insight in Risk: CRISIL Default Study.

## 29.3 ■ DESIGN OF DEBT ISSUES

Debt management seeks to maximise shareholder wealth by minimising the firm's after-tax cost of debt. There are two interrelated phases of debt management. The first is concerned with the design of the debt issue. The issuer must decide on the maturity period, interest rate (fixed or variable), security, embedded options (if any), and so on. The design of the debt instrument must meet the financial objectives of the issuer within the realities of the capital market.

The second phase is concerned with decisions relating to outstanding debt. The issuer should actively explore opportunities for refunding outstanding debt to reduce the cost of debt. The refunding decisions include which debt to redeem, when to redeem, and how to replace it most cost effectively.

A firm that wants to issue bonds has to decide on the following features of the bonds.

- Maturity period
- Coupon/interest payments
- Security
- Currency
- Repayment
- Embedded options

**Maturity Period** A bond's maturity period is simply the time remaining till it finally matures. The maturity period is important for various reasons:

- (a) The issuer has to pay interest till the end of the maturity period and the principal at the end of the maturity period (assuming balloon repayment).
- (b) The yield and volatility of a bond depend on its maturity period.

The maturity period chosen should be such that the debt-servicing burden is aligned with the forecasted operating cash flow stream. For example, if a project has a long gestation period the debt instrument used for it should also have a long maturity. Further, it may make sense to have a step-up pattern of interest rates if the project cash flows are expected to rise over time.

The investor may sometimes want to enjoy the option of extending the maturity of the bond. In extendible bonds the maturity of the bond can be longer than the stated maturity.

**Coupon/Interest Payments** Should the bonds carry a fixed or floating rate of interest? If the issuer's revenues are not sensitive to interest rate movements, a fixed rate bond is appropriate. On the other hand, if the issuer's revenues are sensitive to interest rate movements, a floating rate bond is more suitable. In general, industrial firms would do well to choose a fixed rate bond, whereas financial institutions and banks would be well off with floating rate bonds.

**Security** Lenders have a claim that is prior to that of equity investors in the event of bankruptcy or liquidation. However, not all lenders have equal claims. At the top rung are secured bonds backed by a pledge of specific assets. At the bottom of the rung are unsecured bonds, which are not backed by the security of any specific assets but by the general credit of the firm.

**Currency** Traditionally, firms issued debt denominated in domestic currency largely to domestic investors. There were two reasons for this. Foreign operations accounted for a small proportion of overall revenues and domestic investors were better equipped to assess default risk. Since 1990s, several things have happened. First, foreign operations now account for a higher proportion of revenues for many firms; as a consequence, exchange rate movements have a greater bearing on revenues and profits. Second, better global dissemination of information about companies has enabled companies to access non-domestic markets. Third, firms have become more adept in managing exchange rate risk.

In the wake of increasing globalisation, there have been many innovations, such as Eurobonds, dual currency bonds, and principal exchange linked bonds. A *Eurobond* is an international bond denominated in a currency not native to the country where it is issued. Eurobonds are named after the currency in which they are denominated. For example, Eurodollar and Euroyen bonds are denominated in American dollars and Japanese yen respectively. In a *dual currency bond*, some cash flows (such as coupons) are denominated in one currency and other cash flows (such as principal repayments) are denominated in another currency. In a *principal exchange linked bond*, PELB, the coupons and principal are payable in U.S. dollar. However, the amount of payment is determined by the exchange rate

between the U.S. dollar and a given foreign currency. For example, a firm can structure a PELB to make higher (lower) coupon payments if the dollar weakens (strengthens) against, say, the euro.

**Repayment** The principal amount of a bond is usually repaid in its *entirety* at the time of maturity. Such a bond is called a *balloon payment bond*. However, firms may set up other arrangements for principal repayment. Some firms set up a *sinking fund*, in which a fixed amount is set aside each year to retire the bonds. The bonds to be retired each year are generally chosen at random from the outstanding bonds. Some firms issue *serial bonds* where a portion of the outstanding bonds mature each year, during a pre-specified period. The maturity date is specified in the serial bonds. This helps investors choose the bond maturity that suits them.

**Embedded Options** Bonds may have call and put features embedded in them. A call feature gives the issuing firm the right to prematurely redeem the bond, whereas a put feature gives the investor the right to prematurely sell the bond back to issuer. If the issuer firm thinks that interest rates would soften in future, it may incorporate a call option. Of course, the issuer has to pay for it in terms of a somewhat higher coupon rate. If the investor is concerned about interest rate increase or liquidity, it may ask for a put feature. Of course, the investor has to pay for it in terms of a somewhat lower coupon rate.

## **29.4 ■ INNOVATIONS IN DEBT SECURITIES**

A wide range of innovative debt securities has been created, particularly from the middle of the nineteen-seventies. The rapid pace of innovation has been stimulated by a variety of factors, the most important being the increased volatility of interest rates and frequent changes in the tax and regulatory framework. Further, the process of innovation has been aided and abetted by the deregulation of the financial services industry and heightened competition among investment banking firms engaged in developing new instruments. We describe below the important innovations in debt instruments and look at how they create value.

## Important Innovations

**Deep Discount Bonds** A deep discount bond does not carry any coupon rate but is issued at a steep discount over its face value. It is also referred to as a ‘zero interest (coupon) bond’ or just a ‘zero’. For example, the Industrial Development Bank of India issued deep discount bonds in 1996 which had a face value of ₹ 2 lakh and a maturity period of 25 years. The bonds were issued at ₹ 5300.

Deep discount bonds appeal to issuers interested in conserving their cash flows during the life of the bonds. On the other side of the market, they appear attractive to investors who want to protect themselves against the reinvestment rate risk. Remember that the imputed interest on a deep discount bond is automatically reinvested at a rate equal to its yield to maturity. As Finnerty says: “With zeros, interest is effectively reinvested and compounded over the life of the debt issue at the yield to maturity at which the investor purchased the bond.” This feature of deep discount bonds may be used by financial institutions in managing their liabilities.

A major disadvantage of deep discount bonds is that they entail a balloon payment at maturity. The issuer may experience difficulty in arranging for such a large payment and hence investors may be exposed to higher risk.

**Floating Rate Bonds** Conventional bonds carry a fixed rate of interest. Floating rate bonds, on the other hand, earn an interest rate that is linked to a benchmark rate such as the Treasury bill interest rate. For example, in 1993 the State Bank of India came out with the first ever issue of floating interest rate bonds in India. It issued 5 million (₹ 1000 face value) unsecured, redeemable, subordinated floating interest rate bonds in the nature of promissory notes carrying interest at 3 percent per annum over the bank’s maximum term deposit rate.

Floating rate bonds have been essentially a response to inflation risk. They make sense to a borrower whose assets earn returns that fluctuate with interest rates. Financial institutions and banks which give variable rate interest loans find such bonds appealing. Who is interested in buying floating rate bonds? Investors concerned about the stability of their principal find floating rate bonds attractive. The prices of these bonds tend to be fairly stable and close to par value compared to fixed interest bonds.

**Commodity Linked Bonds** The payoff from a commodity linked bond depends to some extent on the price of a certain commodity. For example, in June 1986 Standard Oil Corporation issued zero coupon notes which would mature in 1992. The payoff from each note was defined as:  $\$1000 + 200 \text{ [Price per barrel of oil in dollars---\$25]}$ . The second term of the payoff, however, was subject to a floor value of 0.

Commodity linked bonds have been a response to volatility in commodity prices. Such bonds enable the producer of a commodity to cope with price fluctuations. Since the principal payment and/or interest outgo rise and fall with the company's revenues (which are dependent on the price of the commodity), commodity linked bonds dampen the volatility of the post-tax cash flows of the issuer. By shifting the debt service burden from adverse times to prosperous periods, such bonds, in effect, enhance the debt capacity of the firm. Who would buy commodity-linked bonds? Such bonds are of interest to users of the commodity. For example, a power plant that uses oil as fuel may be interested in buying oil-linked bonds.

**Bonds with Embedded Options** Bonds often carry options embedded in them. These options give certain rights to investors and/or issuers. The more common types of bonds with embedded options are:

*Convertible bonds* Convertible bonds give the holder the right (option) to convert them into equity shares on certain terms.

*Callable bonds* Callable bonds give the issuer the right (option) to redeem them prematurely on certain terms.

*Puttable bonds* Puttable bonds give the investor the right to prematurely sell them back to the issuer on certain terms.

**Liquid Yield Option Notes (LYON)** A LYON is a zero coupon convertible bond, which is both callable and puttable. This is perhaps one of the most complicated debt instruments.

**Extendable Notes** Extendable notes are short-term debt instruments (maturity period may be one to five years) which give investors the option to seek redemption or renewal on maturity at prevailing interest rates. They mitigate some of the problems faced by investors and issuers with floating rate bonds. Investors can get back their money or extend maturity. Issuers can save the inconvenience and expense of issuing new securities to new investors.

**Exchangeable Bonds** An exchangeable bond allows a business house that has equity stake in subsidiaries to raise money without selling its equity shares immediately. To illustrate, suppose a business house ABC has an equity stake in X, a subsidiary company. ABC can issue bonds that can be exchanged, at the option of the investors, for the equity shares of X. If investors exercise the option, ABC gives the shares of X from its holdings. Note that the shares are not issued by company X, as it happens in a convertible bond issue.

**Structured Notes** A debt obligation which is derived from another debt obligation is called a *structured note*. Perhaps the first structured notes were created in early 1980s when investment bankers in the U.S. bought large blocks of 30-year non-cancellable Treasury bonds and stripped them to create a series of zero coupon bonds (zeroes). The shortest zero was backed by the first interest payment on the T-bond issue, the second shortest zero was backed by the next interest payment, so on and so forth.

Another important type of structured notes are securitised debt instruments. These are securities backed by a designated pool of assets (mortgage loans, consumer loans, hire purchase receivables, and so on). There are two major types of securitised debt instruments: Pass Through Certificates (PTCs) and Collateralised Mortgage Obligations (CMOs). PTCs represent an undivided interest in a portfolio of assets whereas CMOs are prioritised in terms of their right to interest as well as principal repayment.

Yet another kind of structured bonds includes “zero coupon bonds,” “secured premium notes,” and “secured redeemable non-convertible discount bonds.” These instruments are variations of cumulative interest borrowings, where the cumulative interest is written off directly, from reserves under the guise of “redemption premium.” As a result, interest cost is excluded from the profit and loss account and hence profit is overstated.

**Inverse Floaters** The interest rate on a floating rate note (or bond) rises and falls with some benchmark rate. For example, a floating rate note may carry an interest rate equal to LIBOR plus 1 percent. Thus the interest rate on such a note will move up or down with LIBOR. Since the cash flow associated with a floating rate note as well as the discount rate used to value it move in tandem in the opposite directions, the market value of such a note remains fairly stable.

The interest rate on an inverse floater, however, moves counter to a benchmark rate. For example, an inverse floater may carry an interest rate equal to: 14 percent - LIBOR. If LIBOR rises the interest rate on the inverse

floater falls thereby reducing the interest paid. Simultaneously, the discount rate used to value the interest stream increases. Lower interest payment and higher discount rate will drive down the market value of the inverse floater considerably. By the same token when the benchmark rate falls, the market value of the inverse floater appreciates substantially. Thus the inverse floater is highly sensitive to interest rate changes.

**Junk Bonds** Bonds that have a credit rating of BB or lower by Standard & Poor's and 'Ba' or lower by Moody's are referred to as *junk bonds*. Since the term *junk bonds* has a derogatory connotation, the securities industry prefers to call them as *high yield bonds* as they pay 2.5 to 3.5 percent more interest than what investment grade bonds pay.

Historically shunned by merchant (investment) bankers and investors, junk bonds have become popular on Wall Street since the late 1970s. Drexel Burnham Lambert played a key role in popularising junk bonds. Why have junk bonds become important? Two factors seem to have contributed to the growth of junk bonds.

- Investors in junk bonds have done rather well. They have earned higher return over the long pull, notwithstanding the higher default rates.
- Issuers have realised that junk bonds enable them to exploit their available debt capacity. This is particularly true of small and obscure firms.

**Income Bonds** Income bonds are bonds on which interest is payable only if the firm has sufficient income. In a way they are 'payable when able' bonds. Clearly a company that issues such a bond experiences lesser financial distress. Yet, hardly any company issues such bonds.

Why are income bonds not popular? Two explanations may be given. First, income bonds have a 'smell of death.' A firm issuing such a bond may signal that it is exposed to a greater prospect of financial distress. Second, bondholders and shareholders may not easily agree on how to calculate the income. This entails agency costs related to the firm's accounting methods. Despite these possibilities, McConnell and Schlarbaum suggest that no truly satisfactory explanation exists for the lack of popularity of income bonds.

**STRIPS** It is an acronym for Separate Trading of Registered Interest and Principal of Securities. Stripping involves detaching the interest payment coupons from a bond and treating the coupons and the body (represented by the principal amount) as separate securities. Each security so created

represents a single cash return on a specific date. The stripped securities are known as “zero coupons” or “zeros” as they do not carry periodic interest payments. The zeros trade in the market at a discount and are redeemed at a predetermined face value.

For example, a 15-year bond with a face value of ₹ 1,000 and an 8 percent interest rate payable semi-annually may be stripped into its principal (₹ 1,000) and its 30 semi-annual separate zeros of ₹ 40, each with its own maturity date.

Investors looking for a certain cash requirement at a fixed date find zeros appealing, as they are free from reinvestment risk. For the larger market too, STRIPS are beneficial as they help in developing a market-determined zero coupon yield curve (ZCYC).

### Some Innovative Bonds

Catastrophe (CAT) bonds	In the wake of a specified natural disaster, bond payments are reduced
Contingent convertibles	As the value of the company declines, the bonds convert automatically into equity
Pay-in-kind bonds (PIKs)	Interest is paid in cash or in the form of more bonds with an equivalent face value
Step-up bonds	Coupon payments are increased over time

## Sources of Value

Innovative debt securities are essentially positive NPV devices. They add value in one or more of the following ways:

**Risk Reallocation/Yield Reduction** Most of the debt innovations reallocate risk (interest rate risk, credit risk, or some other risk) from those who are less inclined to bear it to those who are more willing to assume it (and hence require a smaller premium to bear risk) or achieve some kind of risk synergy. For example, a company issuing commodity bonds can bear the price risk of the commodity better if it produces the particular commodity.

**Reduction in Agency Costs** Agency costs arise out of conflicts of interest among managers, stockholders, and bondholders. For example, in some cases, managers may increase shareholder value at the expense of bondholders by undertaking risky projects or over-leveraging the firm. Being aware of such potential conflicts, bondholders may charge a higher interest rate or even refuse to lend. Such actions would erode shareholder-value. A security that offers greater in-built protection to lenders reduces agency costs and thereby enhances shareholder value. Here are some examples. *Floating-rate* and *rating-sensitive* notes, which have a coupon rate that varies inversely with credit-rating, protect bondholders against a drop in credit-rating. *Puttable bonds* that contain poison-puts, which give the holder the right to sell the bonds back to the issuer if the leverage increases beyond a certain level or if there is a change in control of the firm, protect bondholders against event risk. *Increasing rate notes*, that bear a coupon rate that increases when bonds are not repaid in time, provide incentive to the issuer to redeem the bonds on schedule.

**Reduction in Transaction Costs** A number of innovative debt securities enhance shareholder value by reducing the transaction costs associated with raising capital. For example, *extendable notes* typically provide for adjusting interest rate every two or three years and hence provide an alternative to rolling over two- or three-year note issues without entailing additional issuance costs.

**Reduction in Taxes** A security can add value if it reduces the total amount of taxes that the firm and its investors pay. This happens when the marginal tax rate on interest income for the investors is lower than the marginal tax rate for the firm.

## **Circumvention of Regulatory Restrictions or Other**

**Constraints** A debt instrument that enables the issuer to circumvent some regulatory restriction or constraint can add value. For debt instruments to qualify as primary capital, bank regulation has changed several times in recent years. To meet such regulations, new debt securities have been designed. A prominent example is *equity-contract notes* which obligate holders to convert the notes into the equity stock of the bank (or its holding company).

**Enhanced Liquidity** If a firm can securitise a loan so that it becomes tradeable, investors will ask for a lower return as they enjoy the benefit of liquidity. For example, Pass Through Certificates, thanks to their liquidity, have lower yields compared to what the underlying assets offer.

## 29.5 ■ SECURITISATION

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 stream. Securitisation is originated by a firm that seeks to liquefy its pool of assets. Securities backed by mortgage loans are referred to as *mortgage backed securities*; securities backed by other assets are called *asset based securities*.

**Key Steps in Securitisation** Securitisation can take place in different ways and assume complex structures. Broadly, the following steps are involved in a securitisation programme:

1. *Seasoning and Credit Enhancement* The originator (the firm that seeks to liquefy its assets) identifies the assets to be securitised and packages them in a pool. The originator or some other agency may enhance the credit quality of the pool of assets to be securitised by providing insurance, often of a limited kind, to the investors.
2. *Creation of a Special Purpose Vehicle (SPV) and Transfer of Assets* An SPV (usually organised as a Trust) is created to hold title of the assets to be securitised. The pool of assets is transferred to the SPV for a valuable consideration and the assets are taken off the balance sheet of the originator.
3. *Fund Raising by the SPV* The SPV raises funds by issuing securities backed by the pool of assets held by it. These securities are called Pass Through Certificates (PTCs) because the cash flows received from the pool of assets are transmitted (passed) to the holders of these securities on a pro-rata basis after deduction of service fee. There may be one or more classes of PTCs with differing priorities: where there are two or more classes of PTCs, the rules for the distribution of interest and principal repayments, derived from the underlying pool of assets, among different classes of PTCs holders are specified upfront.
4. *Payment by SPV* The originator is paid by the SPV the agreed-upon consideration.

**Illustration<sup>2</sup>** HDFC originated a Mortgage Backed Securitisation Programme (2002 MBS 3) which had the following features.

- HDFC assigned a pool of mortgage receivables from 6274 residential loan contracts to an SPV (IL& FS Trust Company Limited). The cut-off date for the assignment was set as December 31, 2002. All the loans in the pool are variable rate loans as on the cut-off date. Thus the cash inflows may vary in future depending on the HDFC Retail Prime Lending Rate.
- The consideration for the sale was worked out by discounting the future cash flows at the “Pass Through Rate” which was the HDFC Retail Prime Lending Rate minus 3.60 percent, subject to a cap of 10.65 percent (6.65% as on start date).
- The SPV issued two classes of PTCs – Senior ( Class A PTC) and Subordinated (Class B PTC) – to the investors. While the scheduled cash flow pattern for the Class A PTCs may change because of prepayments or term changes including reschedulements or change in HDFC Retail Prime Lending Rate, Class B PTCs will be eligible for scheduled pool cash flows for the period only after the Class A PTCs are fully amortised at the applicable Pass-Through Rate.
- The structure provides credit enhancement to the investors through the corporate undertaking provided by HDFC to the extent of 10.785 percent of the future cash flows (around ₹ 395 million). This undertaking would be valid throughout the tenure of Class A PTCs.

**Role of the Merchant Banker** The merchant banker has to coordinate the activities of various agencies to ensure the overall success of the securitisation programme. Its principal tasks are to:

- Bring the originators and the investors together.
- Set up the SPV.
- Design the instruments and price them appropriately.
- Select various agencies like the rating agency, underwriters, credit enhancing agency, and servicing agency.
- Arrange for the listing of the issue.
- Market the issue and, if necessary, provide market support.

## 29.6 ■ BOND COVENANTS

Smith and Warner<sup>3</sup> identified four ways in which shareholders and their agent-managers may increase default risk and hurt the interest of bondholders:

**Dividend Payment** The firm may pay a large dividend to shareholders, leaving fewer assets to meet the claims of bondholders.

**Claim Dilution** The firm may issue additional debt that has the same priority, or even higher priority, as the existing debt. This will enhance the risk of the existing debt, leading to a decline in its price.

**Asset Substitution** After issuing bonds, purportedly meant for low-risk projects, the firm may switch to high-risk projects. This tends to benefit the shareholders at the expense of bondholders.

**Under-investment** If a firm has a large outstanding debt, it may reject positive NPV proposals as the same may benefit the bondholders primarily.

Suppliers of debt capital are aware that shareholders and their agent-managers can hurt them in various ways. So they include several covenants in the debt agreement to protect their interest. According to James Scott, the ideal covenant would be as follows: “Changes in financial, operating, or investment policy which would decrease the value of existing debt are prohibited unless accompanied by adequate compensation to debtholders”.

A covenant like this is meant to protect bondholders against asset depletion, dilution of claim, asset substitution, and under-investment. However, such a covenant is not easily enforceable in the real world as it is stated in very general terms. Hence, in practice, bond covenants are stated in more specific terms. They fall into two broad categories: positive and negative covenants:

**Positive Covenants** A positive (or affirmative) covenant states what the borrowing firm should do during the term of the loan (bond). Here are some examples of positive covenants:

- The firm has to periodically furnish certain reports and financial statements to the lenders.
- The firm agrees to maintain a certain working capital.
- The firm agrees to set up a sinking fund for redemption of debt.

- The firm has to maintain a certain net worth.
- The firm has to mortgage its assets.

**Negative Covenants** A negative covenant prohibits or restricts certain actions by the borrowing firm, without the prior permission of the lender. Here are some typical negative covenants:

- The firm cannot raise additional long-term debt.
- The firm cannot undertake a diversification project or acquire another firm or merge with another firm.
- The firm may not dispose or lease its major assets.
- The firm may not pay dividends in excess of a certain percentage.

## **29.7 ■ BOND REFUNDING**

Callable bonds, popularly used abroad, were virtually unknown in India till the early 1990s. The Industrial Development Bank of India was perhaps the first organisation to issue bonds with call features in 1992. Since then several organisations have issued callable bonds.

## Rationale for Callable Bonds

Why do companies issue callable bonds? This question has puzzled financial economists for a long time. Here are some plausible reasons for using a call provision:

- Superior interest rate forecasting
- Greater investment flexibility
- Reduction in interest rate risk

**Superior Interest Rate Forecasting** Corporate insiders are likely to be more informed about the prospects of the company and its impact on future credit rating. If they believe that better financials in future would improve credit rating which in turn would lower the required yield on the company's debt securities, they would be inclined to issue callable bonds. This gives them the flexibility to do bond refunding – they can replace bonds carrying higher yield with bonds carrying lower yield.

**Greater Investment Flexibility** Bond covenants often limit a company's investment flexibility by imposing restrictions on new investments and acquisitions. When such covenants are highly restrictive, the company may have to forego attractive investment opportunities. However, if bonds are callable the company can call them and restore its freedom for making investments.

**Reduction in Interest Rate Risk** Callable bonds typically carry a higher coupon rate. For example, if the coupon rate on a non-callable bonds is 8 percent, the coupon rate on a callable bond may be 10 percent. The value of a bond carrying a higher coupon rate is less sensitive to interest rate variation, compared to the value of a bond carrying a lower coupon rate.

## Procedure for Analysing the Refunding Decision

A company issues callable bonds primarily to enjoy the flexibility to redeem them prematurely. Typically, such redemption is done with the proceeds of a new issue of bonds that may be issued at a lower rate of interest because of favourable conditions in the capital market. For example, in September 1998, Reliance Industries raised \$ 37 million through a 7-year foreign currency loan at 150 basis points above the LIBOR and redeemed \$ 37 million of \$ 150 million 8.125 percent Yankee bonds issued in 1995. During 2009-2010, Tata Steel took steps to restructure its debt portfolio by exchanging \$ 493 million of its existing Foreign Currency Convertible Alternative Reference Securities ("CARS") with US \$ 546.94 million worth of new Foreign Currency Convertible Bonds, which benefit them from having a lower yield to maturity, longer tenure and more equity – like features. Put differently, the company sought to refund its debt.

How should a bond-refunding decision be analysed? It should be analysed the way any other capital budgeting decision is analysed. Hence, the decision rule is:

*Refund the bond if the present value of the stream of net cash savings is greater than the initial cash outlay.*

The terms initial outlay and the annual net cash savings are explained below.

### ***Initial Outlay***

$$\text{Initial outlay} = \text{Cost of calling the old bonds} - \text{Net proceeds of the new issue} - \text{Tax savings on tax-deductible expenses}$$

The terms on the right-hand side of the above expression are defined as follows:

$$\text{Cost of calling the old bonds} = \text{Face value of the bonds} + \text{Call premium}$$

$$\text{Net proceeds of the new issue} = \text{Gross proceeds} - \text{Floatation costs (issue expense + discount)}$$

$$\text{Tax savings on tax-deductible expenses} = \text{Tax rate} \left[ \frac{\text{Call premium} + \text{Unamortised floatation costs on the old bond issue}}{\text{Face value of the bonds}} \right]$$

### ***Annual Net Cash Savings***

$$\text{Annual net cash savings} = \text{Annual net cash outflow on old bonds} - \text{Annual net cash outflow on new bonds}$$

The terms on the right-hand side of the above expression are defined below:

$$\begin{aligned}\text{Annual net cash outflow} &= \text{Interest expense} - \text{Tax saving on interest expense and amortisation of floatation cost} \\ \text{on old bonds} &\end{aligned}$$

$$\begin{aligned}\text{Annual net cash outflow} &= \text{Interest expense} - \text{Tax saving on interest expense and amortisation of issue cost} \\ \text{on new bonds} &\end{aligned}$$

## Illustration

To illustrate how the bond-refunding decision should be analysed, let us consider an example. Acme Chemicals has ₹ 100 million, 18 percent bonds outstanding with 10 years remaining to maturity. The bonds are callable at a premium of 5 percent. As interest rates have fallen, Acme can refund these bonds with a ₹ 100 million issue of 10-year bonds carrying a coupon rate of 16 percent. The issue costs on the new bonds will be ₹ 5 million. The unamortised portion of the issue costs on the old bonds is ₹ 3 million and this can be written off no sooner the old bonds are called. Acme's marginal tax rate is 40 percent.

The bond-refunding decision may be analysed as follows:

### 1. *Initial Outlay*

(a) Cost of calling the old bonds	
Face value of the old bonds	100,000,000
+ Call premium	+ 5,000,000
	105,000,000
(b) Net proceeds of the new issue	
Gross proceeds	100,000,000
- Issue costs	- 5,000,000
	95,000,000
(c) Tax savings on tax-deductible expenses	
Tax rate [Call premium + Unamortised issue costs on the old bond issue]	
0.4 [5,000,000 + 3,000,000]	3,200,000
Initial Outlay: 1 (a) – 1 (b) – 1 (c)	6,800,000

### 2. *Annual Net Cash Savings*

(a) Annual net cash outflow on old bonds	
Interest expense	18,000,000
Tax savings on interest expense and amortisation of issue costs	
0.4 [18,000,000 + 3000,000/10]	- 7,320,000
	10,680,000
(b) Annual net cash outflow on new bonds	
Interest expense	16,000,000
- Tax saving on interest expense and	- 6,600,000

amortisation of issue cost 0.4 [16,000,000 + 5,000,000/10]	9,400,000
Annual Net Cash Savings: 2(a) – 2(b)	1,280,000
<b>3. Present Value of the Annual Cash Savings</b>	
Present value of a 10-year annuity of 1,280,000 using a discount rate of 9.6 percent after-tax cost of new bonds (1,280,000 × 6.252)	8,002,560
<b>4. Net Present Value of Refunding the Bonds</b>	
(a) Present value of annual cash savings	8,002,560
(b) Net initial outlay	6,800,000
(c) Net present value of refunding the bonds	1,202,560

### **A Bond Refunding Decision**

Satlej Jal Vidyut Nigam borrowed ₹ 2100 crore at an average cost of 9 percent. The money was used to repay the ₹ 1540 crore loan from World Bank (carrying 14.5 percent interest) and ₹ 560 crore for meeting capital expenditures.

## 29.8 ■ DURATION

The duration of a bond is the weighted average maturity of its cash flow stream, where the weights are proportional to the present value of cash flows. Formally, it is defined as:

$$\text{Duration} = [\text{PV}(C_1) \times 1 + \text{PV}(C_2) \times 2 + \dots + \text{PV}(C_n) \times n] / V_0 \quad (29.3)$$

where  $\text{PV}(C_t)$  is the present value of the cash flow receivable at the end of year  $t$  ( $t = 1, 2, \dots, n$ ), and  $V_0$  is the current value of the bond.

For calculating the present value of cash flow, the yield to maturity (the internal rate of return) of the bond issue is used as the discount rate.

The duration of a bond, in effect, represents the length of time that elapses before the 'average' rupee of present value from the bond is received.

To illustrate how duration is calculated consider two bonds, A and B.

	Bond A	Bond B
Face value	₹ 100	₹ 100
Coupon (interest rate)	15 percent payable annually	10 percent payable annually
Years to maturity	6	6
Redemption value	₹ 100	₹ 100
Current market price	₹ 89.50	₹ 71.98
Yield to maturity	18 percent	18 percent

[Exhibit 29.4](#) shows the calculation of duration for these bonds. As expected, the duration of bond A is shorter than the duration of bond B.

The volatility (or interest rate sensitivity) of a bond is approximately related to its duration.

$$\text{Volatility} = \frac{\text{Duration}}{(1 + \text{Yield})} \quad (29.4)$$

The volatilities of bonds A and B are:

$$\text{Volatility of bond A} = 4.257/1.18 = 3.61$$

$$\text{Volatility of bond B} = 4.556/1.18 = 3.86$$

Thus, a 1 percent increase (decrease) in the required yield will result in an approximately 3.61 percent fall (rise) in the price of bond A and a 3.86 percent fall (rise) in the price of bond B. Remember that these numbers are approximations as the measure of volatility reflects the effect of an infinitesimal change in interest rates on bond prices.

For a finite change in interest rate (such as 1 percent variation), the actual bond price change will be somewhat different from that calculated on the basis of [Eq. \(29.4\)](#).

#### Exhibit 29.4 Calculation of Duration

Bond A: 15 Percent Coupon				
Year	Cash Flow	Present Value at 18 Percent	Proportion of the Bond's Value	Proportion of the Bond's Value × Time
1	15	12.71	0.142	0.142
2	15	10.77	0.120	0.241
3	15	9.13	0.102	0.306
4	15	7.74	0.086	0.346
5	15	6.56	0.073	0.365
6	115	42.60	0.476	2.856
				Duration 4.256 years
Bond B: 10 Percent Coupon				
Year	Cash Flow	Present Value at 18 Percent	Proportion of the Bond's Value	Proportion of the Bond's Value × Time
1	10	8.47	0.118	0.118
2	10	7.18	0.100	0.200
3	10	6.09	0.085	0.254
4	10	5.16	0.072	0.287
5	10	4.37	0.061	0.304
6	110	40.70	0.565	3.392
				Duration 4.556 years

**Spreadsheet Calculation** The calculation of duration using a spreadsheet is very easy. Enter the data for bond A in C1 to C5. Using the data for bond A, get the yield to maturity in F3 using the RATE formula. Enter the data on settlement, maturity, frequency, and basis in C6 to C9. Next, use the built-in financial function DURATION to get the duration in F7.

**Characteristics of Duration** The following characteristics of duration are worth noting:

- For a zero coupon bond, the duration is simply equal to the maturity of the bond.

- Other things being equal, the higher the interest (coupon rate), the shorter the duration.
- Other things being equal, the higher the yield to maturity, the shorter the duration. This is so because in this case the present value of nearer payments is more important vis-à-vis the present value of more distant payments.

	A	B	C	D	E	F
1	Face value		100			
2	Coupon payable per annum		15%			
3	Years to maturity in years		6	= RATE(C3,C1*C2,-C5,C4)	→	18%
4	Redemption value		100			
5	Current market price		89.5			
6	Settlement	Any date, if the date of purchase is not certain	1/1/2014			
7	Maturity	= C6 + 365*C3	12/31/2019	=DURATION(C6,C7,C2, F3,C8,C9)	→	4.25
8	Frequency	No. of times interest paid in a year	1			
9	Basis	3 represents the day count convention: actual no. of days/365 in int. calculation	3			

**Duration and Immunisation** If the interest rate goes up it has two consequences for a bondholder: (i) the capital value of the bond falls, and (ii) the return on reinvestment of interest income improves. By the same token, if the interest rate declines, it has two consequences for a bondholder: (i) the capital value of the bond rises, and (ii) the return on reinvestment of interest income decreases. Thus, an interest rate change has two effects in opposite directions. Can an investor ensure that these two opposite effects are equal so that he is immunised against interest rate risk? Yes, it is possible, if the investor chooses a bond whose duration is equal to his investment horizon. For example, if an investor's investment horizon is 5 years he should choose a bond that has a duration of 5 years if he wants to insulate himself against interest rate risk. If he does so, whenever there is a change in interest rate, losses (or gains) in capital value will be exactly offset by gains (or losses) on reinvestments.

## 29.9 THE TERM STRUCTURE OF INTEREST RATES

In [Chapter 6](#), when we discussed how to calculate present values, we used the same discount rate for each period's cash flow. Similarly, a single yield to maturity  $y$  is often used to discount all future cash payments from a bond. While the use of a single discount rate is an acceptable approximation for most purposes, there are some occasions when short-term interest rates have to be differentiated from long-term interest rates.

The term structure of interest rates describes the relationship of spot rates with different maturities, for the debt of a given borrower in a given currency.

To understand how the term structure of interest rates is measured, consider a loan that pays ₹ 1 at the end of one year. To find the present value of this loan, discount the cash flow by one-year rate of interest,  $r_1$ :

$$PV = 1 / (1 + r_1) \quad (29.5)$$

$r_1$  is referred to as the one-year spot rate.

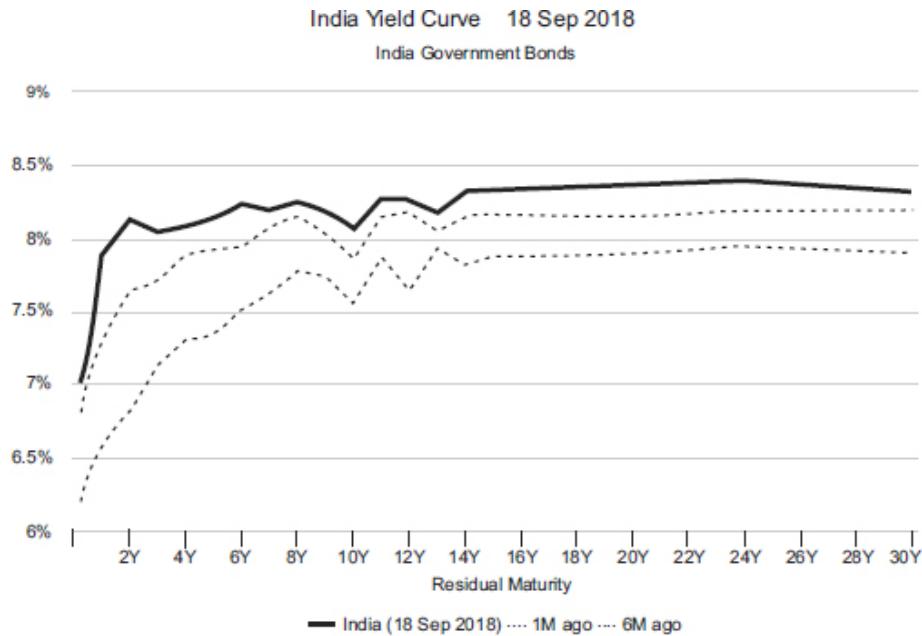
Now, consider a loan that pays ₹ 1 at the end of two years. To find its present value, you need to discount at the two-year spot rate,  $r_2$ :

$$PV = 1 / (1 + r_2)^2$$

Thus, the cash flow at the end of year 1 is discounted at  $r_1$  (today's one-year spot rate) and the cash flow at the end of year 2 is discounted at  $r_2$  (today's two-year spot rate). The term structure of interest rates is defined by the series of spot rates  $r_1, r_2, \dots, r_t$ .

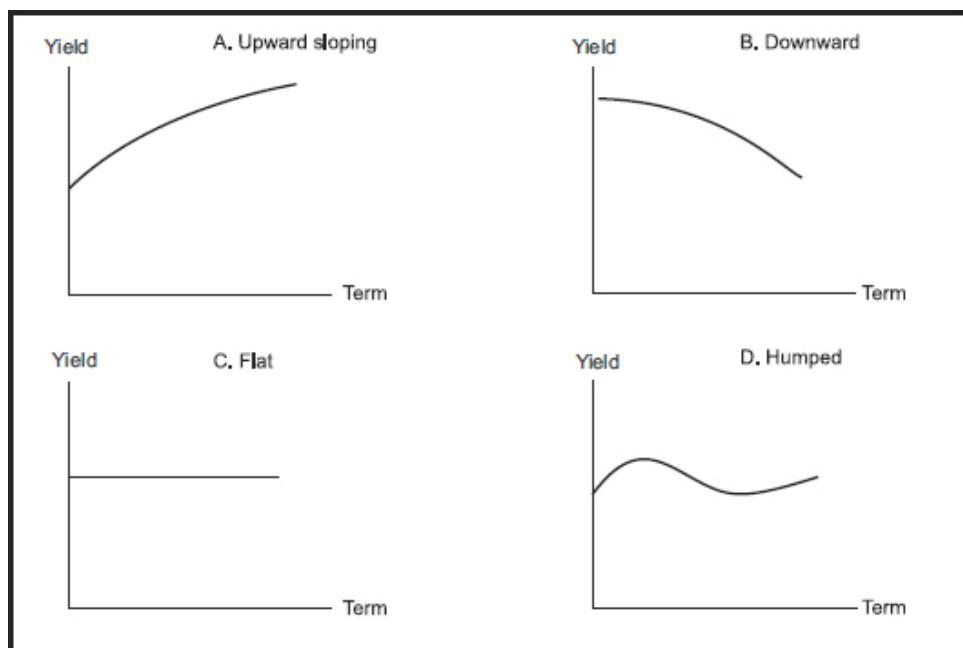
[Exhibit 29.5](#) shows the term structure of interest rates in India at four different points of time. Typically, the term structure of interest rates, informally called the "yield curve," slopes upward. However, it may follow any pattern. Four patterns are depicted in [Exhibit 29.6](#).

## Exhibit 29.5 | Yield Curve



Source: <http://www.worldgovernmentbonds.com/country/india/>

## Exhibit 29.6 | Types of Yield Curve



Suppose, we have to value ₹ 1 payable at the end of years 1 and 2. If the spot rates are different, say  $r_1 = 6\%$  and  $r_2 = 7\%$ , the present value of the two-year cash flow stream is:

$$PV = \frac{1}{1.06} + \frac{1}{1.07^2} = 1.817$$

Armed with this knowledge, we can figure out a single discount rate that will give the right answer. This is called the yield to maturity and it is obtained by solving the following equation for  $y$ .

$$PV = 1.817 = \frac{1}{(1+y)} + \frac{1}{(1+y)^2} \quad (29.6)$$

This gives a yield to maturity of 5.67%. Given the YTM, you can use it to value other two-year annuities. But you can't get the YTM until you know the price and you can't determine the price until you know the spot interest rates for one year and two years. That is why professionals start with spot rates.

## Spot Rates

$r_t$ , the spot rate for year  $t$ , may be viewed as the rate of interest on a bond that makes only a single payment at time  $t$ . Do such bonds exist? Fortunately, such bonds exist and they are called stripped bonds, or strips. In the U.S., for example, you can request, the U.S. Treasury to convert a normal coupon bond into a package of mini-bonds, each of which provides just one cash payment. For example, a \$ 1000 par value bond with a coupon rate of 4.5 percent maturing in 2025 may be exchanged for ten semi-annual coupon strips, each paying \$22.50 and principal strip paying \$1000.

The prices of strips can be used to measure the term structure of interest rates. Suppose in January 2015, a 10-year \$1000 principal strip costs \$588.21. This means that the ten-year discount factor is  $DF_{10} = 1/(1 + r_{10})^{10} = 0.58821$ , and the 10-year spot rate is

$$r_{10} = (1/0.58821)^{0.10} - 1 = 0.0545 \text{ or } 5.45\%.$$

Likewise, the spot rates of other periods can be calculated.

From April 1, 2010, the RBI has permitted stripping of government securities. Presently, bonds with coupon or maturity dates of January 2 or July 2, irrespective of when they mature, can be stripped. The face value of each strip must be ₹ 100. Strips can currently be traded only in the OTC market.

## Forward Rates

Suppose the spot rate for the first year is 7 percent and the spot rate over a period of two years is 8 percent. This means that if you invest ₹ 1 for 1 year, your investment will grow to ₹ 1.07 at the end of the year and if you invest ₹ 1 in a two-year zero coupon bond, your investment will grow to ₹ 1  $(1.08)^2$  or ₹ 1.1664 at the end of year 2. This means that over the second year you receive 9.01 percent, calculated as follows:

$$₹ 1.1664 = ₹ 1 (1.07) (1.0901)$$

The hypothetical rate over the second year, 9.01 percent, is called the forward rate. You can think of your investment in the two-year zero-coupon bond as earning the one-year spot rate of 7 percent and *locking-in* 9.01 over the second year.

In general terms, if  $r_1$  and  $r_2$  are the spot rates, we can determine the forward rate,  $f_2$ , using the following equation:

$$(1 + r_2)^2 = (1 + r_1) \times (1 + f_2) \quad (29.7)$$

Solving this equation, yields

$$f_2 = \frac{(1 + r_2)^2}{(1 + r_1)} - 1 \quad (29.8)$$

We can calculate forward rates over later years as well. The general formula is as follows:

$$f_n = \frac{(1 + r_n)^n}{(1 + r_{n-1})^{n-1}} - 1 \quad (29.9)$$

where  $f_n$  is the forward rate over the  $n^{\text{th}}$  year,  $r_n$  is the spot rate for  $n$  years and  $r_{n-1}$  is the spot rate for  $n - 1$  years.

### Example Assume the following spot rates

Year	1	2	3	4
Spot Rate	7.5%	8%	8.5%	9.0%

What are the forward rates over each of the four years?

By definition, the forward rate for the first year is equal to the spot rate for 1 year. The forward rates over the later years are:

$$f_2 = \frac{(1.08)^2}{1.075} - 1 = .0850$$

$$f_3 = \frac{(1.085)^3}{(1.08)^2} - 1 = .0951$$

$$f_4 = \frac{(1.09)^4}{(1.085)^3} - 1 = .1051$$

## Explaining the Term Structure

What determines the term structure of interest rates? This question has long puzzled academicians and practitioners. Three principal explanations have been offered: the expectations theory, the liquidity preference theory, and the preferred habitat theory (along with its variant the market segmentation theory).

**Expectations Theory** This theory holds that the shape of the yield curve can be explained by the interest rate expectations of those who participate in the market. More precisely, the expectations theory holds that any long-term rate is equal to the geometric mean of current and future one-year rates expected by the market participants.

**Liquidity Preference Theory** An important criticism levelled against the expectations theory is that it assumes that investors know with certainty what lies ahead of them. The future, however, is not known. There is uncertainty about the one-year period return from a bond whose maturity is greater than one period. And this uncertainty regarding the one-period return increases with the maturity of the bond.

Since investors are risk-averse, J.R. Hicks argued that they require an inducement to hold long-term bonds. They will ask for a long-term rate which is higher than the average of expected future rates. Put differently, forward rates should incorporate interest rate expectations as well as a risk (or liquidity) premium.

**Preferred Habitat Theory** The liquidity preference theory assumes that risk premium must necessarily rise with maturity because investors wish to liquidate their investments at the earliest and borrowers want to borrow long. This assumption, however, may not be realistic.

According to Modigliani and Sutch who originally formulated the preferred habitat theory, risk-aversion implies that investors will prefer to match the maturity of investment to their investment objective. Investors with long investment horizons would like to invest in instruments of longer maturities; otherwise they will be exposed to a reinvestment risk, i.e., the risk that the interest rate will decline when the proceeds of a short-term instrument have to be reinvested. Likewise, short-term investors would like to invest in instruments of shorter maturity; otherwise they will be exposed to price risk, i.e. the risk that the price of an asset will fall when it is sold prematurely because of a rise in interest rates. Similar considerations apply

to borrowers; risk-aversion implies that borrowers would like to match the maturity of their borrowings to the length of time for which they need funds.

If there is a mismatch between the demand and supply of funds in a certain maturity range, the preferred habitat theory asserts that some lenders and borrowers may have to be induced to shift out of their preferred maturity ranges. Of course, they will have to be compensated for this in the form of a suitable risk premium which depends on the extent of risk aversion.

**Market Segmentation Theory** In a way, the market segmentation theory is an extreme form of the preferred habitat theory. It states that investors as well as borrowers are unwilling to shift from their preferred maturity range, come what may. Hence, according to this theory the shape of the yield curve is determined entirely by the supply and demand forces within each maturity range.

## SUMMARY

- **Debt market** is poised for substantial growth in the years to come as several factors conducive to its development are falling into place.
- Debt instruments are subject to diverse risks, such as **interest rate risk**, **inflation risk**, **real interest rate risk**, and **default risk**.
- A **debt rating** essentially reflects the probability of timely payment of interest and principal by a borrower.
- Despite variations across individual rating agencies the **rating methodology** employed by different agencies is similar in essential ways.
- Increased volatility of interest rates and changes in the tax and regulatory framework have stimulated a great deal of **innovation** in debt securities such as deep discount bonds, floating rate bonds, commodity linked bonds, convertible bonds, extendable notes, structured notes, inverse floaters, PTCs, and CMOs.
- Innovative debt securities add value by reallocating risk, lowering issue costs, saving taxes, reducing agency cost, and enhancing liquidity.
- To protect their interest, bondholders ask for **positive covenants** as well as **negative covenants**.
- A **callable bond** should be **refunded** if the present value of the stream on net cash savings is greater than the initial cash outlay.
- The **duration** of a bond is the weighted average of maturity of its cash flow stream, where the weights are proportional to the present value of cash flows.
- The **volatility** (or interest rate sensitivity) of a bond is equal to duration divided by  $(1+yield)$ .

- The **term structure** of interest rates, popularly called **yield curve**, shows how the yield to maturity is related to term to maturity.
- The three principal explanations for the term structure of interest rates are: the **expectations theory**, the **liquidity preference theory**, and the **preferred habitat theory**.

## QUESTIONS

1. Why was the market for corporate debt historically small and underdeveloped? What factors are stimulating its growth?
2. Discuss the risks to which debt instruments are subject to.
3. What is the meaning of debt rating?
4. Discuss the functions of debt rating.
5. Describe the key features of the methodology used for debt rating.
6. What symbols are employed by CRISIL for rating debentures?
7. Describe the nature of the following: deep discount bonds, floating rate bonds, commodity linked bonds, extendable notes, pass through certificates, collateralised mortgage obligations, junk bonds, structured notes, and inverse floaters.
8. Discuss how innovative debt instruments add value.
9. Discuss the key steps in securitisation.
10. What are the obstacles to securitisation in India?
11. What are the ways in which shareholders and their agents (managers) may increase default risk and hurt the interest of bondholders?
12. Discuss the nature of bond covenants.
13. How should a bond-refunding decision be analysed?
14. What is duration and how is it calculated?
15. How is volatility of a bond related to its duration?
16. What are the important characteristics of duration?
17. How can an investor in bonds immunise himself against interest rate risk?
18. What is a yield curve?
19. How could you calculate the forward interest rates?
20. Discuss the expectations theory, liquidity preference theory, and preferred habitat theory.

## SOLVED PROBLEMS

- 29.1 Magnavision Electronics has ₹ 300 million, 16 percent bonds outstanding with a balance maturity of 5 years. As interest rates have fallen, Magnavision can refund its bonds with a ₹ 300 million issue of 5 years bonds carrying a coupon rate of 14 percent. The call premium will be 5 percent. The issue costs on the

new bonds will be ₹ 6 million. The unamortised portion of the issue costs on the old bonds is ₹ 5 million and these can be written off no sooner the old bonds are called. Magnavision's marginal tax rate is 35 percent. Analyse the bond refunding decision.

*Solution*

1. Initial Outlay

(a) Cost of calling the old bonds	
Face value of old bonds	300,000,000
+ Call premium	15,000,000
	<hr/>
	315,000,000
(b) Net proceeds of the new issue	
Gross proceeds	300,000,000
– Issue costs	6,000,000
	<hr/>
	294,000,000
(c) Tax savings on tax-deductible expenses	
Tax rate [Call premium + Unamortised issue costs on the old bonds]	
0.35 [15,000,000 + 5,000,000]	7,000,000
Initial Outlay: 1(a) – 1(b) – 1(c)	14,000,000

2. Annual Net Cash Savings

(a) Annual net cash outflow on old bonds	
Interest expense	48,000,000
– Tax savings on interest expense and amortisation of issue costs	17,150,000
.35 [48,000,000 + 5,000,000/5]	<hr/>
	30,850,000
(b) Annual net cash outflow on new bonds	
Interest expense	42,000,000
– Tax savings on interest expense and amortisation of issue costs	15,120,000
0.35 [42,000,000 + 6,000,000/5]	<hr/>
	26,880,000
Annual net cash savings: 2(a) – 2(b)	3,970,000
3. Present Value of the Annual Cash Savings	15,403,600
Present value of a 5-year annuity of 3,970,000 using a discount rate of 9.1 percent (after-tax cost on new bonds) :	
3,970,000 × 3.880	
4. Net Present Value of Refunding the Bond	15,403,000

Present value of annual cash savings	14,000,000
– Initial outlay	1,403,000

29.2 The following data is available for a bond.

Face value	₹ 1000
Coupon (interest rate)	16 percent payable annually
Years to maturity	6 years
Redemption value	₹ 1000
Current market price	₹ 964.5

What is the yield to maturity, duration, and volatility of this bond?

*Solution*

a. The yield to maturity is the value of  $r$  in the equation

$$964.5 = \sum_{t=1}^6 \frac{160}{(1+r)^t} + \frac{1000}{(1+r)^6}$$

$r$  works out to 17.00 percent.

b. The duration is calculated below:

Year	Cash flow	Present value at 17%	Proportion of the bond's value	Proportion of the bond's value × Time
1	160	136.8	0.142	0.142
2	160	116.9	0.121	0.242
3	160	99.9	0.104	0.311
4	160	85.4	0.089	0.354
5	160	73.0	0.076	0.378
6	160	452.4	0.469	2.814
		964.5		4.241

c. The volatility of the bond approximately is:

$$\frac{\text{Duration}}{(1 + \text{Yield})} = \frac{4.241}{1.17} = 3.625$$

This means that 1 percent increase (decrease) in the required yield will result in an approximately 3.625 percent fall (rise) in the price of the bond.

29.3 Assume the following spot rates:

Year	1	2	3	4	5
Spot Rate	7.0%	7.5%	8.0%	8.3%	8.4%

What are the forward rates over each of the five years?

*Solution*

By definition, the forward rate for the first rate is equal to the spot rate 1 year, viz., 7.0%.

The forward rates over the later years are:

$$f_2 = \frac{(1.075)^2}{(1.07)} - 1 = 0.800 \text{ or } 8.0\%$$

$$f_3 = \frac{(1.08)^3}{(1.075)^2} - 1 = 0.900 \text{ or } 9.0\%$$

$$f_4 = \frac{(1.083)^4}{(1.08)^3} - 1 = 0.921 \text{ or } 9.21\%$$

$$f_5 = \frac{(1.084)^5}{(1.083)^4} - 1 = 0.881 \text{ or } 8.81\%$$

## PROBLEMS

- 29.1 Bond Refunding** Zenith Pharmaceuticals has a ₹ 250 million, 17 percent bond outstanding with 8 years remaining to maturity. As interest rates have fallen, Zenith can refund its bond with a ₹ 250 million issue of 8-year bonds carrying a coupon rate of 15 percent. The call premium will be 6 percent. The issue costs on the new bonds will be ₹ 10 million. The unamortised portion of the issue costs on the old bonds is ₹ 8 million and these can be written off no sooner the old bonds are called. Zenith's marginal tax rate is 40 percent. Analyse the bond refunding decision.
- 29.2 Bond Refunding** Laxmi Textiles has a ₹ 120 million 16 percent bond outstanding with 5 years remaining to maturity. Laxmi can refund these bonds with a ₹ 120 million issue of 5-year bonds carrying a coupon rate of 15 percent. The unamortised portion of the issue costs on the old bonds is ₹ 3 million and these can be written off no sooner the old bonds are called. Laxmi's marginal tax rate is 40 percent. Should Laxmi refund the debt?
- 29.3 Duration and Volatility** Consider two bonds, P and Q.

	<i>Bond P</i>	<i>Bond Q</i>
Face value	1,000	1,000
Coupon (interest rate)	16 percent payable annually	12 percent payable annually
Years to maturity	8	5
Redemption value	1,000	1,000
Current market price	₹ 920	₹ 800

What are the yields to maturity, durations, and volatilities of these bonds?

- 29.4 Forward Rates** Assume the following spot rates

Year	1	2	3	4	5
Spot Rate	7.0%	7.2%	7.3%	7.4%	7.5%

What are the forward rates over each of the following five years?

## MINICASE

The recession has just set in and the chairman of Manas Associates has thought it fit to convene a meeting of his senior executives to chalk out some worthwhile future plans. Luckily for them their business has not been much adversely affected till now.

Two different ideas have emerged in the meeting. As the asset prices have fallen steeply, the young members led by the CEO himself, are strongly in favour of going in for modernisation of the plant. The old veterans, on the other hand, are wary of any additional investment whatsoever in a recessionary period. Their proposal is to raise ₹ 400 million through a new issue of bonds at 9 percent coupon for 5 years to replace the outstanding 12% ten year bonds issued five years back. The cost of the issue would be about 3%. According to them on the strength of their standing and respectability it should be possible for them to raise such a sum even in these days and their bankers would only be supportive as it wouldn't increase their leverage. The chairman has asked you to let them know the net present value of the refunding scheme before they meet again for the noon session.

You gather the following information: The call premium is 5 percent of the face value. The issue costs of the outstanding bonds was ₹ 20 million. The unamortised portion of the issue costs can be written off as soon as the outstanding bonds are called. The company's marginal tax rate is 32 percent.

Show your detailed calculations.

## PRACTICAL ASSIGNMENT

For your chosen company, look at the balance sheet for the past three years. Identify various long-term debt instruments employed by the company and explain the rationale for the same.

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- 1 Standard & Poor's, *Debt Ratings Criteria: Industrial Overview*, New York: Standard & Poor's, 1985.
  - 2 This illustration is adapted from *Rating Profile*, April 2003 published by ICRA Rating Services.
  - 3 Clifford W. Smith, Jr. and J.B.Warner, "On Financial Contracting : An Analysis of Bond Covenants," *Journal of Financial Economics*, Vol.7 (1979).

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter29/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter29/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Leasing, Hire-Purchase, and Project Finance

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Discuss the plausible and dubious reasons for leasing.
- ✓ Describe the mechanics of leasing.
- ✓ Evaluate an operating lease.
- ✓ Evaluate leasing as a financing decision.
- ✓ Choose between leasing and hire purchase.
- ✓ Discuss the features of project finance.

A lease represents a contractual arrangement whereby the lessor grants the lessee the right to use an asset in return for periodical lease rental payments. While leasing of land, buildings, and animals has been known from times immemorial, the leasing of industrial equipments is a relatively recent phenomenon, particularly on the Indian scene.

A hire-purchase involves, in essence, the purchase of an asset on the understanding that the purchaser (called the hirer) will pay in equal periodic installments spread over a length of time. In substance, leasing and hire-purchase represent debt financing in different garbs.

Leasing and hire-purchase have emerged as a supplementary source of intermediate to long-term finance. They are provided mainly by non-banking finance companies, financial institutions, and other organisations.

Project finance is the principal arrangement for private sector participation in infrastructure projects like power plants, airports, highways, and telecommunication networks which depend heavily on debt.

This chapter discusses various aspects of leasing, hire-purchase, and project finance.

## 30.1 ■ TYPES OF LEASES<sup>1</sup>

An equipment lease transaction can vary along the following dimensions: extent to which the risks and rewards of ownership are transferred, number of parties to the transaction, domiciles of the equipment manufacturer, the lessor, and the lessee, etc. Based on these variations, the following classifications have evolved:

- Finance lease vs operating lease
- Sale and lease back vs direct lease
- Single investor lease vs leveraged lease
- Domestic vs international lease

**Finance Lease versus Operating Lease** According to Ind AS 17, a finance lease is a lease that transfers substantially the risks and rewards incidental to ownership of an asset. The following conditions individually or in combination would normally lead to a lease being classified as a finance lease:

- The lease agreement transfers ownership to the lessee when the lease expires.
- The lessee can purchase the asset at a bargain price when the lease expires.
- The lease term is for a major part of the asset's life even if the title is not transferred.
- The present value of lease payments is substantially all of the fair value of the leased asset.

An *operating lease* can be defined as any lease other than a finance lease. The salient features of an operating lease are:

- The lease term is significantly less than the economic life of the equipment.
- The lessee enjoys the right to terminate the lease at short notice without any significant penalty.
- The lessor usually provides the operating know-how and the related services and undertakes the responsibility of insuring and maintaining the equipment. Such an operating lease is called a 'wet lease'. An operating lease where the lessee bears the costs of insuring and maintaining the leased equipment is called a 'dry lease'.

From the above features of an operating lease, it is evident that this form of lease does not result in a substantial transfer of the risks and rewards of ownership from the lessor to the lessee. The lessor, structuring an operating lease transaction, has to depend upon multiple leases or on the realisation of a substantial resale value (on expiry of the first lease) to recover the investment cost plus a reasonable rate of return thereon. Therefore, specialising in operating lease calls for an in-depth knowledge of the equipments per se and the existence of a secondary (resale) market for such equipments. Given the fact that the resale market for most of the used capital equipments in India lacks breadth, operating leases are not in popular use. In recent years there have been attempts to structure car lease and computer lease transactions in the operating lease format.

**Sale and Lease Back versus Direct Lease** In a sale and lease back transaction, the vendor of an asset sells the asset to a leasing company, and leases it back in order to enjoy the uninterrupted use of the asset in his business. The lease back arrangement in this transaction can be structured in the form of either a finance lease or an operating lease. Usually manufacturing companies use this arrangement to unlock investment in fixed assets such as factory buildings.

From the leasing company's point of view, a sale and lease back arrangement poses certain issues. First, it is difficult to establish a fair market value of the asset being acquired because the secondary market for the asset may not exist; even if it exists, it may lack breadth. Second, as per the Indian Income Tax Act, the depreciation that can be claimed by the leasing company for tax purposes cannot exceed the depreciation that would have been claimed by the vendor had he continued to own the asset. So the price paid by the lessor is irrelevant for the purpose of calculating tax relevant depreciation. Assuming that the depreciation tax shield is not significant, the leasing company is likely to charge a higher lease rate to make the transaction financially viable from its point of view.

A *direct* lease can be defined as any lease transaction which is not a "sale and lease back" transaction. In other words, in a direct lease, the lessee and the owner are two different entities. A direct lease usually is of two types: bipartite lease and tripartite lease. In a bipartite lease, there are two parties to the transaction—the equipment supplier-cum-lessor and the lessee. The bipartite lease can be structured either as an operating lease or as a finance lease with in – built facilities like upgradation of the equipment (upgrade lease) or additions to the original equipment configuration. A

tripartite lease, on the other hand, is a transaction involving three different parties—the equipment supplier, the lessor, and the lessee. Most of the equipment lease transactions fall under this category and are typically finance leases.

**Single Investor Lease versus Leveraged Lease** In a *single investor lease* transaction, the leasing company (lessor) funds the entire investment by raising an appropriate mix of debt and equity. The important point to be noted is that the debt funds raised by the leasing company are without recourse to the lessee. Put differently, the lender cannot demand payment from the lessee in the event of the leasing company defaulting on its debt servicing obligations.

In a *leveraged lease transaction*, the leasing company or lessor (called the equity participant) and a lender (called the loan participant) jointly fund the investment in the asset to be leased to the lessee. The funding provided by the loan participant is usually structured in the form of a fixed rate loan without recourse to the leasing company. Each lease rental received from the lessee is bifurcated into two parts: a part which represents the debt service charge on the loan is passed on to the loan participant and the balance which is passed on to the leasing company. The loan provided by the loan participant is secured by a first charge on the future rentals payable by the lessee and a fixed charge on the leased asset.

**Domestic Lease versus International Lease** A lease transaction is classified as a *domestic lease* if all parties to the lease transaction—the equipment supplier, the lessor, and the lessee —are domiciled in the same country. A lease transaction is classified as an *international lease* if one or more of the parties to the transaction is/are domiciled in a different country.

The distinction between a domestic lease transaction and an international lease transaction is important for two reasons. First, packaging an international lease transaction calls for (a) an understanding of the political and economic climate; and (b) a knowledge of the tax and the regulatory framework governing these transactions in the countries concerned. Second, as the payments to the supplier and/or the lease payments tend to be denominated in different currencies, the economics of the transaction from the point of view of both the lessor and the lessee tend to be affected by the variations in the relevant exchange rates. Put differently, international lease transactions (unlike domestic lease transactions) are exposed to two additional sources of risk—country risk and currency risk.

## **30.2 ■ RATIONALE FOR LEASING**

A variety of reasons are cited in support of leasing. Some of them are plausible while others are dubious.

## **Plausible Reasons**

**Convenience** Suppose you want a car for one month. You can buy one and sell it after a month. Doing so, however, will involve a lot of effort, time, and cost. You have to select one, arrange for its financing, and negotiate its resale after your use. Clearly it is not worth doing all this, when you have the simple alternative of renting the car for a month. Likewise, when a company needs an equipment for a short period, it makes sense to lease it, rather than buy it. Of course, such a lease will invariably be an operating lease.

**Benefits of Standardisation** Suppose you run a finance company that specialises in leasing trucks. You are effectively lending money to a number of firms that may vary in size and risk. Since the asset in each case is the same (a truck), you can use a standardised contract and you don't have to incur large administrative and investigative costs. Put differently, standardisation and economies of scale will reduce administration and transaction costs. Due to these benefits, leasing can be a cheaper source of finance, particularly for smaller companies.

**Better Utilisation of Tax Shields** The tax benefit of asset ownership may vary across various units in the economy. The sources of this variation are (i) differences in the tax rates across economic units and (ii) differences in the level of past and current income across economic units. Due to such differences in tax shelters enjoyed by various firms, leasing may be a tax-beneficial arrangement. A firm that cannot, on its own, avail of tax benefits of owning an asset may share a part of that benefit in the form of lower lease rentals by taking the asset on lease from a firm that enjoys tax benefits in full.

**Fewer Restrictive Covenants** Term loans have several restrictive covenants associated with them. These relate to matters like new investments, additional financing, working capital position, managerial appointments, dividend payment, and provision of guarantees. By comparison lease contracts contain fewer and less restrictive covenants.

Further, many firms are averse to the 'nominee director' clause often found in term loan agreements. Lease financing, however, does not carry such 'inconvenient clauses'.

**Lower Cost of Obsolescence Risk** In an operating lease, the lessee can terminate the lease at will. This means that the risk of obsolescence is borne by the lessor. The lessor, however, enhances the lease rental suitably for bearing the risk of obsolescence. In effect, the lessee bears the cost of obsolescence risk.

Is it possible for a user of asset to reduce the economic cost of obsolescence by way of leasing? Yes, this may happen. The lessor, with better access to potential users of assets, may be able to find an economic use for somewhat obsolescent assets and thereby reduce the economic cost of obsolescence. A part of this economic advantage is likely to be passed on to the user (lessee) of the asset under competitive pressures in the leasing market.

**Expeditious Implementation** If debt financing is sought from lending institutions, the process of project preparation, appraisal, and sanction can be somewhat time consuming. It may take one to three months and sometimes even longer. As against this, lease financing can be tied up quickly. It can be finalised within a few days. Hence, leasing facilitates expeditious implementation of a project. This may reduce cost and provide some competitive edge.

**Matching of Lease Rentals to Cash Flow Capabilities** The pattern of debt servicing burden, given a certain amount of term loan, is more or less uniform for all types of borrowers. This is because a term loan is typically repayable in 8 to 16 equal semi-annual instalments and the interest is payable on the outstanding loan amount. As against this, leasing companies claim that they can tailor make lease rentals to match the cash flow capability of the lessee. They may offer the following patterns of lease rentals: seasonal, stepped-up, deferred. Seasonal lease rentals have appeal to firms which have pronounced seasonality in their operations. Stepped-up lease rentals are suitable for firms which are likely to experience a gradual increase in their revenues over a period of time. Deferred lease rentals make sense when there is a long gestation period before revenues are generated. Further, lease rentals may be adjusted to enable the lessee to derive the maximal tax advantage from lease payments.

## **Dubious Reasons for Leasing**

**Hundred Percent Financing** Leasing companies often claim that they provide “100 percent financing” because they pay the entire cost of the leased asset. Hence they argue that leasing preserves the capital of the lessee firm.

How valid is this argument? If a firm leases the asset, it does conserve its cash. However, it conserves its cash even when it borrows and buys the asset. Whether the firm goes for the leasing option or the borrowing-cum-buying option it incurs a similar liability, while preserving its cash. So there is nothing special about leasing.

**Circumvention of Certain Controls** In some organisations, leasing decisions are considered as operating decisions and not capital budgeting decisions. This may induce managers to resort to leasing so that they can circumvent the rigorous or time-consuming approval procedure required for capital budgeting.

In a similar vein, financial institutions may sometimes suggest the leasing option to their clients, if they cannot grant term loans in order to conform with certain lending norms.

**Favourable Financial Ratios** Traditionally, leases (both operating and financial) have been regarded as off-balance sheet sources of finance in India. This means that the leased asset and the liability associated with it are not shown on the balance sheet of the lessee firm. Thanks to such a treatment, leasing improves the debt equity ratio of the firm.

The present accounting standard of the Institute of Chartered Accountants of India, however, requires that a finance lease must be shown in the books of the lessee.

### 30.3 ■ MECHANICS OF LEASING

As a financial manager who is evaluating the possibility of leasing, you should know the following:

- Legal aspects of leasing
- Typical contents of a lease agreement
- Sales tax provisions relating to leasing
- Procedural aspects of leasing
- Income tax provisions relating to leasing
- Accounting treatment of leases

**Legal Aspects of Leasing** As there is no separate statute for equipment leasing in India,<sup>2</sup> the provisions relating to bailment in the Indian Contract Act govern equipment leasing agreements as well. Section 148 of the Indian Contracts Act defines bailment as:

“The delivery of goods by one person to another, for some purpose, upon a contract that they shall, when the purpose is accomplished, be returned or otherwise disposed off according to the directions of the person delivering them. The person delivering the goods is called the ‘bailor’ and the person to whom they are delivered is called the ‘bailee’ ”.

Since an equipment lease transaction is regarded as a contract of bailment, the obligations of the lessor and the lessee are similar to those of the bailor and the bailee (other than those expressly specified in the lease contract). This, in essence, has the following implications for the lessor and the lessee.

1. The lessor has the duty to deliver the asset to the lessee, to legally authorise the lessee to use the asset, and to leave the asset in peaceful possession of the lessee during the currency of the agreement.
2. The lessee has the obligation to pay the lease rentals as specified in the lease agreement, to protect the lessor’s title, to take reasonable care of the asset, and to return the leased asset on the expiry of the lease period.

**Typical Contents of a Lease Agreement** The lease agreement specifies the legal rights and obligations of the lessor and the lessee. It typically contains terms relating to the following:

1. Description of the lessor, the lessee, and the equipment.
2. Amount, time, and place of lease rental payments.
3. Time and place of equipment delivery.
4. Lessee's responsibility for taking delivery and possession of the leased equipment.
5. Lessee's responsibility for maintenance, repairs, registration, etc. and the lessor's right in case of default by the lessee.
6. Lessee's right to enjoy the benefits of the warranties provided by the equipment manufacturer/supplier.
7. Insurance to be taken by the lessee on behalf of the lessor.
8. Variation in lease rentals if there is a change in certain external factors like bank interest rates, depreciation rates, and fiscal incentives.
9. Option of lease renewal for the lessee.
10. Return of equipment on expiry of the lease period.
11. Arbitration procedure in the event of dispute.

**Goods and Services Tax (GST) Relating to Leasing** The key GST provisions relating to leasing are as follows:

1. According to Schedule II of the Central Goods and Services Tax Act, any transfer of right in goods or of undivided share in goods without the transfer of title thereof constitutes a supply of services. Since a lease transaction involves a transfer of right to use the asset from the lessor to the lessee, it is treated as supply of services for the purpose of GST. Further, under the GST regime, there is apparently no difference between a financial lease and an operating lease.
2. Some cases of financial leases involve transfer of title of the asset at the end of the lease tenure. Such cases shall be treated as supply of goods and attract GST accordingly.

**Procedural Aspects** The procedure involved in a lease arrangement usually consists of the following steps:

1. The lessee selects the equipment. This involves specification of the equipment, supplier, price, terms of warranties, guarantees, delivery period, installation, and service.
2. The lessee approaches the lessor, submits a formal application, and negotiates the terms of lease.
3. The lessee and the lessor sign the lease agreement.

4. The lessee assigns purchase rights to the lessor and the lessor purchases the equipment which is delivered to the lessee. (The assignable guarantees and service terms are passed on to the lessee).
5. The lessee insures the equipment and endorses the insurance policy in favour of the lessor.

**Income Tax Provisions Relating to Leasing** The principal income tax provisions relating to leasing—and they apply to operating as well as financial leases—are as follows:

1. The depreciation can be claimed by the lessor and not the lessee.
2. The lease rentals received by the lessor are taxable under the head of 'Profits and Gains of Business or Profession'.
3. The lease rentals paid by the lessee are tax-deductible expenses for the lessee.

**Accounting Treatment of Leasing** The accounting treatment of lease transactions in India are as follows:

1. Operating leases are capitalised in the books of the lessor. Lease payments are treated as income of the lessor and expense of the lessee. The depreciation of leased assets should be on a basis consistent with the normal depreciation policy of the lessor for similar assets.
2. Finance leases must be capitalised in the books of lessee. This means that: (a) At the time of inception, the leased equipment is shown as an asset on the balance sheet of the lessee. Its value is equated to the present value of the committed lease rentals. The leased asset is matched by a corresponding liability called the 'lease payable.' (b) Lease payments are split into two parts: finance charge and principal amount. The finance charge is treated as an expense on the profit and loss account and the principal amount is deducted from the liability 'lease payable'. (c) The leased asset is depreciated in the books of the lessee as per its depreciation policy.

Thus we find that as far as a finance lease is concerned there is a divergence between the tax treatment and the accounting treatment.

## 30.4 ■ OPERATING LEASES

Centaur Leasing is in the business of providing automobiles on a wet lease to corporate clients. Centaur is considering a new model of Honda car for which a serious enquiry has come from Moderna Enterprises. The cost of the vehicle is ₹ 1.2 million. Its operating, maintenance, insurance, and other costs are expected to be ₹ 0.2 million in year 1; thereafter it will increase annually by 8 percent. The car is expected to have a useful life of 5 years and it will fetch a net salvage value of ₹ 0.4 million after that. The depreciation rate for tax purposes will be 40 percent under the written down value method. Centaur's marginal tax rate is 35 percent and its cost of capital is 11 percent.

What annual lease rental should Centaur quote to Moderna Enterprises? As a first cut, the lease rental may be arrived at as follows:

1. Calculate the present value of the post-tax cash flows associated with the ownership and operation of the car. The post-tax cash flows associated with the car are shown in [Exhibit 30.1](#). The present value of these cash flows is—₹ 1.204 million. This is the sum of the numbers in line 8 of [Exhibit 30.1](#).
2. Convert the present value obtained in step 1 into post-tax equivalent annual cost (EAC). The post-tax EAC works out to:

$$\frac{\text{PV of costs}}{\text{PVIFA}_{r,n}} = \frac{1.204}{3.696} = ₹ 0.326 \text{ million}$$

3. Adjust the post-tax EAC for the tax factor to get the lease rental.

$$\text{Lease rental} = \frac{\text{Post-tax EAC}}{1 - \text{Tax rate}} = \frac{₹ 0.326}{1 - .35} = ₹ 0.502 \text{ million}$$

Centaur, of course, will have to charge an annual lease rental of more than ₹ 0.502 million for the following reasons: (a) It has to cover the cost of negotiating and administering the lease contract periodically. (b) It has to forego revenues when the car is idle and off-lease. (c) It has to bear the risk of the diminishing appeal of the car over a period of time.

**Leasing versus Buying** Conceptually, the decision rule for choosing between buying and leasing is fairly simple: Buy the asset if the post-tax EAC of ownership and operation is less than the post-tax lease rental; lease the asset if the post-tax EAC of ownership and operation is more than the post-tax lease rental.

## **Exhibit 30.1 | Post-tax Cash Flows Associated with the Ownership and Operation of the Car**

	₹ in million)					
	Year					
	0	1	2	3	4	5
1. Initial cost	–1,200					
2. Operating and other costs		– 0.200	– 0.216	– 0.233	– 0.252	– 0.272
3. Depreciation		0.480	0.288	0.173	0.104	0.062
4. Tax shield on operating costs and depreciation		+ 0.238	+ 0.176	+ 0.142	+ 0.125	+ 0.117
5. Net salvage value						+0.400
6. Post-tax cash flow (1 + 2 + 4 + 5)	– 1,200	0.038	– 0.04	– 0.091	– 0.127	0.245
7. Discount factor (at 11 percent)	1.000	0.901	0.812	0.731	0.659	0.593
8. Present value	– 1,200	0.034	– 0.032	– 0.067	– 0.084	0.145

If you need the asset for a short period, it makes sense to lease it. On the other hand, if you need the asset for a long period, it makes sense to buy the asset because your EAC of ownership and operation is likely to be less than the operating lease rate. Remember that the lessor marks up the lease rate to cover the costs of lease negotiation and administration, the revenues foregone when the asset is idle, and so on. When you buy the asset for your use, these costs are avoided.

In some cases, however, the operating lease may make more sense even when the asset is required for a longer period. First, the lessor may be more efficient in buying and managing the asset than the lessee. For example, a car leasing company that buys cars in bulk can bargain for a lower price with the car manufacturer. Further, it can operate them at a lower cost and extract higher salvage values at the time of disposal. A small company that needs few cars may not enjoy such economies of scale and hence may find the lease option cheaper.

Second, an operating lease offers valuable options to the lessee. Suppose Centaur offers Moderna Enterprises two leasing proposals:

- A one-year lease for ₹ 0.520 million
- A five-year lease for ₹ 0.540 million with the option to cancel the lease any time after 1 year.

Although the second lease proposal is costlier than the first, it has some attractive features. If lease rates increase after one year, the second proposal allows Moderna to continue at the old rate. On the other hand, if lease rates decline, Moderna can cancel the lease and get a better rate. In

essence, the additional cost of the second lease is like an annual insurance premium paid by the lessee.

## 30.5 ■ LEASING AS A FINANCING DECISION

In finance literature, a leasing decision is commonly regarded as a financing decision. The decision to invest in the asset is taken for granted and the option of leasing is compared with the option of buying with borrowed funds. Leasing is compared with borrowing because both of them entail essentially similar obligations.

**Cash Flows of a Finance Lease** Vitex Limited has decided to go for a fork lift for internal transportation. It costs ₹ 10 million and has an economic life of 6 years at the end of which it will fetch a net salvage value of ₹ 1 million. The fork lift will be depreciated at a rate of 40 percent per annum under the written down value method for tax purposes. The marginal tax rate for Vitex is 35 percent. Vitex can borrow ₹ 10 million at 15.4 percent to buy the fork lift.

As the financial manager of Vitex, you have been approached by Anupam Leasing which is willing to lease the fork lift for a lease rental of ₹ 2.4 million per year payable in arrear. Vitex Limited will have to bear all operating, maintenance, and insurance expenses.

If Vitex leases the fork lift rather than buys it, the financial implications are as follows:

1. Vitex saves ₹ 10 million, the cost of the fork lift. This is equivalent to a cash inflow of ₹ 10 million at the end of year 0.
2. Vitex, not being the owner of the fork lift, cannot claim depreciation on it. Hence it loses the depreciation tax shield. Further, Vitex does not get the salvage value after 6 years.
3. Vitex must pay ₹ 2.4 million per year to Anupam Leasing. The first payment is due at the end of year 1.
4. The lease payment of ₹ 2.4 million per year represents a tax deductible expense. Given a 35 percent marginal tax rate, the lease payments will generate a tax shield of ₹ 0.84 million per year.

[Exhibit 30.2](#) shows the cash flow of the lease contract.

**Net Present Value of the Lease** Given the cash flow set out in [Exhibit 30.2](#), you can figure out the NPV of the lease proposal.

In principle, you can use a separate discount rate for each cash flow item, viz., loss of depreciation tax shield on lease payment, lease payment,

tax shield on lease payment, and loss of salvage value. The discount rate chosen for each cash flow item may reflect its risk.

In practice, however, all the cash flow items are considered to be as safe as the interest and principal payments on a secured loan availed of by the lessee. This is a reasonable assumption because the lessor in effect lends money to the lessee against the security of the asset. Given this assumption, the post-tax cost of borrowing is used for discounting the lease cash flows. The post-tax cost of borrowing for Vitex is equal to  $15.4 \times (1 - .35) = 10.0$  percent.

### Exhibit 30.2 Cash Flow of the Lease Contract

	Year (₹ in million)						
	0	1	2	3	4	5	6
1. Cost of fork lift	+ 10						
2. Depreciation		4.0	2.4	1.44	.86	.52	.31
3. Loss of depreciation tax shield ( $2 \times 0.35$ )		- 1.4	- 0.84	- 0.50	- 0.30	- 0.18	- 0.11
4. Lease payment		- 2.4	- 2.4	- 2.4	- 2.4	- 2.4	- 2.4
5. Tax shield on lease payment ( $4 \times 0.35$ )		0.84	0.84	0.84	0.84	0.84	0.84
6. Loss of salvage value							- 1.0
7. Cash flow of lease (1 + 3 + 4 + 5 + 6)	+ 10	- 2.96	- 2.40	- 2.06	- 1.86	- 1.74	- 2.67

Hence, the NPV of lease works out to<sup>3</sup>:

$$\begin{aligned} \text{NPV of the lease} &= 10 - \frac{2.96}{1.10} - \frac{2.40}{(1.10)^2} - \frac{2.06}{(1.10)^3} - \frac{1.86}{(1.10)^4} - \frac{1.74}{(1.10)^5} - \frac{2.67}{(1.10)^6} \\ &= - ₹ 0.08 \text{ million} \end{aligned}$$

Since the lease has a negative NPV, Vitex is better off buying the fork lift from a purely financial point of view. Note that our analysis answers the question: What happens if the firm leases the asset, rather than borrows and buys the asset? Hence the NPV of lease is also referred to as the NAL (net advantage of lease) relative to borrowing.

**Internal Rate of Return** Should you feel more comfortable with the internal rate of return (IRR) criterion, you can calculate the IRR of the lease cash flow and compare it with the post-tax cost of debt to assess whether leasing is a preferable option or not.

The IRR equation for our example is:

$$10.00 = \frac{2.96}{(1+r)} + \frac{2.40}{(1+r)^2} + \frac{2.06}{(1+r)^3} + \frac{1.86}{(1+r)^4} + \frac{1.74}{(1+r)^5} + \frac{2.67}{(1+r)^6}$$

The value of IRR or  $r$  in the above equation is 10.29 percent. This means that if the firm chooses the ‘leasing’ rather than the “borrowing and buying” option, it incurs a post-tax cost of 10.29 percent. Since this figure is higher than the post-tax cost of debt (10.00 percent), leasing is a costlier option.

### Equivalent Loan Amount

The lease cash flow is:

	Year						
	0	1	2	3	4	5	6
Lease cash flow (Rupees in million)	+ 10	- 2.96	- 2.40	- 2.06	- 1.86	- 1.74	- 2.67

Since lease payments are contractual obligations, the cash flow associated with the lease in years 1 through 6 may be regarded as the debt service burden of lease.

How much loan will entail the same debt service burden? The loan that will entail the same debt service burden will simply be:

$$\sum_{t=1}^n \frac{\text{Lease cash flow}}{[1 + r_D(1 - T_C)]^t} = \frac{2.96}{1.10} + \frac{2.40}{(1.10)^2} + \frac{2.06}{(1.10)^3} + \frac{1.86}{(1.10)^4} + \frac{1.74}{(1.10)^5} + \frac{2.67}{(1.10)^6}$$

= ₹ 10.08 million

Thus, a loan of ₹ 10.08 million can be serviced with the lease cash flows. Hence, it is called the *equivalent loan amount*.

Note that the cost of servicing a loan that brings an immediate inflow of ₹ 10.08 million is the same as the cost of servicing the lease, which brings in an immediate inflow ₹ 10.00 million. That is the reason why the lease has a net present value of ₹ 10.00 million - ₹ 10.08 million = -₹ 0.08 million. If Vitex leases the forklift, rather than raises an equivalent loan, it will have ₹ 0.08 million in its bank account.

You can easily establish the following relationship:

$$\text{NPV of lease} = \text{Initial financing provided by the lease} - \text{Equivalent loan amount}$$

**When is a Financial Lease Mutually Beneficial** What is the value of the lease to the lessor? As long as the lessor and lessee are in the same tax situation, the post-tax cash flow of the lessee is exactly opposite of the post-tax cash flow of the lessor. So the value of lease to the lessor will simply be the reverse of the value of lease to the lessee. In our example, the lessor’s cash flow would be the lessee’s cash flow with signs reversed.

	Year						
	0	1	2	3	4	5	6
Lessor's cash flow	-10.00	2.96	2.40	2.06	1.86	1.74	2.67

Hence the value of lease to the lessor is:

$$\begin{aligned} \text{Value of lease to the lessor} &= -10.00 + \frac{2.96}{1.10} + \frac{2.40}{(1.10)^2} + \frac{2.06}{(1.10)^3} + \frac{1.86}{(1.10)^4} + \frac{1.74}{(1.10)^5} + \frac{2.67}{(1.10)^6} \\ &= ₹ 0.08 \text{ million} \end{aligned}$$

What the lessee loses, the lessor gains and *vice versa*. Thus if the lessor and lessee are in the same tax situation the lease transaction is a zero sum game.

If the lessor and lessee have different tax rates, both of them can benefit from the lease transaction. Suppose the tax rate for Vitex is zero. Then the cash flow of the fork lift lease would be:

	Year						
	0	1	2	3	4	5	6
Cost of the fork lift	+10.00						
Lease payment		-2.4	-2.40	-2.40	-2.40	-2.40	-2.4
Salvage value							-1.0

These cash flows will be discounted at 15.4 percent, because  $r_D (1 - T_C)$  when  $T_C = 0$  is simply  $r_D$ . The value of the lease is:

$$\text{Value of the lease} = +10.00 - \sum_{t=1}^6 \frac{2.4}{(1.154)^t} - \frac{1.00}{(1.154)^6} = ₹ 0.59 \text{ million}$$

In this case there is a gain of ₹ 0.08 million to the lessor and a gain of ₹ 0.59 to the lessee. Both of them benefit at the expense of the government. While the government gains when it taxes lease receipts in the hands of the lessor, it loses when the lessor avails of the tax shield associated with depreciation and interest which are of no value to the lessee as its tax rate is zero. On the whole, the government suffers a net loss in terms of the present value of its tax receipts.

Other things being equal, the potential gains from leasing are more when:

- The tax rate of the lessor is much higher than the tax rate of the lessee.
- The depreciation charges are significantly higher in the initial years of the lease.
- The lease is structured in such a way that the lease payments are concentrated toward the end of the lease period.

- The interest rate is high.

## 30.6 ■ HIRE-PURCHASE ARRANGEMENT

Finance companies usually offer the facility of leasing as well as hire-purchase to its clients. What are the features of a hire-purchase arrangement? How are hire-purchase instalments split between interest and principal payments? How should the potential user of an asset choose between leasing and hire-purchase?

**Features of a Hire-Purchase Arrangement** The main features of a hire-purchase arrangement are as follows:

1. The hirer (the counterpart of lessor) purchases the asset and gives it on hire to the hirer (the counterpart of lessee).
2. The hirer pays regular hire-purchase instalments over a specified period of time. These instalments cover interest as well as principal repayment. When the hirer pays the last instalment, the title of the asset is transferred from the hirer to the hirer.
3. The hirer charges interest on a flat basis. This means that a certain rate of interest, usually around 8 percent, is charged on the initial investment (made by the hirer) and not on the diminishing balance.
4. The total interest collected by the hirer is allocated over various years. For this purpose, the 'sum of the years digits' method is commonly employed.

**Split of Hire-Purchase Instalments between Interest and Principal Repayment** To illustrate how the hire-purchase instalments are split between interest and principal repayment components, let us consider an example. Nidhi Finance offers a hire-purchase proposal to one of its customers, Synthetic Chemicals, which requires an equipment costing ₹ 1 million, on the following terms : (i) a flat interest rate of 14 percent and (ii) a hire-purchase period of 36 months. Given this information, the total interest burden and the monthly hire-purchase instalment would be as follows:

Total interest burden : ₹ 1000,000 (0.14) (3) = ₹ 420,000

$$\text{Monthly hire-purchase instalments : } \frac{\text{₹ } 1000,000 + \text{₹ } 420,000}{36} = \text{₹ } 39,444_4$$

To determine the split of the hire-purchase instalments between interest and principal repayments, let us first allocate the interest burden of ₹

420,000 over the three years as per the sum of the years digit method. According to this method, the proportions of interest allocated and the amount of interest to the three years would be as follows:

<i>Year</i>	<i>Proportion</i>	<i>Interest</i>
1	$\frac{36+35+34+\dots+25}{36+35+34+\dots+1} = \frac{366}{666}$	$\frac{366}{666} \times 420,000 = 230,811$
2	$\frac{24+23+22+\dots+13}{36+35+34+\dots+1} = \frac{222}{666}$	$\frac{222}{666} \times 420,000 = 140,000$
3	$\frac{12+11+10+\dots+1}{36+35+34+\dots+1} = \frac{78}{666}$	$\frac{78}{666} \times 420,000 = 49,189$

Given these interest allocations, the annual hire-purchase instalments would be split as follows:

<i>Year</i>	<i>Hire-purchase instalment</i>	<i>Interest</i>	<i>Principal repayment</i>
1	₹ 473,333	₹ 230,811	₹ 242,522
2	₹ 473,333	₹ 140,000	₹ 333,333
3	₹ 473,334	₹ 49,189	₹ 424,145

## 30.7 CHOICE BETWEEN LEASING AND HIRE-PURCHASE

Before discussing the procedure for choosing between leasing and hire-purchase options, the following differences between them, from the point of view of the lessee (hirer), may be noted.

### Leasing

- The lessee cannot claim depreciation for tax purposes.
- The entire lease rental is a tax-deductible expense for the lessee.
- The lessee, not being the owner of the asset, does not enjoy the salvage value of the asset.

### Hire-Purchase

- The hirer is entitled to claim depreciation for tax purposes.
- Only the interest component of the hire purchase instalment is a tax-deductible expense for the hirer.
- The hirer, being the owner of the asset, enjoys the salvage value of the asset.

The steps involved in choosing between leasing and hire-purchase options are:

*Step 1 Estimate the post-tax cash flows associated with these options as follows:*

Year	Leasing	Hire-Purchase
1	$- LR_1 (1 - T_C)$	$- I_1 (1 - T_C) - PR_1 + D_1(T_C)$
2	$- LR_2 (1 - T_C)$	$- I_2 (1 - T_C) - PR_2 + D_2(T_C)$
.	.	.
$n$	$- LR_n (1 - T_C)$	$- I_n (1 - T_C) - PR_n + D_n(T_C) + NSV_n$

where  $LR_t$  is the lease rental for year  $t$ ,  $T_C$  is the tax rate,  $I_t$  is the interest portion of the hire-purchase instalment for year  $t$ ,  $PR_t$  is the principal repayment portion of the hire-purchase instalment for year  $t$ ,  $D_t$  is the depreciation for year  $t$ , and  $NSV_n$  is the net salvage value of the asset at the end of  $n$  years.

**Step 2 Calculate the present value of cash flows associated with the two options (using the post-tax cost of debt as the discount rate) and choose the option which has a lower present value.**

To illustrate this procedure, let us revert to the case of Nidhi Finance and Synthetic Chemicals. In this case, Nidhi Finance, in addition to its hire-purchase proposal, offers a lease proposal on the following terms : (i) the primary lease period will be five years and during this period the lease rentals would be ₹ 300 per 1,000 per year; (ii) the secondary lease period will be five years and during this period the lease rental would be ₹ 12,000 per year; (iii) after the secondary lease period, the asset would be taken back by the lessor.

Other relevant information in this case is as follows: (i) the net salvage value of the asset after 10 years of use would be ₹ 100,000; (ii) the post-tax cost of debt for Synthetic Chemicals is 8 percent; (iii) the tax rate for Synthetic Chemicals is 50 percent; (iv) the depreciation rate for the equipment is 33  $\frac{1}{3}$  percent as per the written down value method.

Given the above information, the choice between leasing and hire-purchase options may be made with the help of the two-step procedure.

**Step 1 Estimate the post-tax cash flows** The cash flows of the leasing and hire-purchase options are shown in [Exhibit 30.3](#).

### **Exhibit 30.3 Cash Flows of Leasing and Hire-Purchase Options**

Year	Leasing		Hire-Purchase			$-I_t(1-T_C)$ $-PR_t + D_t$ $(T_C) + NSV_n$
	$-LR_t(1 - T_C)$	$-I_t(1 - T_C)$	$-PR_t$	$D_t(T_C)$	$NSV_n$	
1.	$-300,000 (0.5) = -150,000$	$-230,811 (0.5)$	$-242,522$	$333,333 (0.5)$	$-$	$-191,261$
2.	$-300,000 (0.5) = -150,000$	$-140,000 (0.5)$	$-333,333$	$222,222 (0.5)$	$-$	$-292,222$
3.	$-300,000 (0.5) = -150,000$	$-49,189 (0.5)$	$-424,144$	$148,148 (0.5)$	$-$	$-374,665$
4.	$-300,000 (0.5) = -150,000$	$-$	$-$	$98,765 (0.5)$	$-$	$49,383$
5.	$-300,000 (0.5) = -150,000$	$-$	$-$	$65,844 (0.5)$	$-$	$32,922$
6.	$-12,000 (0.5) = -6,000$	$-$	$-$	$43,896 (0.5)$	$-$	$21,948$
7.	$-12,000 (0.5) = -6,000$	$-$	$-$	$29,264 (0.5)$	$-$	$14,632$
8.	$-12,000 (0.5) = -6,000$	$-$	$-$	$19,509 (0.5)$	$-$	$9,755$
9.	$-12,000 (0.5) = -6,000$	$-$	$-$	$13,006 (0.5)$	$-$	$6,503$
10.	$-12,000 (0.5) = -6,000$	$-$	$-$	$8,671 (0.5)$	$100,000$	$104,336$

**Step 2 Calculate the present values and select one of the alternatives**

The present values of the two alternatives are as follows:

$$\text{Present value of the lease} = -\sum_{t=1}^5 \frac{150,000}{(1.08)^t} - \sum_{t=6}^{10} \frac{6,000}{(1.08)^t}$$

$$= -₹ 615,211$$

$$\text{Present value of hire-purchase} = -\frac{191,261}{(1.08)} - \frac{292,222}{(1.08)^2} - \frac{374,665}{(1.08)^3} + \frac{49,383}{(1.08)^4} + \frac{32,922}{(1.08)^5}$$

$$+ \frac{21,948}{(1.08)^6} + \frac{14,632}{(1.08)^7} + \frac{9,755}{(1.08)^8} + \frac{6,503}{(1.08)^9} + \frac{104,336}{(1.08)^{10}}$$

$$= -₹ 587,124$$

Since the cost of hire-purchase option in present value terms is lower than the cost of leasing in present value terms, the hire-purchase option is preferable to the leasing option.

**Deposit in a Hire-purchase** Typically, a finance company that gives hire-purchase finance insists that the hirer gives a deposit which may be around 20 percent of the cost of the asset. Of course, the deposit carries interest and is returnable at the end of the hire-purchase period. Hence, the above analysis will have to be amplified to take into account the cash flows associated with the deposit.

## 30.8 ■ PROJECT FINANCE

Project finance involves raising funds for a capital investment project that can be economically separated from its sponsor. The suppliers of funds depend primarily on the cash flows of the project to service their loans and provide return on their equity investment in the project.

While project finance has assumed great significance for infrastructure projects from 1970s onward, it has a long history. Indeed venture-by-venture financing for projects with finite life was the norm in commerce until the 17<sup>th</sup> century. A classic example is the loan provided by the Frescobaldu, a leading Italian merchant bank of its times, in 1299 to the English Crown for developing the Devon silver mines. The loan contract entitled the lender to control the operations of the mines for one year and take as much unrefined ore as it could extract during that period, but it had to bear all the operating costs.

**Features of Project Finance** The key features of project finance, which appears to be the principal arrangement for **private sector participation in infrastructure projects**, are as follows:

- The project is set up as a separate company which is granted a concession by the government.
- The sponsor company which promotes the project usually takes a substantial stake in the equity of the project and enjoys the over all responsibility for running the project.
- The project company enters into comprehensive contractual arrangements with various parties like contractors, suppliers, and customers.
- The project company employs a high debt-equity ratio, with lenders having no recourse or limited recourse to the sponsor company or to the government in the event of default.

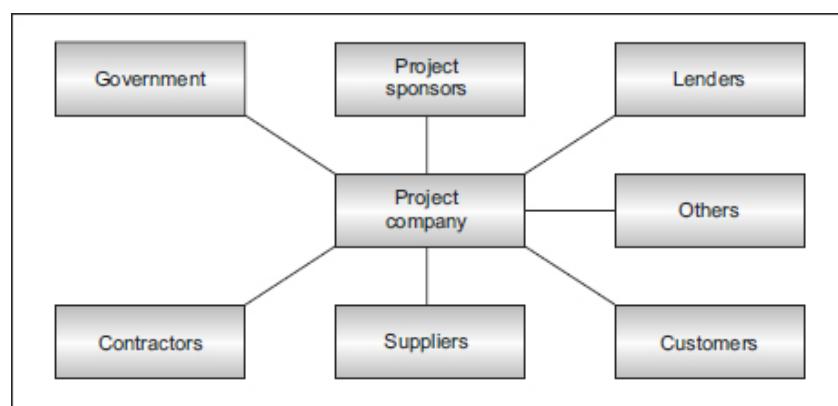
The above features distinguish project finance from conventional direct financing. In the latter, the projects are generally not set up as separate companies; the loans are granted by the lenders against the balance sheet of the sponsor; the contractual arrangements are not very comprehensive and ironclad; the lenders have recourse to the assets of the sponsor; and the debt-equity ratios are not as high as those found in the case of project finance.

**The Main Parties** There are several parties involved in a project finance arrangement as shown in [Exhibit 30.4](#).

**Project Sponsors** Project sponsors establish a separate company to undertake the project. Typically, a single sponsor or a group of sponsors, who generally participate in the construction and management of the project, will own a controlling stake in the equity of the project. Other equity holders are likely to be companies that have commercial interest in the project, such as suppliers, customers, and financial investors.

**Lenders** Infrastructure projects typically involve substantial investments. A significant proportion of the financing need is generally raised by way of loans from a syndicate of lenders such as banks and financial institutions and occasionally through a bond issue.

#### **Exhibit 30.4** Main Parties in Project Finance



Why is bank finance more used compared to bond finance? A plausible explanation for the widespread use of bank finance in preference to bond finance stems from the difference in the ownership structure of these two forms of debt. The ownership of bank debt is concentrated, whereas the ownership of bond debt is diffused. The concentrated ownership of debt motivates banks to evaluate the project thoroughly and to monitor its progress continually. Further, should the project company find it difficult to service its debt it can renegotiate with the bank/s.

In comparison, the diffused ownership structure of bonds diminishes the incentives of bond owners to evaluate thoroughly the project proposal and monitor its progress on a continuing basis. Also, it becomes difficult for bond owners to take concerted action if the bond covenants are violated, or should there be a need for renegotiating the terms of debt.

**Contractors** The principal contractor/s of the plant will often take a stake in the equity of the project and agree to bear penalty, which at times can be severe, for not completing their work on time.

**Suppliers and Customers** Once the project facility becomes operational, the project company will have to buy its supplies and sell its outputs or services. Typically, long-term contracts are entered into with suppliers and consumers. Sometimes, of course, the project may have only one customer. For example, the sole customer of an independent power producer may be the state owned electricity board.

**Government** Often, the project company needs a concession from the government to build a road or operate a hydel power project. Apart from granting concession, the government may also have to set up a regulatory framework to govern the relationship between the project company and its customers, in the main.

In some cases, the government may allow the project company to retain the ownership of the project assets. Such an arrangement is called a BOO (build-own-operate) arrangement. In other cases, the assets of the project are expected to be transferred to the government after the concession period. This arrangement is called a BOT (build-operate transfer) arrangement. In practice, there may be numerous variations of these arrangements.

**Contractual Agreements** A project company is unusual in the sense that it is set up to undertake a single project. However, there is nothing unusual about the parties that participate in the project. All companies have equity shareholders, lenders, contractors, suppliers, and customers, and all deal with the government. The key differentiating feature of project finance is the manner in which project risks are allocated to various parties involved in a project.

Through a comprehensive web of contracts, every major risk inherent in the project is allocated to the party/parties that is best able to assess and manage that risk. Since a party to a project will agree to assume risk at a reasonable price only if it understands that risk clearly, project finance is appropriate only for projects like power stations, roads, railway lines, airports, seaports, and telecom networks that involve established technologies. Project finance is not suitable for projects that involve complex or unproven technologies, as suggested by the inability of the U.K. government to arrange project finance for research and development projects.

Let us examine how contractual arrangements allocate risks among various parties to a project.

- The project sponsor normally assumes the risk of project completion, operation, and management through a facility management contract. Further, the sponsor may enter into a “working capital maintenance” agreement with the lending banks to ensure adequate funding support in the initial years.
- The main contractor, who is best able to control construction risks, often enters into a turnkey arrangement that stipulates a fixed price and imposes penalties for delays. He may also be asked to post a performance bond.
- When a project has a major supplier, a contract will be drawn up to ensure that the supplier produces efficiently and does not abuse its potential monopoly power.
- When there is a major customer (or few major customers) for the output of the project, the revenue risks are transferred largely to him through a long-term sales contract which generally includes a take-or-pay clause and links prices to costs. The transfer of revenue risk to customers gives them the incentive to estimate their demand for the project output carefully.
- When a project has numerous customers, as in the case of a toll road, it is virtually impossible to draw up a long-term sales contract. In such cases, the government may have to provide some guaranteed return to attract project finance.
- The lenders of the project will insist on the usual assurances, including proper security for loans, from the project company. In addition, they may require some recourse to project sponsors for specific problems like cost over-runs. Lenders normally want that cash in excess of debt servicing burden is not distributed to equity shareholders. Rather, it is put in a “reclaim” account which can be used if future cash flows are not adequate to service the debt.
- When a project company gets a concession from the government, a concession agreement is drawn up which grants the project company the right to build and operate the project. The agreement, among other things, may stipulate that the government constructs supporting facilities such as railway links.

To sum up, the distinctive feature of project finance is a web of contractual arrangements, which may change over time, designed to

distribute various risks inherent in the project to parties best qualified to appraise and control them. *Hence project finance represents an efficient way of allocating and managing risk.*

**Financial Structure and Corporate Governance** Many argue that the essence of project finance is the web of contracts meant to ensure that all parties work in concert for the success of the project, to distribute risks efficiently, and to prevent the abuse of monopoly power.

### GVK Power

GVK Industries sponsored GVK Power, the project company, to set up a power project. GVK Power entered into the following contracts with various parties.

- A *turnkey execution contract* was awarded to ABB, Switzerland. This contract stipulated that ABB, Switzerland would have to execute the turnkey contract within 28 months from the time of finalisation of funding. The contract imposed a penalty of rupees one crore for every day of delay beyond 28 months. Thus, the construction risk was transferred to ABB, Switzerland.
- An *operations and maintenance contract* was awarded to CMS Corporation. This contract imposed a penalty on CMS Corporation if the plant load factor was less than 85 percent. Thus, the operating risk was substantially shifted to CMS Corporation. CMS Corporation also took a 25 percent equity stake in GVK Power.
- A *power purchase agreement* was entered into with the Andhra Pradesh State Electricity Board under which the tariff was fixed at ₹ 2.20 per unit for 30 years. GVK Power enjoys the freedom to sell power in excess of 71 percent plant load factor directly to customers. Thus the *market risk* has been transferred to APSEB.
- A *loan agreement* has been entered into with IFC, ADB, and Indian financial institutions who have agreed to a debt-equity ratio of 70:30.

This argument is valid but incomplete as it does not explain the organisational structure, the ownership structure, and the financial leverage of the project. Put differently it does not explain why the project is handled as a separate company, why operators, contractors, suppliers, and consumers typically participate in the equity of the project company, and why the project company relies heavily on debt in the form of non-recourse financing or limited recourse financing. Indeed, a government interested in a certain infrastructure project can raise money on its own and enter into contracts with various parties.

However, it is not possible to write comprehensive contracts (which can envisage every possible contingency) and efficiently monitor them. For

example, when the operator and the main contractor have a significant stake in the equity of the project, they have an incentive to be efficient. After all, as equity shareholders their profit depends on the success of their project.

## SUMMARY

- A **lease** represents a contractual arrangement whereby the lessor grants the lessee the right to use an asset in return for periodical lease payments.
- There are different types of leases: **finance lease and capital lease; direct lease and sale and leaseback; single investor lease and leveraged lease; domestic lease and international lease.**
- There are some plausible reasons and some dubious reasons for leasing.
- Legally, the provisions relating to **bailment** in the **Indian Contract Act** govern equipment leasing agreements as well.
- For income tax purposes, the lessor—irrespective of whether it is a finance lease or an operating lease—is entitled to claim depreciation.
- For accounting purposes, **operating leases** are **capitalised** in the books of the lessor whereas financial leases are capitalised in the books of the lessee.
- In finance literature, a **leasing decision** is commonly regarded as a financing decision. Leasing is compared with the option of borrowing and buying.
- The NPV of a finance lease is:

$$NPV = I - \sum \frac{LR_t(1-T) + DEP_t \times T_c}{[1+r_D(1-T_c)]^t} - \frac{SV_n}{[1+r_D(1-T_c)]^n}$$

- Instead of calculating the NPV of a finance lease, you can calculate the **IRR** of the lease cash flow and compare it with the post-tax cost of debt.
- The loan that entails the same service burden as a finance lease is called the **equivalent loan amount**.
- Under a **hire-purchase agreement**, the **hirer** (the counterpart of lessee) enjoys the benefits of ownership. The hirer pays periodic hire purchase instalments to the **hiree** (the counterpart of the lessor) which cover interest as well as principal repayment.
- The key differentiating feature of **project finance** is the manner in which project risks are allocated to various parties involved in a project.

## QUESTIONS

1. Briefly describe the following types of lease: (a) finance lease, (b) operating lease, (c) sale and lease back, (d) direct lease, (e) single investor lease, (f) leveraged lease, (g) domestic lease, and (h) international lease.

2. What are the plausible reasons as well as the dubious reasons for leasing?
3. Discuss the legal aspects of leasing.
4. What are the typical contents of a lease agreement?
5. Discuss the income tax aspects of leasing.
6. Explain how accounting is done for a finance lease.
7. Discuss the procedure for comparing 'leasing' with 'borrowing and buying' option.
8. What is an equivalent loan amount?
9. When is a financial lease mutually beneficial to the lessor and the lessee?
10. What are the salient features of a hire-purchase arrangement?
11. How are hire-purchase instalments split between interest and principal repayment as per the 'sum of the years digits' method?
12. How would you choose between leasing and hire-purchase?
13. What are the key features of project finance?
14. Who are the main parties in a project finance arrangement?
15. Briefly describe how contractual arrangements allocate risks among various parties to a project.

## SOLVED PROBLEMS

30.1 Magnum Leasing is in the business of providing automobiles on wet lease to corporate clients. Magnum is considering a new model of Ford car for which an enquiry has come. The cost of the vehicle is ₹ 1.5 million. Its operating, maintenance, and insurance costs are expected to be ₹ 0.25 million in year 1; thereafter it will increase annually by 6 percent. The vehicle is expected to have a useful life of 6 years and it will fetch a net salvage value of ₹ 0.6 million after that. The depreciation rate for tax purposes will be 40 percent under the WDV method. Magnum's marginal tax rate is 35 percent and its cost of capital is 10 percent.

What is the minimum annual lease rental that Magnum should quote? Ignore the cost of negotiation and lease administration.

*Solution*

The post-tax cash flows associated with the ownership of car are shown below:

		Year						(₹ in million)
		0	1	2	3	4	5	6
1.	Initial cost	-1.500						
2.	Operating and other costs		-0.250	-0.265	-0.281	-0.298	-0.316	-0.335
3.	Depreciation		0.600	0.360	0.216	0.130	0.078	0.047
4.	Tax shield on operating costs and depreciation		0.298	0.219	0.174	0.150	0.150	0.134
5.	Net salvage value							0.600
6.	Post-tax cash flow (1+2+4+5)	-1.500	.048	-0.046	-0.107	-0.148	-0.178	0.399
7.	Discount factor (at 10 percent)	1.00	0.909	0.826	0.751	0.683	0.621	0.565
8.	Present value	-1.500	0.044	-0.038	-0.080	-0.101	-0.111	0.225

Present value of the post-tax cash flows associated with the ownership of the car = ₹ 1.561 million.

$$\text{Post-tax EAC} = \frac{\text{₹ } 1.561}{\text{PVIFA}_{10\%, 6}} = \frac{\text{₹ } 1.561 \text{ million}}{4.355} = \text{₹ } 0.358 \text{ million}$$

$$\text{Lease rental} = \frac{\text{Post-tax EAC}}{1 - \text{Tax rate}} = \frac{\text{₹ } 0.358 \text{ million}}{0.65} = \text{₹ } 0.551 \text{ million}$$

- 30.2 Mayfair Limited has decided to go for an air conditioning plant costing ₹ 50 million. Mayfair is considering two alternatives: (i) leasing the plant, and (ii) borrowing and purchasing the plant. Saral Leasing is willing to lease the plant to Mayfair at an annual lease rental of ₹ 14 million for 5 years, the lease rental being payable in arrears. The tax-relevant depreciation rate on the plant is 25 percent as per the WDV method. The net salvage value of the plant after 5 years is expected to be ₹ 10 million. Mayfair's marginal rate of tax is 35 percent and its post-tax cost of debt is 8 percent.

What is the net advantage of leasing (NAL) for Mayfair?

**Solution** The cash flow of lease contract is shown below:

		Year					(₹ in million)
		0	1	2	3	4	5
1.	Cost of the plant	+ 50.000					
2.	Depreciation		12.500	9.375	7.031	5.273	3.955
3.	Loss of depreciation tax shield (2 × 0.35)		- 4.375	- 3.281	- 2.461	- 1.846	- 1.384
4.	Lease payment		- 14.000	- 14.000	- 14.000	- 14.000	- 14.000
5.	Tax shield on lease payment (4 × 0.35)		4.900	4.900	4.900	4.900	4.900
6.	Loss of salvage value						- 10.000
7.	Cash flow of lease (1 + 3 + 4 + 5 + 6)	+ 50.000	- 13.475	- 12.381	- 11.561	- 10.946	- 20.484

$$\begin{aligned} \text{NAL of lease} &= 50.000 - \frac{13.475}{1.08} - \frac{12.381}{1.08^2} - \frac{11.561}{1.08^3} - \frac{10.946}{1.08^4} - \frac{20.484}{1.08^5} \\ &= -\text{₹ } 4.263 \text{ million} \end{aligned}$$

## PROBLEMS

**30.1 Leasing vs. Buying** Multi-tech Limited has decided to go for an asset costing ₹ 1.5 million. It has an economic life of 5 years at the end of which it would fetch a net salvage value of ₹ 0.3 million. The depreciation rate, for tax purpose, will be 33½ percent under the written down value method. The marginal tax rate for Multi-tech is 30 percent.

Multi-tech has been approached by Nidhi Leasing Company which offered to lease the asset required by Multi-tech for a period of five years. Nidhi has quoted a lease rental of ₹ 0.42 million per year payable in arrears.

The post-tax cost of debt for Multi-tech is 8 percent. Evaluate the two alternatives of (i) leasing the asset and (ii) borrowing and buying the asset using the net present value and the internal rate of return criteria.

**30.2 Hire Purchase vs. Leasing** Apex Steels requires an asset costing ₹ 2 million. Laxmi Finance offers a hire-purchase proposal for a period of 3 years at a flat interest of 12 percent.

Laxmi also gives a lease proposal wherein the lease rental would be ₹ 280 per ₹ 1,000 per year for the first 5 years (primary period) and ₹ 20,000 per year for the next 5 years (secondary period). Thereafter, the asset would revert to Laxmi.

The depreciation rate on the asset is 25 percent (WDV) and its net salvage value after 10 years would be ₹ 200,000. Apex has a tax rate of 40 percent and its post-tax cost of debt is 10 percent. Should Apex choose the hire-purchase or the leasing option?

## MINICASE

Acer Limited is a fairly profitable company with a reasonably strong balance sheet. Historically, Acer relied on equity, retained earnings, and straight debt (in the form of loans and debentures) to meet its financing needs. Thanks to an increase in its growth rate in the last few years, Acer's financing needs have been growing rather fast. Pratik Dave, the CEO of Acer wants to evaluate alternative sources of finance like leasing and hire-purchase to meet some of its financing needs.

Acer requires a small aircraft for transporting its executives to far-flung plants. The cost of the aircraft is ₹ 30 million and its expected economic life is 10 years. For tax purposes it will be depreciated at a 40 percent under the written down value method. Its expected salvage value ten years hence would be ₹ 6 million.

Acer is evaluating three financing options.

1. Borrow ₹ 30 million at 12 percent interest and buy the aircraft. The principal amount of the loan will be repaid in five equal annual installments. The first repayment will be at the end of the second year.
2. Lease the aircraft for a period of 10 years, 5 years being the primary lease period and 5 years being the secondary lease period. The lease rental during the primary lease period will be ₹ 7 million per year and the lease rental during the secondary lease period will be ₹ 0.5 million per year.
3. Take the aircraft under a hire-purchase arrangement wherein the flat rate of interest is 8 percent and the hire-purchase period is 36 months. The interest component of the hire-purchase is allocated over the years according to the 'sum of the years digits' method.

The pre-tax cost of debt for Acer is 12 percent and the tax rate for Acer is 33.3 percent.

- (a) What is the present value of the 'borrowing-cum-buying option'?
- (b) What is the present value of the cash flows associated with the leasing option?
- (c) What is the present value of the cash flows associated with the hire-purchase option?
- (d) What are the plausible and dubious reasons for leasing?
- (e) How is the accounting treatment done for leasing in India?
- (f) When are the potential gains for leasing more?

<sup>1</sup> This section has been contributed by Dr. K. Sriram.

<sup>2</sup> It may be mentioned that the term 'lease' as defined in the Transfer of Property Act, 1882 and Indian Registration Act, 1899 covers only the lease of immovable property and not the lease of equipments.

<sup>3</sup> In general terms, the NPV of a lease is:

$$\text{NPV of lease} = I - \sum_{t=1}^n \frac{LR_t(1-T) + DEP_t \times T_c}{[1+r_D(1-T_c)]^t} - \frac{SV_n}{[1+r_D(1-T_c)]^n}$$

where  $I$  is the cost of the asset,  $LR_t$  is the lease rental for year  $t$ ,  $T_c$  is the marginal tax rate,  $DEP_t$  is the depreciation charge for year  $t$ ,  $r_D$  is the pre-tax cost of debt,  $n$  is the life of the asset, and  $SV_n$  is the salvage value of the asset.

<sup>4</sup> The annual hire-purchase instalment would simply be:

$$(\text{₹ } 1,000,000 + \text{₹ } 420,000)/3 = \text{₹ } 473,333.$$

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter30/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter30/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Hybrid Financing

### Learning Objectives

After studying this chapter you should be able to:

- ✓ Discuss the features of preference capital, warrants, and convertible debentures.
- ✓ Value a warrant using the Black-Scholes model.
- ✓ Explain the determinants of the value of optionally convertible debentures.
- ✓ Discuss the motives for issuing warrants and convertible debentures.
- ✓ Show how hybrids can be used for managing risk.

As we have seen, equity represents a residual claim on the cash flow and assets of the firm and enjoys the management control over the firm. Debt, on the other hand, represents a fixed claim on the cash flow and assets of the firm and is not generally associated with management control.

Equity and debt lie at the two ends of the spectrum of financing. In between lie hybrid sources of financing which partake some characteristics of equity and some characteristics of debt. The important forms of hybrid financing are preference capital, warrants, convertible debentures, and innovative hybrids.

Preference capital ordinarily carries a fixed rate of dividend which is payable at the discretion of directors when the company has distributable surplus.

A warrant gives its holder the right to subscribe to the equity share (s) of a company during a certain period at a specified price.

A convertible debenture is a debenture that is convertible, partially or fully, into equity shares. The conversion may be compulsory or optional. A variant of a convertible debenture is a foreign currency convertible bond (FCCB). This is an instrument which is issued abroad and denominated in a foreign currency (most commonly in the U.S. dollar). When the stock market was booming between 2004 and 2007, dozens of Indian companies raised

capital by issuing FCCBs. In 2004, 23 companies raised \$2363 million and in 2007, 71 companies raised \$7686 million. Indeed, during those years FCCBs became the most important instrument for raising capital for corporate India.

An innovative hybrid is a hybrid security whose payoff is linked to some general economic variable like the interest rate, exchange rate, or commodity index.

## **31.1 ■ PREFERENCE CAPITAL**

As noted in [Chapter 17](#), preference capital is a hybrid source of financing that partakes some characteristics of equity and some attributes of debt. The claim of preference shareholders lies somewhere between that of debenture holders (or other lenders) on the one hand and equity shareholders on the other. While they have a lower priority than debenture holders (or other lenders), they enjoy a higher priority than equity shareholders.

## **Features of Preference Shares**

The features attached to preference shares may vary along the following dimensions: cumulation of dividends, callability, convertibility, redeemability, participation in surplus profits and assets, and voting power.

**Cumulation of Dividends** Preference shares may be cumulative or non-cumulative with respect to dividends. Barring a few exceptions, preference shares in India carry a cumulative feature with respect to dividends. The unpaid dividends on cumulative preference shares are carried forward and payable when the dividend is resumed. For example, if the dividend payment on a 10 percent cumulative preferred share is skipped for 4 years, a dividend arrear of 40 percent is payable. Note that a company cannot declare equity dividends unless preference dividends are paid with arrears.

**Callability** The terms of preference share issue may contain a call feature by which the issuing company enjoys the right to call the preference shares, wholly or partly, at a certain price.

**Convertibility** Preference shares may sometimes be convertible into equity shares. The holders of convertible preference shares enjoy the option of converting preference shares into equity shares at a certain ratio during a specified period. For example, the preference shareholders may enjoy the option of converting preference shares into equity shares in the ratio of 1:5 after 2 years for a period of 3 months.

**Redeemability** A company in India cannot issue irredeemable preference shares. The redemption period can not exceed 20 years – it can be longer for infrastructure periods. If the terms of issue so prescribe, preference shares can be redeemed at a premium to their face value. According to the Companies Act, preference shares can be redeemed only out of accumulated profits or from the fresh issue of shares of any type. The premium portion, if any, can however be met from the share premium account. The accumulated profits that are utilised for redeeming preference shares have to be transferred to a special reserve called the ‘Capital Redemption Reserve.’

**Participation in Surplus Profits and Assets** Companies may issue participating preference shares which entitle preference shareholders to participate in surplus profits (profits left after preference dividend and

equity dividend at certain rates) every year and residual assets (assets left after meeting the claims of preference shareholders) in the event of liquidation according to a specific formula.

**Voting Rights** Preference shareholders have a right to vote only on resolutions placed before the company which directly affect the rights attached to preference shares and any resolution for the winding up of the company or for the repayment or reduction of its equity or preference capital. In such cases, the voting rights of equity shareholders and preference shareholders shall be proportional to their respective shares in the paid-up capital of the company. If the dividend in respect of a class of preference shares has not been paid for a period of two years or more, such class of preference shareholders shall have a right to vote on all the resolutions placed before the company.

The small numerical strength of preference shareholders, however, makes their voting right meaningless and in most of the cases preference shareholders are often helpless and unable to use their votes effectively.

## **Revival of Preference Capital**

Preference capital was considered a financial anachronism some time back as it did not offer the comfort of equity (because preference dividend is typically payable with arrears) or the tax advantage of debt (because preference dividend, unlike debt interest, is not a tax deductible expense).

In recent years, however, there has been a resurgence of interest in preference capital because preference dividend is now tax-exempt in the hands of investors. Hence investors are willing to accept a lower rate of dividend on preference capital, thereby lowering the cost of preference capital for the issuing companies. It seems to make eminent sense for a company which has more or less exhausted its debt capacity and is unwilling to issue equity capital.

Other reasons for the use of preference capital seem to be as follows:  
(a) Preference shares do not require any charge such as mortgage or hypothecation. (b) The Acceptance of Deposit Rules do not apply to preference shares. (c) Preference shares can be issued quickly for raising funds for the medium term, with maturity periods of 2 to 4 years.

## **31.2 ■ FEATURES OF WARRANTS AND CONVERTIBLE DEBENTURES**

### **Features of Warrants**

A warrant gives its holder the right, but not the obligation, to subscribe to a certain number of equity shares at a stated price during a specified period. Warrants are generally issued to ‘sweeten’ debt issues. For example, the Tata Iron and Steel Company issued Secured Premium Notes (a debt instrument) in 1992. To attract investors, a warrant was attached to each Secured Premium Note. The warrant represented a right to seek allotment of the equity share for cash at ₹ 100 per share between 12 months and 18 months after the allotment of the Secured Premium Note.

## **Features of Convertible Debentures**

Convertible debentures in India, for practical purposes, are of relatively recent origin. Yet during this short period the features of these debentures have undergone significant changes. In the early 1980s when they became prominent for the first time they were typically compulsorily convertible (partially or fully) at a stated conversion price on a predetermined date. The terms of such debentures were fixed by the Controller of Capital Issues.

With the repeal of the Capital Issues Control Act and the enactment of SEBI Act in 1992, the rules of the game applicable to convertible debentures have changed. As per SEBI guidelines, the provisions applicable to fully convertible debentures (FCDs) and partially convertible debentures (PCDs) are as follows:

- The conversion premium and the conversion timing shall be determined and stated in the prospectus.
- Any conversion, partial or full, will be optional at the hands of the debenture holder, if the conversion takes place at or after 18 months but before 36 months from the date of allotment.
- A conversion period of more than 36 months will not be permitted unless conversion is made optional with “put” and “call” options.
- Compulsory credit rating will be required if the conversion period of fully convertible debentures exceeds 18 months.

From the SEBI guidelines it is clear that convertible debentures in India presently can be of three types:

- Compulsorily convertible debentures which provide for conversion within 18 months.
- Optionally convertible debentures which provide for conversion within 36 months.
- Debentures which provide for conversion after 36 months but which carry “call” and “put” features.

My guess is that the bulk of the convertible debentures in the immediate future will be of the first two types. Hence, our discussion on valuation of convertible debentures will focus on these two types.

## **Differences between Warrants and Convertible Debentures**

The essential feature of warrants and convertible debentures is the same. They give the holder a call option on the equity stock of the company. There are, however, some differences between the two.

- In a convertible debenture, the debenture and the option are inseparable. A warrant, however, is detachable.
- Warrants can be issued independently. They need not be tied to some other instrument.
- Warrants are typically exercisable for cash.
- The exercise of warrants results in the infusion of new capital, whereas the conversion of convertibles results in a mere accounting transfer.
- Most convertibles have a call provision that gives the issuer the flexibility to either refund the debt or to force conversion, depending on whether the conversion value is more or less than the call price. However, warrants in general are not callable.
- Typically, convertibles have longer maturities than warrants.

### 31.3 ■ VALUATION OF WARRANTS

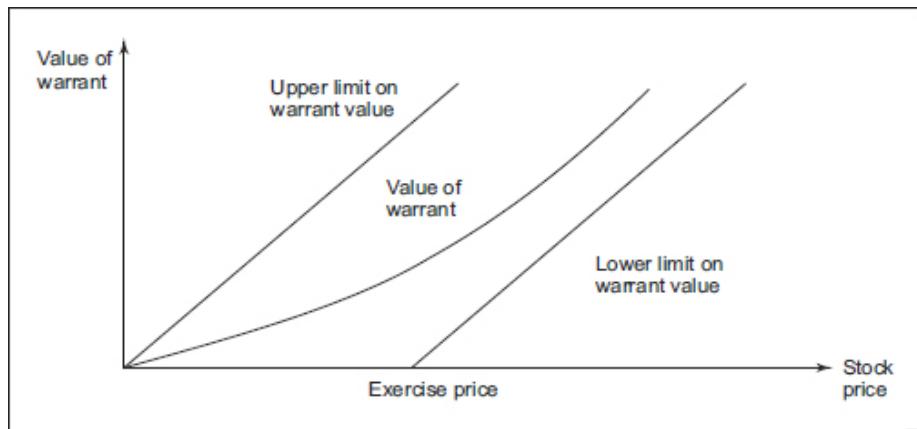
Since a warrant is like a call option on the equity stock of the issuing company, the principles of option valuation can be applied to warrants. [Exhibit 31.1](#) shows how the value of a warrant is influenced by various factors.

The lower limit for the value of the warrant is  $\text{Max}(0, \text{Stock price} - \text{Exercise price})$  and the upper limit for the value of the warrant is the stock price. The actual value of the warrant is shown by the curved line which lies between the boundaries specified by the lower limit and upper limit. The distance between the actual price of the warrant and its lower limit is a function of the following factors:

- Variance of the stock returns
- Time to expiration
- Risk-free interest rate
- Stock price
- Exercise price

Recall that these are the same factors which determine the value of a call option.

#### Exhibit 31.1 Factors Influencing the Value of Warrants



## Applying the Black–Scholes Model

Ignoring the complications arising from dividends and /or dilution, the value of a warrant may be calculated using the procedure described in [Chapter 10](#). To illustrate the calculation, consider the following data for Pioneer Company:

- Number of shares outstanding =  $N = 20$  million
- Current stock price =  $S = ₹ 60$
- Ratio of warrants issued to the number of outstanding shares =  $p = 0.05$
- Total number of warrants issued =  $pN = 0.05 \times 20$  million = 1 million
- Exercise price =  $E = ₹ 50$
- Time to expiration of warrants = 3 months
- Annual standard deviation of stock price changes =  $\sigma = 0.40$
- Risk-free interest rate = 8 percent

Applying the Black-Scholes model involves four steps:

*Step 1:* Calculate  $d_1$  and  $d_2$

$$d_1 = \frac{\ln\left[\frac{S_o}{E}\right] + \left[r + \frac{\sigma^2}{2}\right]t}{\sigma\sqrt{t}}$$
$$d_1 = \frac{\ln\left[\frac{60}{50}\right] + \left[0.08 + \frac{0.16}{2}\right]0.25}{0.40\sqrt{0.25}} = \frac{0.1823 + 0.04}{0.20} = 1.1115$$
$$d_2 = d_1 - \sigma\sqrt{t} = 1.1115 - 0.20 = 0.9115$$

*Step 2:* Find  $N(d_1)$  and  $N(d_2)$ .  $N(d_1)$  and  $N(d_2)$  represent the probabilities that a random variable that has a standardised normal distribution will assume values less than  $d_1$  and  $d_2$ .

$$N(d_1) = N(1.1115) = 0.8668 \quad N(d_2) = N(0.9115) = 0.8190$$

*Step 3:* Estimate the present value of the exercise price, using the continuous discounting principle

$$\frac{E}{e^{rt}} = \frac{₹ 50}{e^{0.08 \times 0.25}} = \frac{₹ 50}{1.0202} = ₹ 49.01$$

*Step 4:* Plug the numbers obtained above in the Black-Scholes formula.

$$C_0 = S_0N(d_1) - \frac{E}{e^{rt}} N(d_2) = 60 \times 0.8668 - 49.01 \times 0.8190 = ₹ 11.87$$

## Effects of Dilution

For the sake of simplicity, we ignored the effects of dilution in the above calculation. Note that there is a difference between a traded option and a warrant. A traded call or put option is a side bet between investors. When an investor exercises a traded call or put option there is no effect whatsoever on the firm. The number of outstanding shares as well as the value of the firm are not affected. However, when a warrant is exercised, the number of outstanding shares goes up and the value of the firm increases by the exercise money. For example, if the warrants of Pioneer Company are exercised, the number of outstanding shares will go up by 1 million and the assets of the firm will increase by the exercise money which is ₹ 50 million. Put differently there is dilution. Hence, in valuing warrants, the dilution has to be taken into account. How this is done is discussed below:

Let  $V$  = value of equity before the exercise of warrants

$N$  = number of outstanding shares

$p$  = ratio of warrants issued to the number of outstanding shares

$E$  = exercise price

If the warrants are exercised, the equity value will rise to  $V + pNE$  and the number of shares will increase to  $N + pN$ . Hence, the share price after the warrants are exercised will be:

$$\frac{V + pNE}{N(1+p)} \quad (31.1)$$

On maturity, the warrant holder can exercise the warrant or let it lapse. So, the value of warrant, on maturity, will be:

$$\text{Max} \left[ \begin{array}{c} \text{Share} \\ \text{price} \end{array} - \begin{array}{c} \text{Exercise,} \\ \text{price} \end{array}, 0 \right]$$

$$\text{Max} \left[ \frac{V + pNE}{N(1+p)} - E, 0 \right]$$

$$\text{Max} \left[ \frac{V/N - E}{(1+p)}, 0 \right]$$

$$= \frac{1}{1+p} \text{Max} \left( \frac{V}{N} - E, 0 \right)$$

Thus, the value of warrant is equal to  $1/(1 + p)$  times the value of call option on the stock of a firm that has the same current value of equity but

has no outstanding warrants.

### **31.4 ■ VALUATION OF COMPULSORILY CONVERTIBLE (PARTLY OR FULLY) DEBENTURES**

Internationally, convertible debentures are convertible into equity shares at the option of the debenture holders. In India, in addition to such debentures, companies also issue debentures which are compulsorily convertible (partly or wholly) into equity shares. For example, in June 1989, Tata Iron and Steel Company (TISCO) offered 3 lakh partly convertible debentures of ₹ 1200 each at par. The principal terms of these partly convertible debentures were as follows: (i) compulsory conversion of ₹ 600 par value into an equity share of ₹ 100 at a premium of ₹ 500 on February 1, 1990, (ii) interest rate of 12 percent per annum payable half yearly, and (iii) redemption of the non-convertible portion at the end of 8 years. Another example: In 2007-2008, Mahindra and Mahindra issued 93,95,974 unsecured fully and compulsorily convertible debentures (FCD), each FCD having a face value of ₹ 745 and convertible into one equity share of ₹ 10 each at a price of ₹ 745 per share. The FCD was convertible anytime within 18 months from the date of allotment of the FCD at the option of the investor and mandatorily convertible into equity shares on the date falling 18 months from the date of allotment.

## Value

What is the value of a partly convertible debenture like the one issued by TISCO? The holder of such a debenture receives (i) interest at a certain rate over the life of the debenture, (ii) equity share/s on part conversion, and (iii) principal repayment relating to the unconverted amount. Hence the value of such a debenture may be expressed as follows:

$$V_0 = \sum_{t=1}^n \frac{I_t}{(1+k_d)^t} + \frac{aP_i}{(1+k_s)^i} + \sum_{j=m}^n \frac{F_j}{(1+k_d)^j} \quad (31.2)$$

where  $V_0$  is the value of the convertible debenture at the time of issue,  $I_t$  is the interest receivable at the end of period  $t$ ,  $n$  is the life of the debenture,  $a$  is the number of equity shares receivable when part-conversion or full conversion occurs at the end of period  $i$ ,  $P_i$  is the expected price per equity share at the end of period  $i$ ,  $F_j$  is the instalment of principal repayment at the end of period  $j$ ,  $k_d$  is the investors' required rate of return on the debt component, and  $k_s$  is the investors' required rate of return on the equity component.

## Cost

The cost of a partly convertible debenture to the issuing firm is the discount rate in the equation:

$$NS_o = \sum_{t=1}^n \frac{I_t(1-T)}{(1+r_C)^t} + \frac{aP_i b}{(1+r_C)^i} + \sum_{j=m}^n \frac{F_j}{(1+r_C)^j} \quad (31.3)$$

where  $NS_o$  is the net subscription price realised at the time of issue,  $I_t$  is the interest rate payable at the end of period  $t$ ,  $T$  is the tax rate applicable to the firm,  $a$  is the number of equity shares to be given when part conversion occurs at the end of period  $i$ ,  $P_i$  is the price per equity share at the end of period  $i$ ,  $b$  is the proportion of  $P_i$  that will be realisable net if the firm were to issue equity shares to public,  $F_j$  is the instalment of principal repayment at the end of period  $j$ , and  $r_c$  is the discount rate representing the cost of capital.

## **31.5 ■ VALUATION OF OPTIONALLY CONVERTIBLE DEBENTURES**

Convertible securities are bonds or preference shares that can be converted into equity shares, according to certain terms and conditions, at the option of the holder. While the exercise of warrants brings additional funds to the firm, conversion does not bring new capital. It simply replaces debt (or preference stock) by equity stock on the balance sheet of the firm. Of course, reduction of debt (or preference stock) improves the firm's gearing, making it easier to raise additional capital. But that calls for a separate action.

## Conversion Ratio and Conversion Price

The most important feature of a convertible security is the conversion ratio, CR, defined as the number of equity shares that are receivable per debenture on conversion. A related number is the conversion price,  $P$ , which is the price per share the holder effectively pays when conversion occurs. These concepts may be illustrated with an example. Ambika Corporation issued convertible debentures at ₹ 1,000 par in January 2010. At any time prior to maturity on January 1, 2020, a debenture holder can convert one debenture into 10 equity shares. Hence the conversion ratio, CR, is 10. Dividing the ₹ 1,000 par value by 10 gives a conversion price,  $P$ , of ₹ 100 a share.

$$\begin{aligned}\text{Conversion Price} &= P_c = \frac{\text{Par value of debenture}}{\text{Shares received}} \\ &= \frac{\text{₹ }1,000}{\text{CR}} = \frac{\text{₹ }1000}{10} = \text{₹ }100\end{aligned}$$

On the issue date, the conversion price, like a warrant's exercise price, is set some 20 to 30 percent higher than the prevailing market price. Further, the conversion ratio and conversion price are fixed for the life of the debenture. Of course, as a norm, there is a clause to protect the convertible debenture against dilution on account of bonus issues, stock splits, and sale of equity shares below the conversion price.

## Behaviour of Component Values

To understand how various values associated with a convertible debenture behave, let us look at the convertible debenture of Ambika Corporation which has a par value of ₹ 1,000, a conversion ratio of 10, a life of 10 years, and a coupon rate of 8 percent. The underlying share is expected to pay a dividend of ₹ 3.75 for the coming year and sold for ₹ 75 per share in January 2015. The dividend per share is expected to grow at a constant rate of 10 percent per year. Therefore,  $r_E = D_1/P_0 + g = 3.75/75 + .10 = 5 + 10 = 15$  percent. If the debentures were not convertible, they would carry a yield of 12 percent. The debentures are call-protected for 5 years, after which they could be called at a price of ₹ 1050, with the call price decreasing by ₹ 10 per year thereafter.

[Exhibit 31.2](#) reflects the expectations of both the average investor and the company.

1. The par (and maturity) value is represented by the horizontal line at  $M = ₹ 1,000$ .
2. For 5 years the debenture is not callable. After 5 years, it is initially callable at ₹ 1050. Thereafter, the call price decreases by ₹ 10 per year. Hence, the call price is shown by the solid segment of  $V_0M'$ .
3. Since the coupon rate on the convertible is 8 percent and the yield on a similar nonconvertible bond is 12 percent, the straight debt value of the convertible,  $B_o$ , will be less than its par value.  $B_o$ , at the time of issue, is ₹ 774:

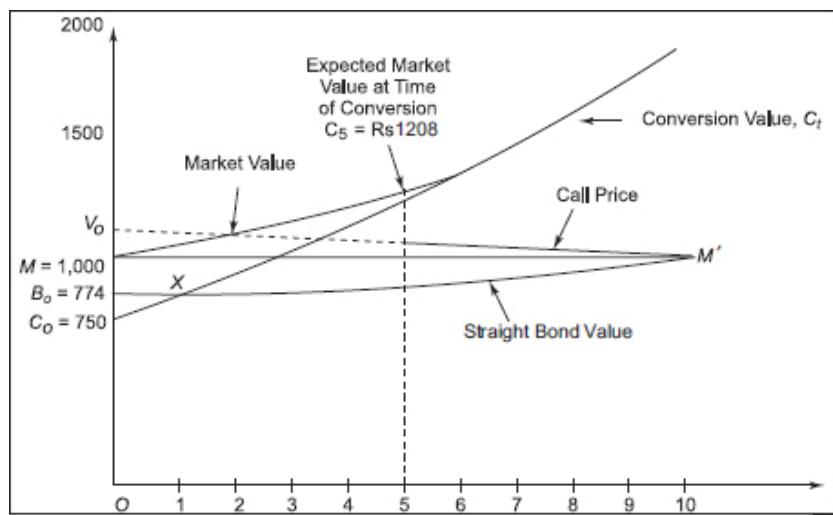
$$\begin{aligned} B_o &= \sum_{t=1}^n \frac{\text{Coupon interest}}{(1+r_d)^t} + \frac{\text{Maturity value}}{(1+r_d)^n} \\ &= \sum_{t=1}^{10} \frac{80}{(1.12)^t} + \frac{1,000}{(1.12)^{10}} = ₹ 774 \end{aligned}$$

At maturity, the straight debt value of the debenture be ₹ 1,000. Hence, the straight debt value,  $B_t$ , rises over time as shown by the line  $B_oM'$  in the graph.

4. The initial conversion value of the debenture,  $C_o$ , is  $P_o (\text{CR}) = ₹ 75 (10) = ₹ 750$ . Because the stock price is expected to rise by 10 percent per year, the conversion value would rise over time as shown by the line  $C_t$  in [Exhibit 31.2](#). For example, in year 5 it would be  $P_5(\text{CR}) = ₹ 75 (1.10)^5 (10) = ₹ 1208$ .

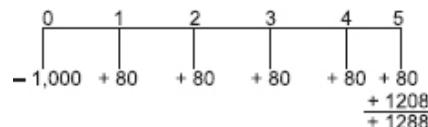
5. The actual market price of the convertible cannot fall below the higher of its straight debt value or its conversion value. If the market price falls below the straight debt value, bond investors will find it a bargain and buy it as a straight bond. Similarly, if its price falls below the conversion value, investors will buy the convertible, convert it into shares, and sell the shares to earn profit. Thus, the higher of the straight debt value and conversion value curves in the exhibit define a floor price, as represented by the line  $B_0 X C_t$ .
6. The market value of the convertible will typically be greater than its floor value. It will be higher than the straight debt value because the conversion option has a value – an 8 percent debenture with conversion option is worth more than a similar debenture without the conversion option. The market value of the convertible will be higher than its conversion value because holding the convertible is like holding a call option, and, prior to expiration, the value of an option exceeds its exercise (or conversion) value.

### Exhibit 31.2 Ambika Corporation: Convertible Debenture



Year	Straight Debt Value, $B_t$	Conversion Value, $C_t$	Maturity Value, $M$	Market Value	Floor Value	Premium
0	₹ 774	₹ 750	₹ 1,000	₹ 1,000	₹ 774	₹ 226
1	₹ 787	₹ 825	₹ 1,000	₹ 1039	₹ 825	₹ 214
2	₹ 801	₹ 908	₹ 1,000	₹ 1080	₹ 908	₹ 172
3	₹ 817	₹ 998	₹ 1,000	₹ 1122	₹ 998	₹ 124
4	₹ 836	₹ 1098	₹ 1,000	₹ 1166	₹ 1098	₹ 68
5	₹ 855	₹ 1208	₹ 1,000	₹ 1208	₹ 1208	0
6	₹ 879	₹ 1329	₹ 1,000	₹ 1329	₹ 1329	0
7	₹ 904	₹ 1462	₹ 1,000	₹ 1462	₹ 1462	0
8	₹ 932	₹ 1608	₹ 1,000	₹ 1608	₹ 1608	0
9	₹ 964	₹ 1768	₹ 1,000	₹ 1768	₹ 1768	0
10	₹ 1000	₹ 1945	₹ 1,000	₹ 1945	₹ 1945	0

7. After some time, the market value line converges with the conversion value line. This happens for two reasons. First, the dividend on the stock is expected to grow over time, whereas the interest payment on the convertible is fixed. Second, once the convertible becomes callable, investors are exposed to the risk of the call. So, the market value cannot exceed the higher of the call price and the conversion value.
8. Let  $n$  represent the year when conversion is expected to occur, either because investors find it attractive or because the company calls the convertibles. In our example, let us assume that  $n = 5$ .
9. The expected market value in year 5 is ₹ 75  $(1.10)^5 \times 10 = ₹ 1208$ . The expected rate of return on the convertible debenture,  $r_c$ , equals the IRR of the following cash flow stream.



The solution is  $r_c = \text{IRR} = 11.3$  percent.

10. Out of this total expected return, 8 percent represents interest income and 3.3 percent represents expected capital gain. While the interest component is relatively assured, the capital gain component is more risky. Hence, a convertible bond is more risky than a straight bond. So,  $r_c$  should be greater than  $r_d$  (the cost of a straight bond). In general,  $r_c$  should lie between  $r_d$  ( $r_d = 12$  percent) and  $r_e$  ( $r_e = 15$  percent).
11. Investment bankers use the kind of analysis discussed above, along with their knowledge of the market conditions, to set the terms on

convertibles (the conversion ratio, coupon interest rate, maturity period, years of call protection, and call price schedule) so that the security will just “clear the market” at its offering price of ₹ 1,000.

12. In our example,  $r_c$ (11.3 percent) does not lie between  $r_d$  (12 percent) and  $r_e$  (15 percent). So, the terms of the convertible will have to be tweaked to make it more attractive to investors. Ambika Corporation will have increase the coupon rate, or raise the conversion ratio, or lengthen the period of call protection, or use a combination of these changes so that  $r_c$  ends up between 12 percent and 15 percent.

## **31.6 ─ MOTIVES FOR ISSUING WARRANTS AND CONVERTIBLE DEBENTURES**

Warrants and convertible debentures, commonly used instruments of financing all over the world, are gaining currency in India as well. Why are they popular? Several explanations have been offered for their widespread use. They may be divided into two broad categories: conventional explanations and modern finance explanations.

## **Conventional Explanations**

Surveys of finance executives have thrown up two popular motives for issuing warrants and convertible debentures: (i) They allow companies to issue debt cheaply. (ii) They provide companies an opportunity to issue equity shares in future at a premium over the current price. These explanations have a “free lunch” flavour and do not appear, on closer examination, to be convincing. Let us see why.

**Cheaper Debt** The interest rate on convertible debentures or debentures with warrants is typically lower than that on straight debentures. For example the interest rate on the convertible debentures of Videocon Narmada Electronics Limited issued in 1992 was 10 percent when the prevailing yield on straight debentures was 17 percent and upward. This may persuade some to believe that convertible debentures and warrants enable companies to issue debt cheaply. You should be suspicious of such an argument as it has a “free lunch” flavour.

When a company issues convertible debentures or debentures with warrants, it is providing investors a combination of a straight debt instrument and a call option on the equity shares of the firm. We know that a call option typically has a positive value and in no case can it have a negative value. As investors enjoy the call option when they buy convertible debentures or debentures with warrants, they are willing to accept a lower interest rate.

A convertible debenture or a debenture with warrants may be regarded as a means of raising cheap debt finance only if investors over-value the call option embedded in them. In an efficient market it is unlikely that investors would do so.

**Equity at a Premium** The conversion price associated with a convertible debenture or the subscription price for exercising the warrant is typically higher than the price at which the equity stock can be currently issued. Hence, many finance executives believe that convertible debentures or debentures with warrants enable a company to issue equity at a premium. This argument, too, is flawed.

Remember that investors will choose the conversion option (or exercise the warrants) only when it is advantageous for them. Suppose, for example, the current share price of a company is ₹ 20 (and assume, for the sake of simplicity, that the company can issue shares at ₹ 20) and the company issues convertible debentures for ₹ 100 (the face value too is ₹ 100) that can be converted into 4 equity shares at a conversion price of ₹ 25 at the

option of the holder a year from now. If the equity share price a year from now happens to be, say, ₹ 30, the holders of convertible debentures will exercise the conversion option. In such a case the firm loses because what is worth ₹ 30 has to be issued at ₹ 25. Hence, while the issue price is certainly higher than the current price of ₹ 20, it is clearly lower than the future price of ₹ 30.

What happens if the share price a year from now turns out to be less than ₹ 25, the conversion price? In this case the holders of convertible debentures will not exercise the conversion option. So the company is not assured of an issue price of ₹ 25 in future. Hence, the convertible debenture is not a reliable means of issuing equity shares at a premium.

## Modern Finance Explanations

The preceding discussion suggests that the conventional explanations for the popularity of convertible debentures and debentures with warrants are flawed. Can we find a better explanation? Yes, we can. Modern finance offers superior explanation for the popularity of convertible debentures and debentures with warrants. These instruments improve cash flow matching, generate financial synergy, and mitigate agency problems.

**Cash Flow Matching** Firms prefer financing instruments that can be comfortably serviced. A growing but risky firm may find convertible debentures or debentures with warrants appealing because of the lower initial interest burden. Of course, should the firm do well, the investors will seek conversion. Though it entails expensive dilution, the firm may not mind it as it occurs when it can afford it.

**Financial Synergy** Convertible debentures and debentures with warrants make sense when it is very costly or difficult to assess the risk characteristics of the issuing firm. Suppose you are evaluating a newly set up company that plans to manufacture a novel product, being introduced for the first time India. You are not sure whether the company is a high risk company (in this case your expected yield on straight debentures will be 20 percent) or a low risk company (in this case your expected yield on straight debentures will be 15 percent).

In a situation like this, convertible debentures and debentures with warrants provide a measure of protection against errors of risk assessment. Remember that these instruments have two components, the straight debenture component and the call option component. If the company turns out to be risky, the debenture component will have a low value but the call option component a high value. On the other hand, if the company turns out to be relatively risk-free, the debenture component will have a high value but the call option component a low value. Given this compensating behaviour of the two components, the required yield on the convertible debenture (or the debentures with warrant) will not be very sensitive to default risk. A numerical illustration is given as follows:

	Firm Risk	
	Low	Risk
■ Yield on straight debenture	15%	20%
■ Yield on convertible debenture (or debenture)	10%	11%

with warrant)

The above example essentially suggests that companies with widely varying risks, faced with substantially different costs for straight debentures, can issue convertible debentures on similar terms. Does it mean that convertible debentures provide a “free lunch” to high risk firms? No, it does not mean that. However, it does suggest that a combination of debentures and options produces a financial synergy (or risk synergy) that enables companies with uncertain prospects to obtain capital on more favourable terms.

**Agency Costs** Convertible debentures and debentures with warrants can mitigate agency problems associated with financing. Holders of straight debentures impose restrictions on a firm so that its risk exposure is kept low. They do this to minimise the prospect of default risk. Equity stockholders, in contrast, would like the firm to undertake high risk projects because their claim is akin to that of holders of call option. If the conflicting demands of debtholders and equity stockholders are not properly resolved, the firm may have to forego profitable investment opportunities. Convertible debentures and debentures with warrants may provide a satisfactory resolution of this conflict. When you invest in these securities you are unlikely to impose highly restrictive debt covenants as you are less concerned about the increase in future risk. Since you participate in gains as well as losses, you don't mind if the company assumes unanticipated risk or acts in a way which is not congruent with bondholders' interest.

## 31.7 ■ INNOVATIVE HYBRIDS

A hybrid security is generally created by combining two types of securities: a standard debt or equity security plus an over-the-counter derivative (a forward contract, or swap, or option).

From the turn of the twentieth century until 1975, volatility was mainly associated with prices of individual equity securities. So, the hybrids that were created during that period typically involved equity. However, the onset of volatility in foreign exchange rates, interest rates, and commodity prices from the 1975 triggered a new wave of hybrid securities.

Hybrids are essentially devices for managing risk. Examples of different types of hybrids are given below.

Type	Example
■ Hybrids to manage commodity risk	■ <i>Oil-indexed bond</i> In 1986, Standard Oil issued an oil-indexed note which combined a zero coupon bond with a call option on oil with the same maturity.
■ Hybrids to manage foreign exchange risk	■ <i>Dual currency bond</i> In 1985 Philip Morris Credit issued a dual currency bond, the coupon payments of which were to be made in Swiss francs whereas the principal was to be paid in U.S. dollars.
■ Hybrids to manage interest rate risk	■ <i>Inverse floating rate note</i> In 1986 the Student Loan Market Association (Sallie Mae) issued inverse floating rate notes (which is called “yield curve notes”) which could be decomposed into two parts: (i) a floating rate, bullet repayment note, and (ii) a plain vanilla interest rate swap for twice the principal of the loan.

- Hybrids to reduce conflicts between bond holders and stockholders
- *Floating rate, rating sensitive note* In 1988, Manufacturer Hanover issued a security on which it agreed to pay a spread above LIBOR which increased with the decline in debt rating.

There are two primary economic reasons for the popularity of hybrids:

- (1) They may offer a ‘play’ which is not available otherwise. In this sense, they help the market become more complete.
- (2) They may provide a tax or regulatory advantage.

The proliferation of exotic varieties of hybrids has caused concern. The critics say that hybrids represent a supply-driven fad and are foisted by mercenary investment bankers on gullible or unsuspecting issuers and investors. The defendants of hybrids, however, argue that they represent useful capital market innovations which succeed only if they do a better job than the existing products in fulfilling the need of the issuers and investors.

## SUMMARY

- The features attached to preference shares may vary along the following dimensions: cumulation of dividends, participation in surplus profits, redeemability, callability, and convertibility.
- A **warrant** gives its holder the right, but not the obligation, to subscribe to a certain number of equity shares at a stated price during a specified period.
- A **convertible debenture** is a debenture that is convertible, partially or fully, into equity shares.
- Since a warrant is like a call option on the equity stock of the issuing company, the principles of option valuation can be applied to warrants.
- For analytical purposes, an optionally convertible debenture may be viewed as a debenture -warrant package. Its value is a function of three factors: straight debenture value, conversion value, and option value.
- The holders of convertible debentures are not compelled to make an immediate choice in favour or against conversion. They can wait, learn from hindsight, and finally choose the most profitable alternative. This option to wait is valuable. Thus:

$$\text{Value of the convertible debenture} = \text{Max} \left[ \begin{array}{l} \text{Straight debenture value,} \\ \text{Conversion value} \end{array} \right] + \text{Option value}$$

- Surveys of finance executives have thrown up two popular motives for issuing warrants and convertible debentures: (i) They allow companies to issue debt cheaply. (ii) They provide companies an opportunity to issue equity shares in

future at a premium over the current price. These explanations have a “free lunch” flavour and do not appear, on closer examination, to be convincing.

- Modern finance offers superior explanation for the popularity of convertible debentures and debentures with warrants. These instruments have appeal because they improve cash flow matching, generate financial synergy, and mitigate agency problems.
- An **innovative hybrid** is a hybrid security whose payoff is linked to some general economic variable like the interest rate, exchange rate, or commodity index.

## QUESTIONS

1. What is a warrant?
2. As per SEBI guidelines, what are the provisions applicable to fully convertible debentures (FCDs) and partly convertible debentures (PCDs)?
3. What are the differences between warrants and convertible debentures?
4. Discuss the factors that influence the value of a warrant.
5. How would you value a warrant with the help of the Black and Scholes option pricing model?
6. What is the effect of dilution on the value of a warrant?
7. Discuss the method for valuing a debenture that is compulsorily convertible (partially or fully) into equity shares.
8. Show how the value of an optionally convertible debenture is influenced by its straight debenture value, its conversion value, and its option value.
9. Critically evaluate the conventional explanations for the popularity of warrants and convertible debentures.
10. Discuss the modern finance explanations for the popularity of warrants and convertible debentures.

## SOLVED PROBLEM

31.1 Consider the following data:

- |                                      |              |
|--------------------------------------|--------------|
| ■ Number of shares outstanding       | : 80 million |
| ■ Current stock price                | : ₹ 80       |
| ■ Ratio of warrants issued to the    |              |
| ■ number of outstanding shares       | : 0.05       |
| ■ Exercise price                     | : ₹ 84       |
| ■ Standard deviation of continuously |              |
| ■ compounded annual returns          | : 0.30       |

- Time to expiration of warrants : 3 months
- Risk-free interest rate per year : 8 percent

What is the value of a warrant? Ignore the complication arising from dividends and /or dilution.

*Solution* The value of the warrant (call option) is calculated as follows:

*Step 1:* Calculate  $d_1$  and  $d_2$

$$d_1 = \frac{I_n\left[\frac{S_0}{E}\right] + \left[r + \frac{\sigma^2}{2}\right]t}{\sigma\sqrt{t}} = \frac{I_n\left[\frac{80}{84}\right] + \left[0.08 + \frac{0.09}{2}\right]0.25}{0.3\sqrt{0.25}}$$

$$= \frac{-0.0488 + \left[0.08 + \frac{0.09}{2}\right]0.25}{0.3\sqrt{0.25}} = -0.117$$

$$d_2 = d_1 - \sigma\sqrt{t} = -0.117 - 0.3\sqrt{0.25} = -0.267$$

*Step 2:* Find  $N(d_1)$  and  $N(d_2)$

$$N(d_1) = N(-0.117) = 0.4535 \quad N(d_2) = N(-0.267) = 0.3948$$

*Step 3:* Estimate the present value of the exercise price, using the continuous discounting principle

$$\frac{E}{e^{rt}} = \frac{84}{e^{0.08 \times 0.25}} = 82.34$$

*Step 4:* Plug the numbers obtained above in the Black–Scholes formula

$$C_0 = S_0 N(d_1) - \frac{E}{e^{rt}} N(d_2) = 80 \times 0.4535 - 82.34 \times 0.3948 = ₹ 3.77$$

## PROBLEMS

### 31.1 Value of a Warrant

Consider the following data:

- Number of shares outstanding: 50 million
- Current stock price: ₹ 40
- Ratio of warrants issued to the number of outstanding shares: 0.04
- Exercise price: ₹ 25
- Time to expiration of warrant: 2 years
- Annual standard deviation of stock price changes: 0.35.
- Interest rate: 16 percent

What is the value of a warrant? Ignore the complication arising from dividends and/or dilution.

### 31.2 Value of a Warrant

Kapoor Opticals has just issued warrants. The following data is available:

- Number of shares outstanding = 40 million
- Current stock price = ₹ 50
- Ratio of warrants issued to the number of outstanding shares = 5 percent
- Exercise price = ₹ 30

- Time to expiration of warrants = 2 years
- Annual standard deviation of stock price changes = 40 percent
- Interest rate = 12 percent
- What is the value of a warrant?

**31.3 Value of a Convertible Debenture** Shiva Limited issues a partly convertible debenture for ₹ 600, carrying an interest rate of 10 percent. ₹ 200 will get compulsorily converted into two equity shares of Shiva Limited a year from now. The expected price per share of Shiva Limited's equity a year from now would be ₹ 150. The non-convertible portion will be redeemed in two equal installments of ₹ 200 each at the end of years 5 and 6 respectively. The tax rate for Shiva is 30 percent and the net price per share Shiva would realise for the equity after a year would be ₹ 120.

- (a) What is the value of convertible debenture? Assume that the investors' required rate of return on the debt component and the equity component are 10 percent and 15 percent respectively.
- (b) What is the post-tax cost of the convertible debenture to Shiva?

## MINICASE

Aditya Corporation has managed to procure long term repeat orders sufficient to ensure an annual revenue growth of 15 percent for the next ten years. Additional investment of ₹ 600 million is needed for executing the orders and Samir, their CFO, has been given the task of mobilising this amount. Though for a company just two years old, this is a real breakthrough, Samir is not confident of selling their story to the equity market, what with their share price languishing at ₹ 30 for the past several months. So he is exploring the possibility of raising the amount through debentures.

The cash flow projections show that they would be in a position to repay the entire debt in 6 years and meanwhile service it at a maximum annual interest rate of 9 to 10 percent. With the ten year government bonds selling at a yield of 8 percent and companies of their size and standing able to issue debt only at 12 percent, he is at a loss on how to proceed.

It is in such a mood that you find him when you call on him on the way back home after a busy day. He is one of your few close friends who has (still!) faith in your abilities as a financial consultant. On hearing him, the immediate idea that comes to your mind is to consider going in for an issue of convertible debentures. Tentatively, you think of issuing fully convertible debentures of par value of ₹ 300 maturing in 6 years which could be converted into six equity shares at say ₹ 50 each at any time during its life, at the option of the investor. You understand from Samir that the company should start generating good cash flow from the third year onwards. Also, according to market watchers, interest rates are likely to soften considerably by then. So you think of adding a call feature whereby the company could call back the debentures from the end of the third year at a fixed price of ₹ 330 per debenture, to be reduced by ₹ 10 per year thereafter.

The company has just paid a dividend of ₹ 1.50 per share for the previous year. The growth rate in both the dividend and the market price of their share is expected to be in step with the revenue growth.

At Samir's request you take half an hour's time to work out the following, to advise him suitably on the design of a possible convertible issue.

1. The premium included in the ₹ 300 par issue at 10 percent coupon over a corresponding straight bond issue.
2. The cost of equity and straight debt to the company.
3. The cost of the convertible issue at 10 percent coupon assuming that the conversion would take place immediately at the beginning of the call period.
4. A sensitivity analysis on the cost of the convertible with (a) coupon rate of 9.5 percent and conversion at the end of three years and (b) initial call free period of 4 years and coupon rate of 10 percent. Show the above calculations. Based on those, what design for the product will you recommend to Samir and why?

## **Appendix 31A**

### **Merton Miller's Views on Financial Innovations**

Merton Miller describes financial innovations as unanticipated improvements in financial products that are stimulated by unexpected tax or regulatory impulses. He cites the following examples.

- The Eurobond market emerged in response to a 30 percent withholding tax imposed by the US Government on interest payments on bonds sold in the US to overseas investors.
- Zero coupon bonds were offered to exploit a mistake of the Internal Revenue Service in the US which permitted deduction of the same amount each year for tax purposes. (Put differently, the Internal Revenue Service employed simple interest, not compound interest.)
- Financial futures came into being when the Bretton Woods system of fixed exchange rates was abandoned in the early 1970s.
- Paper currency, in a sense the most fundamental financial instrument, was invented when the British Government prohibited the minting of coins by the colonial North America.
- The Eurodollar market developed in response to Regulation Q in the US that imposed a ceiling on the interest rate payable on time deposits with commercial banks.
- Financial swaps emerged initially in response to a restriction imposed by the British Government on dollar financing by British firms and sterling financing by non-British firms.

Since taxes and regulation have triggered a number of major financial innovations, Miller likens them to the grains of sand that irritate the oyster to produce the pearls of financial innovation.

#### **Online Resources**

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter31/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter31/index.html)

- Additional Solved Problems
- Excel on Solved Problems



## **PART–IX**

### **Corporate Valuation, Restructuring and Value Creation**

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Corporate Valuation

**33**

Value Based Management

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Mergers, Acquisitions, and Restructuring

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Corporate Governance and Executive Compensation

**36**

Performance Measurement and Balanced Scorecard

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## Corporate Valuation

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Discuss the adjusted book value approach to corporate valuation.
- ✓ Explain the direct comparison approach to corporate valuation.
- ✓ Analyse the historical ROIC tree for a firm.
- ✓ Develop the free cash flow forecast and determine the continuing value.
- ✓ Discuss the important guidelines for corporate valuation.

Since the primary objective of management is to maximise the value of the firm, managers need a tool for estimating the effects of alternative strategies on firm value. This tool is the corporate valuation model. This chapter discusses the enterprise DCF model, the most important model for corporate valuation – in addition it looks at other approaches to corporate valuation. This model draws on a number of concepts and tools such as financial statements, cash flows, financial projections, present value, and cost of capital which have been discussed at length in the previous chapters.

Value maximisation is the central theme in financial management. Owners of corporate securities will hold management responsible if they fail to enhance value. Hence all senior managers must understand what determines value and how to measure it. While valuation was regarded as an abstruse academic subject in the past, it is of considerable importance to managers now.

In the wake of economic liberalisation, companies are relying more on the capital market, acquisitions and restructuring are becoming commonplace, strategic alliances are gaining popularity, employee stock option plans are proliferating, and regulatory bodies are struggling with tariff determination. In these exercises a crucial issue is: How should the value of a company or a division thereof be appraised?

The goal of such an appraisal is essentially to estimate a fair market value of a company. So, at the outset, we must clarify what is meant by "fair market value" and what is meant by "a company". The most widely accepted definition of fair market value was laid down by the Internal Revenue Service of the U.S. It defined fair market value as "the price at which the property would change hands between a willing buyer and a willing seller when the former is not under any compulsion to buy and the latter is not under any compulsion to sell, both parties having reasonable knowledge of relevant facts." When the asset being appraised is "a company", the property the buyer and the seller are trading consists of the claims of all the investors of the company. This includes outstanding equity shares, preference shares, debentures, and loans.

There are four broad approaches to appraising the value of a company: adjusted book value approach, stock and debt approach, direct comparison approach, and discounted cash flow approach.

## 32.1 ■ ADJUSTED BOOK VALUE APPROACH

The simplest approach to valuing a firm is to rely on the information found on its balance sheet. There are two equivalent ways of using the balance sheet information to appraise the value of a firm. First, the book values of investor claims may be summed up directly. Second, the assets of the firm may be totaled and, from this total, non-investor claims (like accounts payable and provisions) may be deducted. To illustrate this approach, let us look at an example. [Exhibit 32.1](#) presents the balance sheet of Horizon Limited as on 31/3/20X1. From the balance sheet, the value of the firm can be calculated using the investor claim approach or the asset-liabilities approach as illustrated in [Exhibit 32.2](#).

**Exhibit 32.1 Balance Sheet of Horizon Limited as on March 31, 20X1**

Liabilities		(₹ in crore)	
		Assets	
Share capital	15.00	Fixed assets (net)	33.00
Equity	15.00	Gross block	59.00
Preference	—	Acc. depr'n	26.00
Reserves & surplus	11.20	Investments	1.50
Secured loans	14.30		
Term loans	7.00	Current assets, loans,	
Debentures	7.30	and advances	23.40
Unsecured loans	6.90	Cash and bank	1.00
Bank credit	2.50	Debtors	11.40
Inter-corporate	4.40	Inventories	10.50
loans		Pre-paid exp.	0.50
Current liabilities and		Miscellaneous	
provisions	10.50	expenditures and	
		losses	—
	57.90		57.90

## Exhibit 32.2 | Balance Sheet Valuation

		₹ in crore	
<i>Investor Claims Approach</i>		<i>Asset-Liabilities Approach</i>	
Share capital	15.00	Total assets	57.90
Reserves & surplus	11.20	Less: Current	
Secured loans	14.30	liabilities and provisions	10.50
Unsecured loans	6.90		
	<hr/> 47.40		<hr/> 47.40

The accuracy of the book value approach depends on how well the net book values of the assets reflect their fair market values. There are three reasons why book values may diverge from market values:

- Inflation drives a wedge between the book value of an asset and its current value. The book value of an asset is its historical cost less depreciation. Hence it does not consider inflation which is definitely a factor influencing market value.
- Thanks to technological changes some assets become obsolete and worthless even before they are fully depreciated in the books.
- Organisational capital, a very valuable asset, is not shown on the balance sheet. Organisational capital is the value created by bringing together employees, customers, suppliers, and managers in a mutually beneficial and productive relationship. An important characteristic of organisational capital is that it cannot be easily separated from the firm as a going entity.

## **Adjusting Book Value to Reflect Replacement Cost**

Though an asset's earning power may not be related to its book value, especially if the asset is old, it is likely to be related to its current replacement cost. Hence, net book values may be substituted by current replacement costs. The various assets are valued as follows:

**Cash** Cash is cash. Hence there is no problem in valuing it. Indeed, it is gratifying to have an asset which is so simple to value.

**Debtors** Generally debtors are valued at their face value. If the quality of debtors is doubtful, prudence calls for making an allowance for likely bad debts.

**Inventories** Inventories may be classified into three categories: raw materials, work-in-process, and finished goods. Raw materials may be valued at their most recent cost of acquisition. Work-in-process may be approached from the cost point of view (cost of raw materials plus the cost of processing) or from the selling price point of view (selling price of the final product less expenses to be incurred in translating work-in-process into sales). Finished goods inventory is generally appraised by determining the sale price realisable in the ordinary course of business less expenses to be incurred in packaging, handling, transporting, selling, and collection of receivables.

**Other Current Assets** Other current assets like deposits, prepaid expenses, and accruals are valued at their book value.

**Fixed Tangible Assets** Fixed tangible assets consist mainly of land, buildings and civil works, and plant and machinery. Land is valued as if it is vacant and available for sale. Buildings and civil works may be valued at replacement cost less physical depreciation and deterioration. The value of plant and machinery may be appraised at the market price of similar (used) assets plus the cost of transportation and installation.

**Non-operating Assets** Assets not required for meeting the operating requirements of the business are referred to as non-operating assets. The more commonly found non-operating assets are financial securities, excess land, and unused buildings. These assets are valued at their fair market value.

## **Adjusting Book Values to Reflect Liquidation Value**

The most direct approach for approximating the fair market value of the assets on the balance sheet of a firm is to find out what they would fetch if the firm were liquidated immediately. If there is an active secondary market for the assets, liquidation values equal secondary market prices. However, active secondary markets do not exist for many business assets. In such cases, the appraiser must try to estimate the hypothetical price at which the assets may be sold.

The principal weakness of the liquidation value approach is that it ignores organisational capital. Instead of valuing the firm as a going concern, it values it as a collection of assets to be sold individually. This approach makes sense only for a firm that is worth more dead than alive.

## **The Bottom Line**

The unadjusted book value approach makes sense only in rare cases, such as the appraisal of regulated industries. The adjusted book value approach – replacement cost approach or liquidation value approach – makes sense for firms which derive their value mainly from owning tangible resources. Even such situations are not common because most firms have valuable organisational capital. Thus, in most real life situations, the book value approach has limited applicability.

## 32.2 ■ STOCK AND DEBT APPROACH

When the securities of a firm are publicly traded its value can be obtained by merely adding the market value of all its outstanding securities. This simple approach is called the stock and debt approach by property tax appraisers. It is also referred to as the market approach.

The market approach is based on the premise that the market is efficient. This means that the market price of a security is the least unbiased estimate of its intrinsic value.

Consider an example of stock and debt approach. On March 31, 20X1, the Horizon Limited firm had 1.5 billion outstanding shares. At the closing price of ₹ 20 on that day, Horizon's equity had a market value of ₹ 30 billion. On March 31, 20X1 the firm also had outstanding debt with a market value of ₹ 21 billion. Adding the market value of the equity to the market value of debt gives a total firm value of ₹ 51 billion for Horizon as on March 31, 20X1.

Although the stock and debt approach is fairly straightforward, there is some debate about which prices to use when valuing the securities, particularly the equity shares. Since stock prices are volatile, some appraisers suggest using an average of recent stock prices, rather than the price on the lien date (the day on which the appraiser is attempting to value is called the lien date). Their argument is that the average of prices over a period of time, rather than the current stock price, is a more reliable estimate of the firm's true underlying value.

Is averaging a reasonable procedure? The answer depends on whether or not the stock market is efficient. If the market is considered to be efficient, implying that security prices reflect all publicly available information, there is no justification for averaging.

The efficient market hypothesis has two important implications for appraisal practice:

- Where stock and debt approach can be employed, it will produce the most reliable estimate of value.
- The securities of the firm should be valued at the market price obtaining on the lien date. Averaging of prices over a period of time is not correct. It reduces the accuracy of appraisal.

### 32.3 ■ DIRECT COMPARISON APPROACH

Common sense and economic logic tell us that similar assets should sell at similar prices. Based on this principle, one can value an asset by looking at the price at which a comparable asset has changed hands between a reasonably informed buyer and a reasonably informed seller. This approach, referred to as the direct comparison approach, is commonly applied in real estate. If there are two identical or near-identical apartments and one of them sells for ₹ 12 million, the appraised value of the other apartment is also ₹ 12 million.

Differences in scale, however, make it difficult to find directly comparable properties. If the apartment next to yours measures 3,000 square feet and is sold for ₹ 15 million, you can't appraise your apartment which measures 2,000 square feet also for ₹ 15 million. To solve the scale problem you may first determine the price per square foot of the apartment next to yours and apply it to the size of your apartment. In this case the price per square foot works out to ₹ 5000. When you apply this rate to your apartment which measures 2,000 square feet, you get an appraised value of ₹ 10.0 million.

Essentially, the direct comparison approach is reflected in a simple formula:

$$V_T = x_T \frac{V_c}{x_c} \quad (32.1)$$

where  $V_T$  is the appraised value of the target firm (or asset),  $x_T$  is the observed variable for the target firm that supposedly drives value,  $V_c$  is the observed value of the comparable firm, and  $x_c$  is the observed variable for the comparable company.

## **Steps in Applying the Direct Comparison Approach**

Operationally, a top-down procedure may be followed in applying the direct comparison approach. This involves the following steps:

- Analyse the economy
- Analyse the industry
- Analyse the subject company
- Select comparable companies
- Analyse subject and comparable companies
- Analyse multiples
- Value the subject company

**Analyse the Economy** The first step in the comparable company approach is to analyse the economy. An analysis of the economy provides the basis for assessing the prospects of various industries and evaluating individual companies within an industry. Such an analysis calls for, *inter alia*, examining the following factors and forecasting their growth rates: gross domestic product, industrial production, agricultural output, inflation, interest rates, balance of payment, exchange rate, and government budget (as well as its composition).

**Analyse the Industry** The second step in the comparable company approach is to analyse the industry to which the subject company belongs. This analysis should focus on the following:

- The relationship of the industry to the economy as a whole.
- The stage in which the industry is in its life cycle.
- The profit potential of the industry.
- The nature of regulation applicable to the industry.
- The relative competitive advantages in procurement of raw materials, production costs, marketing and distribution arrangements, and technological resources.

**Analyse the Subject Company** The third step is to carry out an in-depth analysis of the competitive and financial position of the subject company. The key aspects to be covered in this examination are as follows:

- Product portfolio and market segments covered by the firm.
- Availability and cost of inputs.
- Technological and production capability.
- Market image, distribution reach, and customer loyalty.
- Product differentiation and economic cost position.

- Managerial competence and drive.
- Quality of human resources.
- Competitive dynamics.
- Liquidity, leverage, and access to funds.
- Turnover, margins, and return on investment.

**Select Comparable Companies** After the subject company is studied, the next step is to select companies which are similar to the subject company in terms of the lines of business, nature of markets served, scale of operation, and so on. Often, it is hard to find truly comparable companies because companies are engaged in a variety of businesses, serve different market segments, and have varying capacities. Hence, in practice, the analyst has to make do with companies which are comparable in some ways. He should make every effort to look carefully at 10 to 15 companies in the same industry and select at least 3 to 4 which come 'as close as possible' to the subject company. Understandably, a good deal of subjective judgment is involved in this process.

**Analyse the Financial Aspects of the Subject and Comparable Companies** Once the comparable companies are selected, the historical financial statements (balance sheets and income statements) of the subject and comparable companies must be analysed to identify similarities and differences and make adjustments so that they are put on a comparable basis. Adjustments may be required for differences in inventory valuation methods, for intangible assets, for off-balance sheet items, and so on. The purpose of these adjustments is to normalise the financial statements.

**Choose the Observable Financial Variable** For the direct comparison approach to provide a reliable estimate of value, the ratio of the value indicator to the observed financial variable,  $V/x$ , must not vary widely for the comparable firms and the target firm. Since the variability of  $V/x$  depends considerably on the choice of  $V$  and  $x$ , the two variables must be selected with care.

The financial variables that are likely to produce a constant  $V/x$  ratio are those that are closely associated with the value of the firm. Since the value of a firm is ultimately based on the cash generated for its investors, financial variables like earnings and cash flow are the obvious choices for  $x$ . In addition, financial variables such as sales and net worth which indirectly measure earning power are also possible candidates.

The value indicator must be consistent with the financial variable chosen. If a gross financial variable like PBDIT (profit before depreciation interest and tax) is chosen, then it should be matched with total firm value. On the other hand, if the appraiser uses a financial variable like equity earning, it should be matched with equity value and not the total firm value. In such a case the estimated value of equity must be added to the estimated value of other investor claims (debt and preferred stock) which are separately assessed to calculate the total value of the firm.

The ratios or multiples that are commonly used in the direct comparison method are as follows:

- Firm value to sales
- Firm value to book value of assets
- Firm value to PBIDT
- Firm value to PBIT
- Equity value to equity earnings (Price-earnings multiple)
- Equity value to net worth (Market-book ratio)

**Value the Subject Company** The final step in this process is to decide where the subject company fits in relation to the comparable companies. This is essentially a judgmental exercise. Once this is done, appropriate multiples may be applied to the financial numbers (sales, EBIT, and so on) of the subject company to estimate its value. If several bases are employed, the several value estimates may be averaged (for this purpose a simple arithmetic average or a weighted arithmetic average may be employed).

## Illustration

The following financial information is available for company D, a pharmaceutical company,

■ Earnings before interest, taxes, depreciation and amortisation	₹ 400 million
■ Book value of assets	₹ 1,000 million
■ Sales	₹ 2500 million

Based on an evaluation of several pharmaceutical companies, companies A, B, and C have been found to be comparable to company D. The financial information for these companies is given below.

	A	B	C
EBITDA*	280	360	480
Book value of assets*	800	1000	1400
Sales*	1600	2000	3200
Enterprise value*(EV)	2000	3500	4200
EV/EBITDA	7.1	9.7	8.8
EV/Book value	2.5	3.5	3.0
EV/Sales	1.25	1.75	1.31

\*In million rupees

Taking into account the characteristics of company D vis-à-vis companies A, B, and C, the following multiples appear reasonable for company D:

$$\text{EV/EBITDA} = 8.5 \quad \text{EV/Book value} = 3.0 \quad \text{EV/Sales} = 1.44$$

Applying these multiples to the financial numbers of company D, gives the following value estimates:

1.  $\text{EV} = 8.5 \times \text{EBITDA} = 8.5 \times 400 = ₹ 3400 \text{ million}$
2.  $\text{EV} = 3.0 \times \text{BV} = 3.0 \times 1,000 = ₹ 3000 \text{ million}$
3.  $\text{EV} = 1.44 \times \text{Sales} = 1.44 \times 2500 = ₹ 3600 \text{ million}$

A simple arithmetic average of the three value estimates is:

$$(3,400 + 3,000 + 3,600)/3 = ₹ 3333 \text{ million}$$

## **Bottom Line**

The direct comparison approach is very popular because it relies on multiples that are easy to relate to and can be obtained easily and quickly. They are particularly useful when several comparable companies are traded and, on average, the market prices them accurately.

However, multiples are amenable to misuse and manipulation. Since no two firms are likely to be identical in terms of risk and growth, the key determinants of multiples, the choice of “comparable” companies is subjective. Hence, the appraiser can choose a group of firms that confirm his biases about the target firm’s value. While the potential for subjective bias exists with the DCF approach as well, the appraiser there has to be much more explicit about his assumptions and has lesser scope to hide his biases in unstated assumptions.

There is another problem with the direct comparison approach. The multiples used in this approach reflect the valuation errors (overvaluation or undervaluation) of the market. Thus, if software companies in general are overvalued, applying the average price-earnings multiple of listed software companies to determine the value of an unlisted company may lead to overvaluation. In contrast, the DCF approach is grounded on firm-specific cash flows and growth rates and hence is likely to be less affected by market valuation errors.

## 32.4 ■ DISCOUNTED CASH FLOW APPROACH

Traditionally, the adjusted book value approach and the direct comparison approach were used more commonly. From the early 1990s, however, the discounted cash flow approach has received greater attention, emphasis, and acceptance. This is mainly because of its conceptual superiority and its strong endorsement by leading consultancy organisations.

Valuing a firm using the discounted cash flow approach is conceptually identical to valuing a capital project using the present value method. However, there are two important differences:

- While a capital project is deemed to have a finite life, a firm is considered as an entity that has an indefinite life. This means that when we value a capital project we define its economic life and impute a salvage value to the assets of the project at the end of its economic life; however, for a firm we don't define an economic life and impute a salvage value to its assets at the end of such a period.
- A capital project is typically valued as a 'one-off' investment. We do not ordinarily look at the follow on investments on the assumption that these will be evaluated separately as and when they crystallise. A firm, however, is viewed as a growing entity and for valuing a firm we take into account all the investments in fixed assets and net working capital that are expected to be made over time to sustain the growth of the firm.

To sum up, valuing a firm using the discounted cash flow approach calls for forecasting cash flows over an indefinite period of time for an entity that is expected to grow. This is indeed a daunting proposition. To tackle this task, in practice, the value of the firm is separated into two time periods:

$$\text{Value of the firm} = \text{Present value of cash flow during the explicit forecast period} + \text{Present value of cash flow after the explicit forecast period}$$

During the explicit forecast period – which is often a period of 5 to 15 years – the firm is expected to evolve rather rapidly and hence a great deal of effort is expended to forecast its cash flow on an annual basis. At the end of the explicit forecast period the firm is expected to reach a "steady state" and hence a simplified procedure is used to estimate its continuing value.

Thus, the discounted cash flow approach to valuing a firm involves the following steps:

1. Analysing historical performance
2. Estimating the cost of capital
3. Forecasting performance
4. Determining the continuing value
5. Calculating the firm value and interpreting the results.

These steps are discussed in detail in the sections that follow.

## 32.5 ■ ANALYSING HISTORICAL PERFORMANCE

Analysis of historical performance is the first step in valuing a business. A sound understanding of how the company has fared in the past provides a good foundation for forecasting its future performance.

*Inter alia*, historical performance analysis should focus on:

- Extracting valuation related metrics from accounting statements.
- Calculating the free cash flow and the cash flow available to investors.
- Getting a perspective on the drivers of free cash flow.
- Developing the ROIC tree.

For discussing historical performance analysis, the profit and loss account and the balance sheet of Matrix Limited given in [Exhibit 32.3](#) will be used. This exhibit gives the financial statements for three years (1,2, and 3) – the year that has just ended is year 3.

### Exhibit 32.3 Financial Statements of Matrix Limited for the Preceding Three Years (Years 1-3)

Profit and Loss Account			
	1	2	3
Net sales	180	200	229
Income from marketable securities	—	—	3
Non-operating income	—	—	8
Total income	180	200	240
Cost of goods sold	100	105	125
Selling and general administration expenses	30	35	45
Depreciation	12	15	18
Interest expenses	12	15	16
Total costs and expenses	154	170	204
PBT	26	30	36
Tax provision	8	9	12
PAT	18	21	24
Dividend	11	12	12
Retained earnings	7	9	12

<i>Balance Sheet</i>			
	1	2	3
Equity capital	60	90	90
Reserves & surplus	40	49	61
Debt	100	119	134
<b>Total</b>	<b>200</b>	<b>258</b>	<b>285</b>
Fixed assets	150	175	190
Investments	—	20	25
Net current assets*	50	63	70
<b>Total</b>	<b>200</b>	<b>258</b>	<b>285</b>

\* The difference between current assets and non-interest bearing current liabilities.

## Extracting Valuation Related Metrics from Accounting Statements

The accounting statements must be reorganised to get a handle over the following: operating invested capital, NOPLAT, ROIC, and net investment.

**Operating Invested Capital** The capital provided by shareholders and lenders is invested in operating assets (operating invested capital) and non-operating assets. Operating invested capital consists of net fixed assets deployed in the operations of the firm plus the operating working capital (operating working assets minus non-interest bearing current liabilities). In practice, operating invested capital may be obtained as follows:

- Total assets in the balance sheet
- Non-operating fixed assets like surplus land
- Excess cash and marketable securities<sup>1</sup>

If we assume that the investment figures of 20 and 25 in the balance sheet of Matrix Limited at the end of years 2 and 3 represent excess cash and marketable securities, the operating invested capital at the end of years 1,2, and 3 for Matrix Limited is:

	Year 1	Year 2	Year 3
Operating invested capital	200	238	260

**NOPLAT** NOPLAT stands for net operating profit less adjusted taxes. It is equal to:

$$\text{EBIT} - \text{Taxes on EBIT}$$

EBIT is the pre-tax operating income the firm would have earned if it had no debt. While calculating EBIT, the following are excluded: interest expenses, interest income, and non-operating income (or loss).

Taxes on EBIT represent the taxes the firm would pay if it had no debt, excess marketable securities, or non-operating income (or loss). Taxes on EBIT can be calculated by adjusting the income tax provision for the income tax attributable to interest expense, interest and dividend income from excess marketable securities and, non-operating income (or loss).

The calculation of NOPLAT for Matrix Limited, assuming a marginal tax rate of 40 percent is shown below:

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Profit before tax	26	30	36
+ Interest expense	12	15	16
- Interest income	—	—	3
- Non-operating income	—	—	8
= EBIT	38	45	41
Tax provision from income statement	8	9	12
+ Tax shield on interest expense	4.8	6	6.4
- Tax on interest income	—	—	1.2
- Tax on non-operating income	—	—	3.2
= Taxes on EBIT	12.8	15	14.0
NOPLAT	25.2	30	27.0

**Return on Invested Capital** Return on invested capital, ROIC, is defined as follows:

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{Invested capital}}$$

Invested capital is usually measured at the beginning of the year or as the average at the beginning and end of the year. While calculating ROIC, define the numerator and denominator consistently. If an asset is included in invested capital, income related to it should be included in NOPLAT to achieve consistency. The ROIC for Matrix Limited is calculated below:

	<i>Year 2</i>	<i>Year 3</i>
NOPLAT	30	27
Invested capital at the beginning of the year	200	238
ROIC	30/200 = 15%	27/238 = 11.3%

ROIC focuses on the true operating performance of the firm. It is a better measure compared to return on equity and return on assets. Return on equity reflects operating performance as well as financial structure and return on assets is internally inconsistent (numerator and denominator are not consistent).

**Net Investment** Net investment is the difference between gross investment and depreciation:

$$\text{Net investment} = \text{Gross investment} - \text{Depreciation}$$

Gross investment is the sum of incremental outlays on capital expenditures and net current assets (also called net working capital). Depreciation refers to all non-cash charges.

Alternatively, the net investment during the year can be calculated as follows:

$$\left[ \begin{array}{l} \text{Net fixed assets at the end} \\ \text{of the year} \end{array} + \begin{array}{l} \text{Net current assets at the end} \\ \text{of the year} \end{array} \right]$$

$$- \left[ \begin{array}{l} \text{Net fixed assets at the beginning} \\ \text{of the year} \end{array} + \begin{array}{l} \text{Net current assets at the beginning} \\ \text{of the year} \end{array} \right]$$

Calculated in this manner, the net investment for Matrix Limited is shown below.

	Year 2	Year 3
Net fixed assets at the end of the year	175	190
+ Net current assets at the end of the year	63	70
- Net fixed assets at the beginning of the year	150	175
- Net current assets at the beginning of the year	<u>50</u>	<u>63</u>
	<u>38</u>	<u>22</u>

## Calculating the Free Cash Flow

The **free cash flow** (FCF) is the post-tax cash flow generated from the operations of the firm after providing for investments in fixed assets and net working capital required for the operations of the firm. FCF can be expressed as:

$$FCF = NOPLAT - \text{Net investment}$$

$$FCF = (NOPLAT + \text{Depreciation}) - (\text{Net investment} + \text{Depreciation})$$

$$FCF = \text{Gross cash flow} - \text{Gross investment}$$

[Exhibit 32.4](#) shows the FCF calculation for Matrix Limited.

### Exhibit 32.4 Matrix Limited Free Cash Flow

	Year 1	Year 2	Year 3
NOPLAT	25.2	30.0	27.0
Depreciation	12	15	18
Gross cash flow	37.2	45	45
Increase/(decrease in working capital)		13	7
Capital expenditure		40	33
Gross investment		53	40
Free cash flow	(8)	5	

The **cash flow available to investors** (shareholders and lenders) is equal to free cash flow plus non-operating cash flow. We have discussed what free cash flow is. What is non-operating cash flow? Non-operating cash flow arises from non-operating items like sale of assets, restructuring, and settlement of disputes. Such items must, of course, be adjusted for taxes.

The cash flow available to investors can also be viewed as the **financing flow** which is derived as follows:

$$\text{Financing flow} = \text{After-tax interest expense}$$

- + Cash dividend on equity and preference capital
- + Redemption of debt
- New borrowings
- + Redemption of preference shares
- + Share buybacks
- Share issues
- +  $\Delta$  Excess marketable securities

- After-tax income on excess market securities

The last two items in the above expression require some clarification. Excess marketable securities are regarded as negative debt. It is as if the firm were telling its lenders that we have surplus funds for a short period and we are parking it with you. So, a change in excess marketable securities is treated as financing flow – an increase in excess marketable securities is a positive financing flow and a decrease in excess marketable securities is a negative financing flow. For the same reason, the post-tax income on excess marketable securities is regarded as a financing flow – of course, it will represent a negative financing flow because it is the income received by the firm.

[Exhibit 32.5](#) shows the calculation for the cash flow available to investors.

### **Exhibit 32.5 | Matrix Limited – Cash Flow Available to Investors**

	Year 2	Year 3
Free cash flow	(8)	5
+ Non-operating cash flow	–	4.8
= Cash flow available to investors	(8)	9.8
After-tax interest expense	9.0	9.6
+ Cash dividend on equity and preference capital	12	12.0
+ Redemption of debt	–	–
– New borrowings	19	15
+ Share buybacks	–	–
– Share issues	30	–
+ Δ Excess marketable securities	20	5
– After-tax income on excess securities	–	1.8
= Financing flow	(8)	9.8

## Getting a Perspective on the Drivers of FCF

The FCF may be analysed in terms of its key drivers as follows:

$$FCF = NOPLAT - \text{Net Investment}$$

$$\begin{aligned} &= NOPLAT \left[ 1 - \frac{\text{Net Investment}}{NOPLAT} \right] \\ &= \text{Invested Capital} \left[ \frac{NOPLAT}{\text{Invested Capital}} \right] \left[ 1 - \frac{\text{Net Investment}}{NOPLAT} \right] \\ &= \text{Invested Capital} \left[ \frac{NOPLAT}{\text{Invested Capital}} \right] \left[ 1 - \frac{\text{Net Investment/Invested Capital}}{NOPLAT/\text{Invested Capital}} \right] \\ &= \text{Invested capital} \times \text{ROIC} \times \left[ 1 - \frac{\text{Growth rate}}{\text{ROIC}} \right] \end{aligned}$$

Thus, invested capital, ROIC, and growth rate are the basic drivers of FCF. The drivers of FCF for Matrix Limited for the years 2 and 3 are given below:

	<i>Year 2</i>	<i>Year 3</i>
■ Invested capital (Beginning of the year)	₹ 200 crore	₹ 238 crore
■ NOPLAT	₹ 30 crore	₹ 27 crore
■ $\text{ROIC} = \frac{\text{NOPLAT}}{\text{Invested capital}}$	15.00%	11.3%
■ Net investment	₹ 38 crore	₹ 22 crore
■ $\text{Growth rate} = \frac{\text{Net investment}}{\text{Invested capital}}$	19.00%	9.2%
■ FCF	- ₹ 8 crore	₹ 5 crore

## Developing the ROIC Tree

As ROIC is a key driver of free cash flow and valuation, it is useful to develop the ROIC tree which disaggregates ROIC into its key components. The starting point of the ROIC tree is:

$$\text{ROIC} = \frac{\text{NOPLAT}}{\text{Investment}}$$

Since NOPLAT is equal to  $\text{EBIT} \times (1 - \text{cash tax rate})$ , ROIC can be expressed as pre-tax ROIC  $\times (1 - \text{cash tax rate})$ :

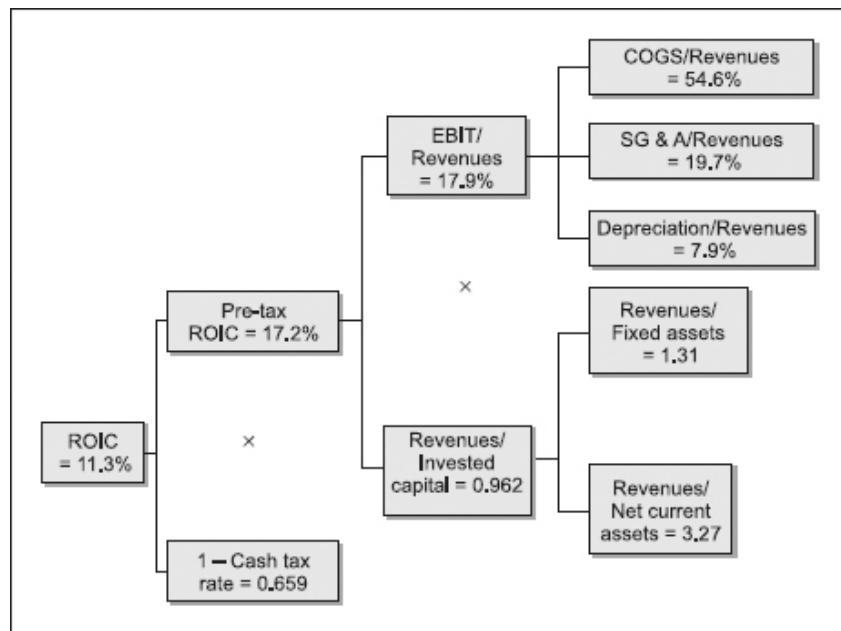
$$\text{ROIC} = \frac{\text{EBIT}}{\text{Invested capital}} (1 - \text{Cash tax rate})$$

Pre-tax ROIC can be broken down into two components as follows:

$$\frac{\text{EBIT}}{\text{Invested capital}} = \frac{\text{EBIT}}{\frac{\text{Revenues}}{\text{Operating Margin}}} \times \frac{\text{Revenues}}{\frac{\text{Invested capital}}{\text{Capital turnover}}}$$

The first term, viz., operating margin measures how effectively the firm converts revenues into profits and the second term, viz., capital turnover reflects how effectively the company employs its invested capital. Each of these two components can be further disaggregated. [Exhibit 32.6](#) shows the ROIC tree for Matrix Limited.

**Exhibit 32.6** Matrix Limited – ROIC Tree for Year 3



## 32.6 ■ ESTIMATING THE COST OF CAPITAL

Providers of capital (shareholders and lenders) want to be suitably compensated for investing funds in the firm. The cost of capital reflects what they expect. It is the discount rate used for converting the expected free cash flow into its present value. Hence, its definition must be consistent with that of the free cash flow. This means that the cost of capital should have the following features:

- It represents a weighted average of the costs of all sources of capital, as the free cash flow reflects the cash available to all providers of capital.
- It is calculated in post-tax terms because the free cash flow is expressed in post-tax terms.
- It is defined in nominal terms, since the free cash flow is stated in nominal terms.
- It is based on market value weights for each component of financing, as market values, not book values, represent the economic claims of various providers of capital.
- It reflects the risks borne by various providers of capital.

## Formula

The formula that may be employed for estimating the weighted average cost of capital is:

$$WACC = r_E (S/V) + r_P (P/V) + r_D(1 - T) (B/V) \quad (32.1)$$

where WACC is the weighted average cost of capital,  $r_E$  is the cost of equity capital,  $S$  is the market value of equity,  $V$  is the market value of the firm,  $r_D$  is the cost of preference capital,  $P$  is the market value of preference capital,  $r_D$  is the pre-tax cost of debt,  $T$  is the marginal rate of tax applicable, and  $B$  is the market value of interest-bearing debt.

Note that non-interest bearing liabilities, such as trade creditors, are not included in the calculation of the weighted average cost of capital. This is done to ensure consistency and simplify valuation. True, non-interest bearing liabilities have a cost. However, this cost is implicitly reflected in the price paid by the firm to acquire goods and services. Hence, it is already taken care of before the free cash flow is determined. While it is possible to separate the implicit financing costs of non-interest bearing liabilities from the free cash flow, it will make the analysis needlessly more complex, without enhancing the quality of valuation.

## **Matrix's Weighted Average Cost of Capital**

Matrix Limited has a target capital structure in which debt and equity have weights (in market value terms) of 2 and 3. The component costs of debt and equity are 12.67 percent and 18.27 percent. The marginal tax rate for Matrix is 40 percent. Given this information the, weighted average cost of capital is calculated as follows:

$$\begin{aligned} \text{WACC} &= \frac{3}{5} \times 18.27 + \frac{2}{5} \times 12.67\% (1 - .4) \\ &= 10.96 + 3.04 = 14 \text{ percent} \end{aligned}$$

## **32.7 ■ FORECASTING PERFORMANCE**

After analysing historical performance and estimating the cost of capital, we move on to developing financial forecasts. This involves the following steps.

1. Select the explicit forecast period.
2. Develop a strategic perspective on the future performance of the company.
3. Convert the strategic perspective into financial forecasts.
4. Check for consistency and alignments.

## **Select the Explicit Forecast Period**

The general guideline is that the explicit forecast period should be such that the business reaches a steady state at the end of this period. This condition has to be satisfied because typically the continuing value formula is based on the following assumptions: (i) The firm earns a fixed profit margin, achieves a constant asset turnover, and hence earns a constant rate of return on the invested capital. (ii) The re-investment rate (the proportion of gross cash flow invested annually) and the growth rate remain constant.

## **Develop a Strategic Perspective**

The strategic perspective reflects a credible story about the company's future performance. One such story about a telecom software provider is given below for illustrative purposes:

"The global telecom market is recovering. The company is well-positioned in those segments of the telecom market which are growing rapidly. The company has restructured its licensing arrangements with its customers and this is expected to augment its overall income from licensing. The combination of these factors is expected to generate a robust growth in revenues and improve the net profit margin over the next five years."

The story that you craft about the future prospects of the company provides the context for financial forecasting. So, develop the story on the basis of a thoughtful strategic analysis of the company and the industry to which it belongs. There are several analytical frameworks available in the strategy literature to help you in developing the story. Prominent among them are the classical industry structure analysis, customer segmentation analysis, and competitive business system analysis.

## **Convert the Strategic Perspective into a Financial Forecast**

Once you have crafted a story about the company's future performance, you have to develop a forecast of free cash flow. Sometimes the free cash flow forecast is developed directly without going through the profit and loss account and the balance sheet. However, it is advisable to base the free cash flow forecast on an integrated profit and loss account and balance sheet forecast. This provides a proper perspective on how the various elements fit together.

For non-financial companies, the most common method for forecasting the profit and loss account and the balance sheet is as follows:

1. Develop the revenue forecast on the basis of volume growth and price changes.
2. Use the revenue forecast to estimate operating costs, working capital, and fixed assets.
3. Forecast non-operating items such as investments, non-operating income, interest expense, and interest income.
4. Project net worth. Net worth at the end of year  $n$  is equal to net worth at the end of year  $n - 1$ , plus the amount ploughed back from the earnings of year  $n$ , plus new share issues during year  $n$ , minus share repurchases during year  $n$ .
5. Use the cash and/or debt account as the balancing account.

The projected profit and loss account and balance sheet for Matrix Limited for five years – years 4 through 8 – representing the explicit forecast period are given in [Exhibit 32.7](#).



**Exhibit 32.7 | Projected Profit and Loss Account and Balance Sheet for Matrix Limited for Five Years – Years 4 through 8 – The Explicit Forecast Period**

	(₹ in crore)				
	<i>Profit and Loss Account</i>				
	4	5	6	7	8
■ Net sales	270	320	360	400	440
■ Income from excess marketable securities	3	2	—	—	—
■ Non-operating income	—	—	—	—	—
■ Total income	273	322	360	400	440
■ Cost of goods sold	144	173	193	218	245
■ Selling and general administration	47	59	67	70	77
■ Depreciation	22	26	29	32	35
■ Interest expense	18	20	21	23	25
■ Total costs and expenses	231	278	310	343	382
■ Profit before tax	42	44	50	57	58
■ Tax provision*	13	16	18	19	18
■ Profit after tax	29	28	32	38	40
■ Dividend	15	15	15	16	16
■ Retained earnings	14	13	17	22	24
	<i>Balance Sheet</i>				
■ Equity capital	90	90	90	90	90
■ Reserves & surplus	75	88	105	127	151
■ Debt	140	150	161	177	192
Total	305	328	356	394	433
■ Fixed assets	220	240	266	294	324
■ Investments	10	—	—	—	—
■ Net current assets	75	88	90	100	109
Total	305	328	356	394	433

\* Due to some tax shelters the average tax rate is less than the marginal tax rate.

Drawing on the projected profit and loss account and balance sheet, the free cash flow forecast for the five year period is developed in [Exhibit 32.8](#).

## Check for Consistency and Alignment

The final step in the forecasting exercise is to evaluate the forecast for consistency and alignment by asking the following questions.

- Is the projected revenue growth consistent with industry growth?
- Is the ROIC justified by the industry's competitive structure?
- What will be the impact of technological changes on risk and returns?
- Is the company capable of managing the proposed investments?
- Will the company be in a position to raise capital for its expansion needs?

### Exhibit 32.8 Free Cash Flow Forecast for Matrix Limited for Five Years – Years 4 through 8 – The Explicit Forecast Period

	(₹ in crore)				
	4	5	6	7	8
1. Profit before tax	42	44	50	57	58
2. Interest expense	18	20	21	23	25
3. Interest income	3	2	—	—	—
4. Non-operating income	—	—	—	—	—
A. EBIT: (1) + (2) - (3) - (4)	57	62	71	80	83
5. Tax provision on income statement	13	16	18	19	18
6. Tax shield on interest expense	7.2	8.0	8.4	9.2	10.0
7. Tax on interest income	1.2	0.8	—	—	—
8. Tax on non-operating income	—	—	—	—	—
B. TAXES ON EBIT: (5) + (6) - (7) - (8)	19.0	23.2	26.4	28.2	28.0
C : NOPLAT : (A) - (B)	38.0	38.8	44.6	51.8	55.0
D : NET INVESTMENT	35.0	33.0	28.0	38.0	39.0
E : FREE CASH FLOW : (C) - (D)	3.0	5.8	16.6	13.8	16.0

Because ROIC and growth are the key drivers of value, let us look at how companies have performed on these parameters. Empirical evidence suggests that:

- Industry average ROICs and growth rates are related to economic fundamentals. For example, the pharmaceutical industry, thanks to patent protection, enjoys a higher ROIC whereas the automobile industry earns a lower ROIC because of its capital intensity.
- It is very difficult for a company to out perform its peers for an extended period of time because competition often catches up, sooner or later.

## 32.8 ■ DETERMINING THE CONTINUING VALUE

As discussed earlier, a company's value is the sum of two terms:

$$\text{Present value of cash flow during the explicit forecast period} + \text{Present value of cash flow after the explicit forecast period}$$

The second term represents the continuing value or the terminal value. It is the value of the free cash flow beyond the explicit forecast period. Typically, the terminal value is the dominant component in a company's value. Hence, it should be estimated carefully and realistically.

There are two steps in estimating the continuing value:

- Choose an appropriate method
- Calculate the continuing value

## Choose an Appropriate Method

A variety of methods are available for estimating the continuing value. They may be classified into two broad categories as follows:

- | <i>Cash Flow Methods</i>                   | <i>Non-cash Flow Methods</i>  |
|--|-------------------------------|
| ■ Growing free cash flow perpetuity method | ■ Replacement cost method     |
| ■ Value driver method                      | ■ Price-PBIT ratio method     |
|  | ■ Market-to-book ratio method |

**Growing Free Cash Flow Perpetuity Method** This method assumes that the free cash flow would grow at a constant rate for ever, after the explicit forecast period,  $T$ . Hence, the continuing value of such a stream can be established by applying the constant growth valuation model:

$$CV_T = \frac{FCF_{T+1}}{WACC - g} \quad (32.2)$$

where  $CV_T$  is the continuing value at the end of year  $T$ ,  $FCF_{T+1}$  is the expected free cash flow for the first year after the explicit forecast period, WACC is the weighted average cost of capital, and  $g$  is the expected growth rate of free cash flow forever.

**Value Driver Method** This method too uses the growing free cash flow perpetuity formula but expresses it in terms of value drivers as follows:

$$CV_T = \frac{NOPLAT_{T+1}(1 - g/r)}{WACC - g} \quad (32.3)$$

where  $CV_T$  is the continuing value at the end of year  $T$ ,  $NOPLAT_{T+1}$  is the expected net operating profits less adjusted tax for the first year after the explicit forecast period, WACC is the weighted average cost of capital,  $g$  is the constant growth rate of NOPLAT after the explicit forecast period, and  $r$  is the expected rate of return on net new investment.

The key value driver formula may be called the **Zen of Corporate Finance** because it reflects the value of a company in terms of its fundamental economic drivers viz., invested capital, ROIC, growth, and WACC. You can argue that this formula captures all there is to valuation. Everything else is a matter of detail.

The formulae given in Eqns. (32.2) and (32.3) produce the same result as they have the same denominator, and the numerator in Eqn. (32.3) is a different way of expressing the free cash flow (the numerator of Eqn. (32.2)).

**Replacement Cost Method** According to this method, the continuing value is equated with the expected replacement cost of the fixed assets of the company.

This method suffers from two major limitations: (i) Only tangible assets can be replaced. The “organisational capital” (reputation of the company; brand image; relationships with suppliers, distributors, and customers; technical know-how; capabilities of manpower, and so on) can only be valued with reference to the cash flows the firm generates in future, as it cannot be separated from the business as a going entity. Clearly, the replacement cost of tangible assets often grossly understates the value of the firm. (ii) It may simply be uneconomical for a firm to replace some of its assets. In such cases, their replacement cost exceeds their value to the business as a going concern.

**Price-to-PBIT Ratio Method** A commonly used method for estimating the continuing value is the price-to-PBIT ratio method. The expected PBIT in the first year after the explicit forecast period is multiplied by a ‘suitable’ price-to-PBIT ratio. The principal attraction of this method is that the price-to-PBIT ratio is a commonly cited statistic and most executives and analysts feel comfortable with it.

Notwithstanding the practical appeal of the price-to-PBIT ratio method, it suffers from serious limitations: (i) It assumes that PBIT drives prices. PBIT, however, is not a reliable bottom line for purposes of economic evaluation. (ii) There is an inherent inconsistency in combining cash flows during the explicit forecast period with PBIT (an accounting number) for the post-forecast period. (iii) There is a practical problem as no reliable method is available for forecasting the price-to-PBIT ratio.

**Market-to-Book Ratio Method** According to this method, the continuing value of the company at the end of the explicit forecast period is assumed to be some multiple of its book value. The approach is conceptually analogous to the price-PBIT ratio, and, hence, suffers from the same problems. Further, the distortion in book value on account of inflation and arbitrary accounting policies may be high. Overall, it appears that the cash flow methods are superior to the non-cash flow methods.

## Calculate the Continuing Value

The growing free cash flow perpetuity method is commonly used for estimating the continuing value. The key inputs required for this method are the weighted average cost of capital (WACC) and the constant growth rate ( $g$ ). The WACC has been estimated at 14 percent. If we assume that  $g$  is 10 percent, the continuing value of Matrix Limited at the end of year 8 can be calculated as follows.

$$\begin{aligned}\text{Continuing value}_8 &= \frac{\text{FCF}_9}{\text{WACC} - g} = \frac{\text{FCF}_8(1 + g)}{\text{WACC} - g} \\ &= \frac{16(1.10)}{0.14 - 0.10} = ₹ 440 \text{ crore}\end{aligned}$$

## **32.9 ■ CALCULATING THE FIRM VALUE AND INTERPRETING THE RESULTS**

The last phase of the valuation exercise is concerned with calculating the value of the firm and interpreting the results.

## Calculating the Firm Value

The value of the firm is equal to the sum of the following three components:

- Present value of the free cash flow during the explicit forecast period.
- Present value of the continuing value (horizon value) at the end of the explicit forecast period.
- Value of non-operating assets (like excess marketable securities) which were ignored in free cash flow analysis.

The above three components for Matrix Limited are as follows:

$$PV(FCF) = \frac{3.0}{(1.14)} + \frac{5.8}{(1.14)^2} + \frac{16.6}{(1.14)^3} + \frac{13.8}{(1.14)^4} + \frac{16.0}{(1.14)^5} = ₹ 34.78 \text{ crore}$$

$$PV(CV) = \frac{440}{(1.14)^5} = ₹ 228.52 \text{ crore}$$

Value of non-operating assets = ₹ 25 crore

Hence the value of Matrix Limited is:  $34.78 + 228.52 + 25.0 = ₹ 288.3$  crore

## Interpreting the Results

Valuation is done to guide some management decision like issuing securities, acquiring a company, divesting a division, or adopting a strategic initiative. Hence the results of valuation must be analysed from the perspective of the decision at hand. As risk and uncertainty characterise most business decisions, you must think of scenarios and ranges of value, reflective of this uncertainty.

While the decision based on any one scenario is fairly obvious, given its expected impact on shareholder value, interpreting multiple scenarios is far more complex. At a minimum, you should address the following questions:

- If the decision is positive, what can possibly go wrong to invalidate it?  
How likely is that to happen?
- If the decision is negative, what upside potential is being given up?  
What is the probability of the same?

Answering these questions can be illuminating. As Copeland et al. put it: "The process of examining initial results may well uncover unanticipated questions that are best resolved through evaluating additional scenarios. This implies that the valuation process is inherently circular. Doing the valuation itself often provides insights that lead to additional scenarios and analyses."

## **32.10 ■ DCF APPROACH: 2-STAGE AND 3-STAGE GROWTH MODELS**

In our previous discussions we worked with detailed year-by-year forecasts which permitted any kind of variation in any item from year to year. When such detailed forecasts are not available, we may have to rely on simplified versions of the DCF approach. This section discusses two simplified versions of the DCF approach:

- Two-stage growth model
- Three-stage growth model

## Two-Stage Growth Model

The two-stage growth model allows for two stages of growth - an initial period of higher growth followed by a stable (but lower) growth forever.

$$\text{Value of the firm} = \text{Present value of the FCF during the high growth phase} + \text{Present value of terminal value}$$

Note that in simplified versions of the DCF approach, it is generally assumed that the operating free cash flow (FCF) is equal to the free cash flow to the firm (FCFF). In other words, it is assumed that non-operating cash flows are nil.

To illustrate the two stage-growth model, let us consider an example. Exotica Corporation is expected to grow at a higher rate for five years; thereafter the growth rate will fall and stabilise at a lower level. The following information is available:

### Base Year (Year 0) Information

■ Revenues	= ₹ 4000 million
■ EBIT (12.5% of revenues)	= ₹ 500 million
■ Capital expenditure	= ₹ 300 million
■ Depreciation	= ₹ 200 million
■ Working capital as a percentage of revenues	= 30 percent
■ Corporate tax rate (for all time)	= 40 percent
■ Paid-up equity capital (₹ 10 par)	= ₹ 300 million
■ Market value of debt	= ₹ 1250 million

### Input for the High Growth Rate

■ Length of the high growth phase	= 5 years
■ Growth rate in revenues, depreciation, EBIT and capital expenditure	= 10 percent
■ Working capital as a percentage of revenues	= 30 percent
■ Cost of debt	= 15 percent (pre-tax)
■ Debt-equity ratio	= 1 : 1
■ Risk free rate	= 13 percent

- Market risk premium = 6 percent
- Equity beta = 1.333

### Inputs for the Stable Growth Period

- Expected growth rate in revenues and EBIT = 6 percent
- Capital expenditures are offset by depreciation
- Working capital as a percentage of revenues = 30 percent
- Cost of debt = 15 percent (pre-tax)
- Debt-equity ratio = 2 : 3
- Risk free rate = 12 percent
- Market risk premium = 7 percent
- Equity beta = 1.0

Given the above information, the forecasted FCF during the high growth period are calculated in [Exhibit 32.9](#).

#### **Exhibit 32.9 Forecasted FCF: Exotica Corporation**

	1	2	3	4	5	Terminal Year	(₹ in million)
1. Revenues	4400	4840	5324	5856.4	6442.0	6828.6	
2. EBIT	550	605	665.6	732.1	805.1	853.4	
3. EBIT( $1 - t$ )	330	363	399.3	439.2	483.2	512.1	
4. Cap exp-Depreciation	110	121	133.1	146.4	161.1	-	
5. Δ Working capital	120	132	145.2	159.7	175.7	116.0	
6. FCF	100	110	121	133.1	146.4	396.1	
(3 – 4 – 5)							

The cost of equity ( $r_E$ ), using the capital asset pricing model, and the weighted average cost of capital (WACC) during the high growth period and stable growth period are calculated below:

	$r_E = \text{Risk free} + \text{Equity beta}$ (Market premium)	$\text{WACC} = w_E r_E + w_D r_D (1 - t)$
High growth	13% + 1.333 (6%)	0.5(21%) + 0.5(15%)

period	= 21%	(0.6) = 15%
Stable growth period	12% + 1.000(7%) = 19%	0.6(19%) + 0.4 (15%) (0.6) = 15%

The present value of the FCF during the explicit forecast period is:

$$= \frac{100}{(1.15)} + \frac{110}{(1.15)^2} + \frac{121}{(1.15)^3} + \frac{133.1}{(1.15)^4} + \frac{146.4}{(1.15)^5} = ₹ 398.58 \text{ million}$$

The present value of the terminal value is:

$$= \frac{396.1}{0.15 - 0.06} \times \frac{1}{(1.15)^5} = ₹ 2188.13 \text{ million}$$

The value of the firm is:

$$= 398.58 + 2188.13 = ₹ 2586.71 \text{ million}$$

## Three-Stage Growth Model

The three-stage growth model assumes that:

- The firm will enjoy a high growth rate for a certain period (usually 3 to 7 years).
- The high growth period will be followed by a transition period during which the growth rate will decline in linear increments.
- The transition period will be followed by a stable growth rate forever.

Hence the value of the firm is expressed as follows:

$$\text{Value of the firm} = \text{PV of FCF during the high growth period} + \text{PV of FCF during the transition period} + \text{PV of terminal value}$$

The three-stage growth model may be illustrated with an example. Multiform Limited is being appraised by an investment banker. The following information has been assembled.

### Base Year (Year 0) Information

■ Revenues	= ₹ 1000 million
■ EBIT	= ₹ 250 million
■ Capital expenditure	= ₹ 295 million
■ Depreciation and amortisation	= ₹ 240 million
■ Working capital as a percentage of revenues	= 20 percent
■ Tax rate	= 40 percent (for all time to come)

### Inputs for the High Growth Period

■ Length of the high growth period	= 5 years
■ Growth rate in revenues, depreciation, EBIT, and capital expenditures	= 25 percent
■ Working capital as a percentage of revenues	= 20 percent
■ Cost of debt	= 15 percent (pre-tax)
■ Debt-equity ratio	= 1.5
■ Risk free rate	= 12 percent
■ Market risk premium	= 6 percent
■ Equity beta	= 1.583

- $\text{WACC} = 0.4 [12 + 1.583(6)] + 0.6 [15(1 - 0.4)] = 14.00 \text{ percent}$

### Inputs for the Transition Period

- Length of the transition period = 5 years
- Growth rate in EBIT will decline from 25 percent in year 5 to 10 percent in year 10 in linear movements of 3 percent each year
- Working capital as a percentage of revenues = 20 percent
- The debt-equity ratio during this period will drop to 1:1 and the pre-tax cost of debt will be 14 percent
- Risk-free rate = 11 percent
- Market risk premium = 6 percent
- Equity beta = 1.10
- WACC =  $0.5 [11 + 1.1(6)] + 0.5 [14(1 - 0.4)] = 13.00 \text{ percent}$

### Inputs for the Stable Growth Period

- Growth rate in revenues, EBIT, capital expenditure, and depreciation = 10 percent
- Working capital as a percentage of revenues = 20 percent
- Debt-equity ratio = 0:1
- Pre-tax cost of debt = 12 percent
- Risk-free rate = 10 percent
- Market risk premium = 6 percent
- Equity beta = 1.00
- WACC =  $1.0 [10 + 1 (6)] = 16.00 \text{ percent}$

The above inputs are used to estimate free cash flows to the firm, the cost of capital, and the present values during the high growth and transition periods in [Exhibit 32.10](#).

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## Exhibit 32.10 | Estimate FCF—Multiform Limited

Period	Growth Rate (%)	EBIT (1 – t)	Cap Exp	Dep	WC	ΔWC	FCF	D/E	Beta	WACC (%)	Present Value
1	25	187.5	368.8	300	250	50	68.7	1.5	1.583	14	60.26
2	25	234.4	460.9	375	312.5	62.5	85.9	1.5	1.583	14	66.10
3	25	293.0	576.2	468.8	390.6	78.1	107.3	1.5	1.583	14	72.43
4	25	366.2	720.2	585.9	488.3	97.7	134.2	1.5	1.583	14	79.45
5	25	457.8	900.3	732.4	610.4	122.1	167.8	1.5	1.583	14	87.15
6	22	558.5	1098.3	893.6	744.6	134.2	219.6	1.0	1.100	13	100.93
7	19	664.6	1307.0	1063.3	886.1	141.5	279.4	1.0	1.100	13	113.64
8	16	770.9	1516.1	1233.5	1027.9	141.8	346.5	1.0	1.100	13	124.72
9	13	871.1	1713.2	1393.8	1161.5	133.6	418.1	1.0	1.100	13	133.18
10	10	958.2	1884.6	1533.2	1277.7	116.2	490.6	1.0	1.100	13	138.30

The terminal value at the end of year 10 can be calculated based on the FCF in year 11, the stable growth rate of 10 percent, and the WACC of the stable growth period, 16 percent.

$$FCF_{11} = FCF_{10} \times (1.10) = 490.6 (1.10) = ₹ 539.7 \text{ million}$$

$$\text{Terminal value}_{10} = \frac{FCF_{11}}{\text{WACC} - g} = \frac{539.7}{0.16 - 0.10} = ₹ 8995 \text{ million}$$

$$\text{Present value of terminal value} = \frac{8995}{(1.14)^5 (1.13)^5} = ₹ 2535.62 \text{ million}$$

The value of Multiform Limited is arrived at as follows:

Present value of FCF during the high growth period	: ₹ 365.39 million
Present value of FCF in the transition period	: ₹ 610.77 million
Present value of the terminal value	: ₹ 2535.62 million
Value of the firm	: ₹ 3511.78 million

## 32.11 ■ FREE CASH FLOW TO EQUITY (FCFE) VALUATION

So far our focus was on valuing the firm (or the enterprise) as a whole. If you are interested in determining the equity value, you can derive it as follows:

$$\text{Equity value} = \text{Firm value} - \text{Debt value}$$

Alternatively, you can look at the free cash flow to equity (FCFE) and discount it at the cost of equity.

The FCFE is the cash flow left for equity shareholders after the firm has covered its capital expenditure and working capital needs and met all its obligations toward lenders and preference shareholders. It is defined as follows:

$$\begin{aligned} \text{FCFE} = & (\text{Profit after tax} - \text{Preference dividend}) \\ & - (\text{Capital expenditure} - \text{Depreciation}) \\ & - (\text{Change in net working capital}) \\ & + (\text{New debt issue} - \text{Debt repayment}) \\ & + (\text{New preference issue} - \text{Preference repayment}) \\ & - (\text{Change in investment in marketable securities}) \end{aligned}$$

The equity value is the present value of the FCFE stream, where the discounting rate is the cost of equity ( $r_E$ )

$$\text{Equity value} = \sum_{t=1}^{\infty} \frac{\text{FCFE}_t}{(1 + r_E)^t} \quad (32.4)$$

To illustrate the FCFE valuation, let us look at the data for Matrix Limited for year 3, the year that has just ended, and for the next five years, years 4 through 8. This data has been extracted from [Exhibit 32.3](#) and [32.7](#).

	3	4	5	6	7	8
■ Profit after tax	24	29	28	32	38	40
■ Preference dividend	—	—	—	—	—	—
■ Fixed assets (net)	190	220	240	266	294	324
■ Investments	25	10	—	—	—	—
■ Net current assets	70	75	88	90	100	109
■ Debt	134	140	150	161	177	192
■ Preference	—	—	—	—	—	—

The FCFE forecast for the explicit forecast period, years 4 through 8, is worked out below:

	4	5	6	7	8
(Profit after tax – Preference dividend)	29	28	32	38	40
– (Capital expenditure – Depreciation)	– 30	– 20	– 26	– 28	– 30
– (Change in net current assets)	– 5	– 13	– 2	– 10	– 9
+ (New debt issue – Debt repayment)	+ 6	+ 10	+ 11	+ 16	+ 15
– (Change in investment in marketable securities)	+ 15	+ 10	—	—	—
FCFE	15	15	15	16	16

To understand the above numbers remember the following accounting identities:

$$\text{Change in net fixed assets} = \text{Capital expenditure} - \text{Depreciation}$$

$$\text{Change in debt} = \text{New debt issue} - \text{Debt repayment}$$

If we assume that the FCFE grows at a constant rate of 10 percent per year after the explicit forecast period, the equity value using the FCFE valuation method can be calculated as follows:

$$\text{Equity value}_3 = \frac{\text{FCFE}_4}{(1+r_E)^1} + \frac{\text{FCFE}_5}{(1+r_E)^2} + \frac{\text{FCFE}_6}{(1+r_E)^3} + \frac{\text{FCFE}_7}{(1+r_E)^4} + \frac{\text{FCFE}_8}{(1+r_E)^5} + \frac{\text{FCFE}_8(1.10)}{(r_E - 0.10)} \times \frac{1}{(1+r_E)^5}$$

Plugging the FCFE estimates and the cost of equity ( $r_E$ ) value of 18.27 percent, we get:

$$\begin{aligned} \text{Equity value}_3 &= \frac{15}{(1.1827)^1} + \frac{15}{(1.1827)^2} + \frac{15}{(1.1827)^3} + \frac{16}{(1.1827)^4} + \frac{16}{(1.1827)^5} \\ &\quad + \frac{16(1.10)}{(0.1827 - 0.10)} \times \frac{1}{(1.1827)^5} = ₹ 139.51 \text{ crore} \end{aligned}$$

## 32.12 ■ GUIDELINES FOR CORPORATE VALUATION

We have explored various approaches to valuation and touched upon the difficulties and pitfalls that the appraiser encounters. Let us wrap up our discussion by presenting important guidelines that an appraiser should bear in mind.

**Understand How the Various Approaches Compare** The various approaches to valuation compare as follows:

- The adjusted book value approach makes sense when liquidation is being considered a distinct possibility or when you want to establish a minimum benchmark price.
- The stock and debt approach is eminently suitable when the securities of the firm are actively traded and there is no price manipulation.
- The direct comparison approach is quite appropriate when (a) the current earnings of the firm are reflective of future earnings capacity, (b) the company expects to enjoy stable growth rate, and (c) there are comparable companies.
- The discounted cash flow approach is ideally suited when (a) fairly credible business plans and cash flow projections are available for the explicit forecast period of five to ten years or even more and (b) the firm is expected to reach a steady state at the end of the explicit forecast period.

**Use at least Two Different Approaches** Every approach has its limitations. Hence exclusive reliance on a single approach may lead to biases in valuation. Practical wisdom suggests that in most real life valuations exercises, the appraiser must use at least two different approaches. The final value indicator may be arrived at by taking a weighted average of the valuation figures produced by two or more different approaches. Weighting should be based on the judgement of the appraiser, not on a mechanical formula.

**Work with a Value Range** Valuation is an inherently imprecise, inexact, and uncertain exercise. Given an inescapable indeterminateness characterising valuation, it is naïve and foolhardy to attach great precision to any single value estimate. A more sensible approach would be to look at

two to three plausible scenarios and define a value range, based on the value indicators for these scenarios, to take care of the imponderables.

**Go Behind Numbers** As we have seen, there are several value drivers, viz., invested capital, return on invested capital, growth rate, and cost of capital. Often, appraisers have difficulty in getting a handle over return on invested capital, perhaps the most critical value driver. Since the return on invested capital is mainly a function of entry barriers, the appraiser must go behind the numbers and examine carefully entry barriers like economies of scale, product differentiation, technological edge, access to distribution channels, patent protection, and governmental license.

**Value Flexibility** The discounted cash flow approach to valuation is based on cash flows forecasted on the basis of a current assessment of future prospects. This approach, in an important sense, is incomplete as it does not take into account the value of flexibility. Remember that the management may change its policies in the light of future developments and can exercise a variety of options suited to the needs of the unfolding environment. Flexibility and options are quite valuable. To ignore them is to overlook an important source of value.

**Blend Theory with Judgement** Valuing real companies calls for combining theory, judgement, and experience. As Milton Rock said : "In the end, even when armed with the results of various analyses such as DCF values, secondary market trading levels, a history of comparable transactions, and estimates of liquidation or replacement values, the evaluator moves from the arena of seeming precision and science to the realm of judgement and art." Bradford Cornell echoed a similar view: "Valuing a company is neither an art nor a science but an odd combination of both. There is enough science that appraisers are not left to rely solely on experience, but there is enough art that without experience and judgements, failure is assured."

**Avoid Reverse Financial Engineering** In valuation exercises, the appraiser may sometimes start with a given value estimate and then work backwards to specify the assumptions that produce the pre-determined value figure. This may be referred to as 'reverse financial engineering'. Obviously this is an elaborate attempt to give a veneer of sophistication or provide pseudo-scientific justification for a foregone conclusion. At best it is futile and at worst it is highly misleading. A professionally honest appraiser should resist the temptation to do reverse financial engineering.

**Beware of Possible Pitfalls** Valuation is a complex and difficult exercise in which one can easily commit mistakes. Here are some common pitfalls that a careful analyst should avoid:

- **Use of shortcuts** As Copeland, Koller, and Murrin said: “Too often, analysts forecast only the income statement and a partial balance sheet. For example, changes in working capital and new investment. This approach does not allow them to cross check the validity of their assumptions.”
- **Belief in Hockey Stick** A forecast based on a dramatic turnaround of a lacklustre performer is an example of a “hockey stick”. If the analyst assumes a hockey stick, he must specify clearly an action plan required to bring about a successful turnaround and argue convincingly that the incumbent management is capable of implementing the action plan.
- **Short Forecast Horizons** Analysts often use a short horizon period for valuation as they equate it with the planning period of the firm which may be five years or so. If the analyst employs a cash flow method (either the growing free cash flow perpetuity method or a value driver method) for estimating the continuing value, the horizon period should be such that, at the end of it, the growth rate stabilises or the return on invested capital becomes equal to the cost of capital. Typically this period is longer than the planning period of the firm.

**Adjust for Control Premia and Non-Marketability Factor** The issue of premia and discounts is important when partial interests rather than the entire businesses are valued. Here are some indicative guidelines.

- For a partial interest that gives the buyer an effective control over the firm add a control premium which typically ranges between 20 and 60 percent of the *pro rata* value of the firm, irrespective of whether the firm is listed or not.
- For a partial interest that represents a minority stake without any control rights, deduct a non-marketability discount—which typically ranges between 10 and 25 percent—from the *pro rata* value of the firm, should the firm be an unlisted firm.

**Debunk the Myths Surrounding Valuation** Here are some popular myths surrounding valuation along with the reality corresponding to them

<i>Myth</i>	<i>Reality</i>
■ Since valuation involves	■ The key inputs in valuation

quantitative models, it is an objective exercise.

models rely heavily on subjective judgement.

- A well-done valuation is timeless.
- What matters is the product of valuation; the process is not important.
- Valuation changes over time in response to new developments.
- The process of valuation is perhaps as important as the product thereof.

## SUMMARY

- The IRS of the US has defined **fair market value** as “the price at which the property would change hands between a willing buyer and willing seller when the former is not under any compulsion to buy and the latter is not under any compulsion to sell, both the parties having reasonable knowledge of relevant facts”.
- There are four broad approaches to appraising the value of a company: adjusted book value approach, stock and debt approach, direct comparison approach, and discounted cash flow approach.
- The simplest approach to valuing a company is to rely on the information found on its balance sheet, adjusted for replacement cost or liquidation value.
- When the securities of a firm are publicly traded, its value can be obtained by merely adding the market value of all its outstanding securities. This approach is called the **stock and debt approach** to valuation.
- The **direct comparison approach** involves valuing a company on the basis of how similar companies are valued in the market place.
- The **discounted cash flow** approach to valuation involves five steps: (a) analysing historical performance, (b) forecasting cash flows, (c) establishing the cost of capital, (d) determining the continuing value at the end of the explicit forecast period, and (e) calculating the firm value and interpreting results.
- There are two simplified versions of the DCF approach which are commonly used: the **2-stage growth model** and the **3-stage growth model**.
- If you are interested in determining the equity value, you can look at the **free cash flow to equity (FCFE)** and discounting the same at the cost of equity.
- The important guidelines that an appraiser should bear in mind while valuing a company are as follows: (i) Understand how the various approaches compare. (ii) Use at least two different approaches. (iii) Look at a value range. (iv) Go behind the numbers. (v) Value flexibility. (vi) Blend theory with judgement. (vii) Avoid reverse financial engineering. (viii) Beware of possible pitfalls. (ix) Adjust for control premia and non-marketability factor. (x) Debunk the myths surrounding valuation.

## QUESTIONS

1. What is the meaning of "fair market value" as defined by the Internal Revenue Service of the US?
2. Describe and evaluate the adjusted book value approach to corporate valuation.
3. Describe and evaluate the stock and debt approach to corporate valuation.
4. Discuss the steps involved in using the direct comparison approach for valuing a company.
5. What are the limitations of the direct comparison approach?
6. Discuss the important differences between project valuation and corporate valuation.
7. How would you select the explicit forecast period in DCF valuation?
8. What is free cash flow to the firm (FCFF)? What are its components?
9. Define the following: operating free cash flow (FCF), NOPLAT, net investment, and non-operating cash flow.
10. What are the elements of financing flow?
11. Discuss the key drivers of FCF?
12. What are the features of cost of capital?
13. Discuss the various methods for estimating the continuing (or terminal) value.
14. Describe the two-stage growth model and the three-stage growth model.
15. Discuss the important guidelines to be borne in mind while valuing a company.

## SOLVED PROBLEMS

32.1 The profit and loss account and balance sheet of Zenith Corporation for two years (years 1 and 2) are given below:

<i>Profit and Loss Account</i>	<i>(₹ in million)</i>	
	<i>Year 1</i>	<i>Year 2</i>
Net sales	5600	6440
Income from marketable securities	140	210
Non-operating income	70	140
Total income	5810	6790
Cost of goods sold	3220	3780
Selling and administrative expenses	700	770
Depreciation	350	420
Interest expenses	336	392

Total costs and expenses	4606	5362
PBT	1204	1428
Tax provision	364	448
PAT	840	980
Dividend	420	560
Retained earnings	420	420
<i>Balance Sheet</i>		
Equity capital	2100	2100
Reserves and surplus	1680	2100
Debt	2520	2940
	6300	7140
Fixed assets	4200	4550
Investments	1260	1400
Net current assets	840	1190
	6300	7140

- (i) What is the EBIT for year 2?
- (ii) What is the tax on EBIT for year 2?
- (iii) What is the NOPLAT for year 2?
- (iv) What is the free cash flow to the firm (FCFF) for year 2?
- (v) Give the break up of the financing flow for year 2?

*Solution*

- (i) EBIT for Zenith Corporation for year 2 is calculated below:

Profit before tax	1428
+ Interest expense	+ 392
- Interest income	- 210
- Non-operating income	-140
	<u>1470</u>

- (ii) Taxes on EBIT for year 2 is calculated below:

Tax provision from income statement	448
+ Tax shield on interest expense	+156.8
- Tax on interest income	- 84
- Tax on non-operating income	- 56
	<u>464.8</u>

- (iii) NOPLAT for year 2 is:

EBIT	1470
– Tax on EBIT	464.8
	<u>1005.2</u>

(iv) FCFF for year 2 is:

NOPLAT	1005.2
– Net investment	–
	700.0
+ Non-operating cash flow	+ 84.0
	<u>389.2</u>

(v) The break-up of the financing flow is as follows:

After-tax interest expense	235.2
+ Cash dividend	+ 560
– Net borrowing	– 420
+ Δ Excess marketable securities	– 140
– After-tax income on excess marketable securities	– 126
	<u>389.2</u>

32.2 Magnavision Corporation is expected to grow at a higher rate of 4 years; thereafter the growth rate will fall and stabilise at a lower level. The following information has been assembled:

#### *Base Year (Year 0) Information*

■ Revenues	₹ 3000 million
■ EBIT	₹ 500 million
■ Capital expenditure	₹ 350 million
■ Depreciation	₹ 250 million
■ Working capital as a percentage of revenues	25%
■ Corporate tax rate (for all time)	30%
■ Paid-up equity capital (₹ 10 par)	₹ 400 million
■ Market value of debt	₹ 1200 million

#### *Inputs for the High Growth Phase*

■ Length of high growth phase	4 years
■ Growth rate in revenues, depreciation, EBIT and capital expenditure	20%
■ Working capital as a percentage	25%

of revenues	
■ Cost of debt (pre-tax)	13%
■ Debt-equity ratio	1:1
■ Risk-free rate	11%
■ Market risk premium	7%
■ Equity beta	1.129

*Inputs for the Stable Growth Period*

■ Expected growth rate in revenues and EBIT Capital expenditures are offset by depreciation	10%
■ Working capital as a percentage of revenues	25%
■ Cost of debt (pre-tax)	12.14%
■ Risk-free rate	10%
■ Market risk premium	6%
■ Equity beta	1.0
■ Debt-equity ratio	2:3

- (i) What is the WACC for the high growth phase and the stable growth phase?
- (ii) What is the value of the firm?

*Solution*

(i) According to the CAPM, the cost of equity during the high growth phase will be:  
 $11\% + 1.129 (7\%) = 18.90\%$

The cost of debt during the high growth phase will be:

$$13\% (1 - 0.30) = 9.10\%$$

The WACC for the high growth phase will be:

$$\begin{aligned} \text{WACC} &= 0.5 \times 18.90 + 0.5 \times 9.10 \\ &= 14.0\% \end{aligned}$$

According to the CAPM, the cost of equity during the stable growth phase will be:

$$10\% + 1.0 (6\%) = 16\%$$

The cost of debt during the stable growth phase will be:

$$12.14 (1 - 0.30) = 8.50\%$$

The WACC during the stable growth phase will be:

$$0.4 \times 8.50\% + 0.60 \times 16\% = 13.0\%$$

- (ii) The forecasted FCF during the high growth period and the terminal year are given below:

### Forecasted FCF: Magnavision Corporation

	1	2	3	4	Terminal year
1. Revenues	3600	4320	5184	6220.8	6849.9
2. EBIT	600	720	864	1036.8	1140.5
3. EBIT ( $1 - t$ )	420	504	604.8	725.8	798.3
4. Capital expenditure – depreciation	120	144	172.8	207.4	—
5. Δ Working capital	150	180	216	259.2	155.5
6. FCF (3 – 4 – 5)	150	180	216	259.2	642.8

The present value of the FCF during the explicit forecast period is:

$$\frac{150}{(1.14)} + \frac{180}{(1.14)^2} + \frac{216}{(1.14)^3} + \frac{259.2}{(1.14)^4} = ₹ 569.2 \text{ million}$$

The present value of the terminal value is:

$$\frac{642.8}{0.13 - 0.10} \times \frac{1}{(1.14)^4} = ₹ 12684.6 \text{ million}$$

The value of the firm is:

$$₹ 569.2 \text{ million} + ₹ 12684.6 \text{ million} = ₹ 13253.8 \text{ million}$$

- 32.3 You are looking at the valuation of a stable firm, Networks Limited, done by an investment analyst. Based on an expected free cash flow of ₹ 54 million for the following year and an expected growth rate of 9 percent, the analyst has estimated the value of the firm to be ₹ 1800 million. However, he committed a mistake of using the book values of debt and equity. You do not know the book value weights employed by him but you know that the firm has a cost of equity of 20 percent and a post-tax cost of debt of 10 percent. The market value of equity is thrice its book value, whereas the market value of its debt is nine-tenths of its book value. What is the correct value of the firm?

*Solution*

$$1800 = \frac{54}{r - 0.09} \Rightarrow r = 0.12 \text{ or } 12\%$$

$$0.12 = x \times 0.20 + (1 - x) \times 0.10 \Rightarrow x = 0.20$$

x is the weight assigned to equity is 0.20

So  $D/E = 0.8/0.2 = 4$

Since the market value of equity is thrice its book value and the market value of debt is nine-tenths of its book value, the market value weights of equity and debt are

$0.2 \times 3$  and  $0.8 \times 0.9$

That is 0.6 and 0.72.

Hence the WACC is

$$\frac{0.6}{1.32} \times 0.20 + \frac{0.72}{1.32} \times 0.10 = 0.1454 \text{ or } 14.54\%$$

Hence the value of the firm is:

$$\frac{54}{.1454 - .09} = ₹ 974.7 \text{ million}$$

## PROBLEMS

**32.1** The profit and loss account and balance sheet of Hitech Limited for three years (year 1, year 2, and year 3) are given below:

*Profit and Loss Account*

	₹ in million)		
	1	2	3
Net sales	350	400	460
Income from marketable securities	—	10	15
Non-operating income	—	5	10
Total income	350	415	485
Cost of goods sold	200	230	270
Selling and general administration expenses	45	50	55
Depreciation	20	25	30
Interest expenses	20	24	28
Total costs and expenses	285	329	383
PBT	65	86	102
Tax provision	20	26	32
PAT	45	60	70
Dividend	20	30	40
Retained earnings	25	30	30

*Balance Sheet*

	1	2	3
Equity capital	130	150	150
Reserves and surplus	90	120	150
Debt	150	180	210
Total	370	450	510
Fixed assets	250	300	325
Investments	60	90	100
Net current assets	60	60	85
Total	370	450	510

The tax rate for Hitech Limited is 40 percent. During year 2 the firm made a rights issue of ₹ 20 million at par.

(a) Calculate the following for years 2 and 3

- (i) EBIT
- (ii) Taxes on EBIT
- (iii) NOPLAT

- (iv) Net investment
- (v) Operating free cash flow
- (vi) Net operating cash flow
- (vii) Free cash flow to the firm
- (b) Give the break-up of the financing flow for years 2 and 3.
- (c) Calculate the following key drivers of FCF for years 2 and 3.
  - (i) Invested capital
  - (ii) ROIC
  - (iii) Growth rate

**32.2** Televista Corporation is expected to grow at a higher rate for 4 years; thereafter the growth rate will fall and stabilise at a lower level. The following information available:

### ***Base Year (Year 0) Information***

Revenues	= ₹ 1600 million
EBIT	= ₹ 240 million
Capital expenditure	= ₹ 200 million
Depreciation	= ₹ 120 million
Working capital as a percentage of revenues	= 25 percent
Corporate tax rate (for all time)	= 35 percent
Paid-up equity capital (₹ 10 per)	= ₹ 180 million
Market value of debt	= ₹ 600 million

### ***Inputs for the High Growth Period***

Length of the high growth period	= 4 years
Growth rate in revenues, depreciation, EBIT and capital expenditure	= 20 percent
Working capital as a percentage of revenues	= 25 percent
Cost of debt	= 15 percent
Debt-equity ratio	= 1.5 : 1
Risk-free rate	= 12 percent
Market risk premium	= 7 percent
Equity beta	= 1.25

### ***Inputs for the Stable Growth Period***

Expected growth rate in revenues and EBIT	= 10 percent
Capital expenditures are offset by depreciation	
Working capital as a percentage of revenues	= 25 percent

Cost of debt	= 14 percent (pre-tax)
Debt-equity ratio	= 1.1
Risk-free rate	= 12 percent
Market risk premium	= 6 percent
Equity beta	= 1.00
Calculate the value of the firm.	

- 32.3** You have been asked to appraise Multisoft Limited for which the following information has been assembled:

#### ***Base Year (Year 0) Information***

Revenues	= ₹ 320 million
EBIT	= ₹ 90 million
Capital expenditure	= ₹ 100 million
Depreciation	= ₹ 60 million
Working capital as a percentage of revenues	= 20 percent
Tax rate	= 0 percent

#### ***Inputs for the High Growth Period***

Length of the high growth period	= 5 years
Growth rate in revenues, depreciation, EBIT and capital expenditure	= 40 percent
Working capital as a percentage of revenues	= 20 percent
Cost of debt	= 15 percent (pre-tax)
Tax rate will increase to 30 percent in linear increments of 6 percent.	
Debt-equity ratio	= 1 : 1
Risk-free rate	= 12 percent
Market risk premium	= 7 percent
Equity beta	= 1.3

#### ***Inputs for the Transition Period***

Length of the transition period	= 5 years
Growth rate in revenues, depreciation, EBIT, and capital expenditures will decline	

From 40 percent in year 5 to 10 percent in year 10 in linear increments of 6 percent each year.

Working capital as a percentage of revenues	= 20 percent
Debt-equity ratio	= 0.8 : 1
Cost of debt	= 14 percent (pre-tax)
Risk-free rate	= 11 percent
Market risk premium	= 6 percent
Equity beta	= 1.1
Tax rate	= 30 percent

### ***Inputs for the Stable Growth Period***

Growth rate in revenues, EBIT, capital expenditure, and depreciation	= 10 percent
Working capital as a percentage of revenues	= 20 percent
Debt-equity ratio	= 0.5 : 1.0
Cost of debt	= 13 percent (pre-tax)
Risk-free rate	= 11 percent
Market risk premium	= 5 percent
Equity beta	= 1.0
Tax rate	= 30 percent

What value would you put on Multisoft Limited?

### **MINICASE - 1**

Fifteen years ago, Manish Kothari set up a company called Manish Detergents to make detergent powder. After a few years of teething problems the company established itself as a low cost producer of good quality detergent powder branded as Manna. For the last decade Manish Detergents has grown profitably. The profit and loss account for year 0 (the year that just ended) and the balance sheet at the end of year 0 for Manish Detergents are given below in [Exhibit 1](#).

## Exhibit 1 Financials of Manish Detergents

Profit and Loss Account		Balance Sheet		₹ in million)
		Sources of Funds		
■ Revenues	900	Shareholders' funds	500	
■ PBDIT	209	Loan funds	200	
■ Depreciation	45			<u>700</u>
■ PBIT	164			
■ Interest	24			
■ PBT	140	Application of Funds		
■ Tax	49	Net fixed assets	450	
■ PAT	91	Net current assets	250	
				700

The paid-up capital of Manish Detergents is ₹ 100 million divided into 10 million shares of ₹ 10 each. All the shares are presently held by Manish Kothari, who is planning to take the company public by selling 4 million of his existing shares. The purpose of the issue is to enable Manish Kothari to liquefy a portion of his equity. Once the equity of Manish Detergents is listed it will help the company in raising capital from the market as and when required in the future.

Manish Kothari called Ajay Kapoor, vice president of Indus Capital, a merchant banking firm, to help him in estimating the worth of his shares.

Ajay Kapoor asked Manish Kothari to spell out his plans for the next 5 to 10 years, develop the forecast for financial performance and investment requirements, and indicate his target debt-equity ratio.

Manish Detergents is currently operating mainly in western India but it has definite plans to set up a unit in Hyderabad in the next two years to serve the southern market. This will require substantial investment in factory, godowns, and current assets. Since this investment will take some time to start yielding results, Manish expects a short-term dip in profits. However, once the southern venture takes off Manish is confident that profits will improve.

Taking into account the above, Manish Kothari has developed forecasts of operating profit and investment requirements which are given in [Exhibit 2](#). Beyond year 6 he expects that Manish Detergents will grow at a steady state of 10 percent and this will apply to its free cash flow as well.

## **Exhibit 2 | Financial Forecasts**

### **Part A : Forecasted Operating Profit**

	1	2	3	4	5	6
Revenues	950	1000	1200	1450	1660	1770
PBDIT	195	200	210	305	330	374
Depreciation	55	85	80	83	85	87
PBIT	140	115	130	222	245	287

### **Part B: Forecasted Investments**

	1	2	3	4	5	6
Gross investments in fixed assets	100	250	85	100	105	120
Investments in net current assets	10	15	70	70	70	54
Total	110	265	155	170	175	174

Manish Kothari is happy with the present debt-equity ratio of 0.4 :1.0 and plans to keep it that way.

Ajay Kapoor has come up with the following estimates:

- Tax rate : 35 percent
- Pre-tax cost of debt for Manish Detergents : 12 percent
- Risk free rate : 8 percent
- Market risk premium : 8 percent
- Beta for the equity of Manish detergent (using comparative analysis) : 1.06

*Required:*

1. Calculate the DCF value of the firm.
2. Calculate the value of the equity, assuming that the market value of debt is the same as its book value.
3. Discuss the important guidelines for corporate valuation.

## **MINICASE - II**

Sundaram Paints is a large privately held decorative paints company which has been in existence for nearly three decades. Founded by Shankar Sundaram, it is presently managed by Ravi Sundaram, the only son of the founder. Ravi Sundaram wants to

expand the business and take it global. For this the firm needs access to the capital market. So, Ravi has engaged the services of Integral Capital Services, a merchant banking firm.

Praveen Chopra, the CEO of Integral Capital Services, has entrusted you with the task of doing a preliminary valuation of Sundaram Paints. You have asked your analyst Pawan Kumar to gather relevant financial information on International Paints Company, Elegant Paints Limited, and Modern Paints Corporation (the three largest listed companies in the decorative paints industry) as well as on Sundaram Paints Limited.

Pawan Kumar assembled the following information for the just-ended financial year.

<i>Financial Information (in million)</i>	<i>International</i>	<i>Elegant</i>	<i>Modern</i>	<i>Sundaram</i>
Revenues	19600	15400	12750	10800
EBITDA	2840	2520	1675	1890
PAT	1588	1098	791	886
Shareholders' Funds	8750	7540	6260	4820
Loan Funds	5060	5150	4500	2880
Total Assets	13810	12690	10760	7700
Net Profit Margin	8.1%	7.1%	6.2%	8.2%
Debt-equity Ratio	57.8%	68.3%	71.9%	59.8%
Paid-up Equity Capital (Par value per share in all cases is 10)	2400	2000	1800	1440
Expected EPS growth (5 years)	14.0%	12.0%	10.2%	15.0%
Market price per share	96.8	68.4	43.2	
Beta	1.10	1.20	1.28	

Assume that the market value of debt is the same as its book value.

- (a) What is the Enterprise value/EBITDA of International, Elegant, and Modern?
- (b) What is the retrospective and prospective P/E ratio for International, Elegant, and Modern? Retrospective P/E ratio reflects the P/E ratio based on the immediately preceding financial year and prospective P/E ratio reflects the P/E based on the following year's expected earnings.
- (c) What factors do you think explain the differences in the valuation ratios of the three firms?
- (d) What will be your recommendation for the issue price if Sundaram Paint wants to raise 250 million by way of an IPO? Why?

## PRACTICAL ASSIGNMENT

Value the company chosen by you, using the DCF method. Make suitable assumptions for the same.

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<sup>1</sup> This represents cash and marketable securities in excess of the operational needs of the firm.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter32/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter32/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Value Based Management

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Discuss the Alcar approach to shareholder value creation.
- ✓ Assess the impact of a strategy on shareholder value.
- ✓ Calculate the EVA of a firm.
- ✓ Show how EVA is used for valuation, capital budgeting, and incentive compensation.
- ✓ Compute the total shareholder return, total business return, cash flow return on investment, and cash value added.

Creating value for shareholders is now widely accepted as the dominant corporate objective. The interest in value creation has been stimulated by several developments.

- Institutional investors, which traditionally were passive, have begun exerting influence on corporate managements to create value for shareholders.
- Many leading companies like General Electric, Coca Cola, Siemens, Hindustan Unilever, Reliance Industries, and Infosys Technologies which have accorded value creation a central place in their corporate planning serve as role model for others.
- Business press is emphasising shareholder value creation in performance rating exercises.
- Greater attention is now being paid to link top management compensation to shareholder returns.

To help firms create value for shareholders, value based management (VBM) approaches have been developed. VBM represents a synthesis of various business disciplines. From finance, VBM has adopted the goal of shareholder value maximisation and the discounted cash flow model; from business strategy, VBM has borrowed the notion that value creation stems

from exploiting opportunities based on the firm's comparative advantage; from accounting, VBM has adopted the structure of financial statements with some modification; finally, from organisational behaviour, VBM has borrowed the notion that 'you get what you measure and reward.'

### 33.1 ■ METHODS AND KEY PREMISES OF VBM

Several methods have been used in VBM. The three principal methods of VBM are:

- The free cash flow method proposed by McKinsey and LEK/Alcar group.
- The economic value added/market value added (EVA/MVA) method pioneered by Stern Stewart and Company.
- The cash flow return on investment/cash value added (CFROI/CVA) method developed by BCG and Holt Value Associates.

**Common Premises** Though these methods look outwardly different, the basic premises underlying them are the same. They are as follows:

- The value of any company (or its individual strategies and investments) is equal to the present value of the future cash flows the company is expected to produce.
- Conventional accounting earnings are not a sufficient indicator of value creation because they are not the same as cash flow, they do not reflect risk, they do not include an opportunity cost of capital, they do not consider time value of money, and they are not calculated the same way by all firms because of variations in accounting policy.
- For managing shareholder value, firms should use metrics that are linked to value creation and employ them consistently in all facets of financial management.
- A well designed performance measurement and incentive compensation system is essential to motivate employees to focus their attention on creating shareholder value.

**Key Difference** The key difference between these methods relates to VBM metrics. For example, the LEK/Alcar method uses shareholder value added (SVA), the Stern Stewart method emphasises EVA and MVA, and the BCG method focuses on CFROI and CVA.

Each camp argues that its measures are the best and cites supporting evidence for the same. It is difficult to objectively assess the validity of these claims.

While the different methods to VBM have their own fan clubs, the EVA/MVA method seems to have received more attention and gained more popularity.

## 33.2 ■ ALCAR APPROACH

The Alcar Group Inc.,<sup>1</sup> a management education and software company, developed an approach to VBM which is based on discounted cash flows analysis. The Alcar approach is described fully in the book *Creating Shareholder Value: A Guide for Managers and Investors* authored by Alfred Rappaport<sup>2</sup>, regarded by many as the father of shareholder value.

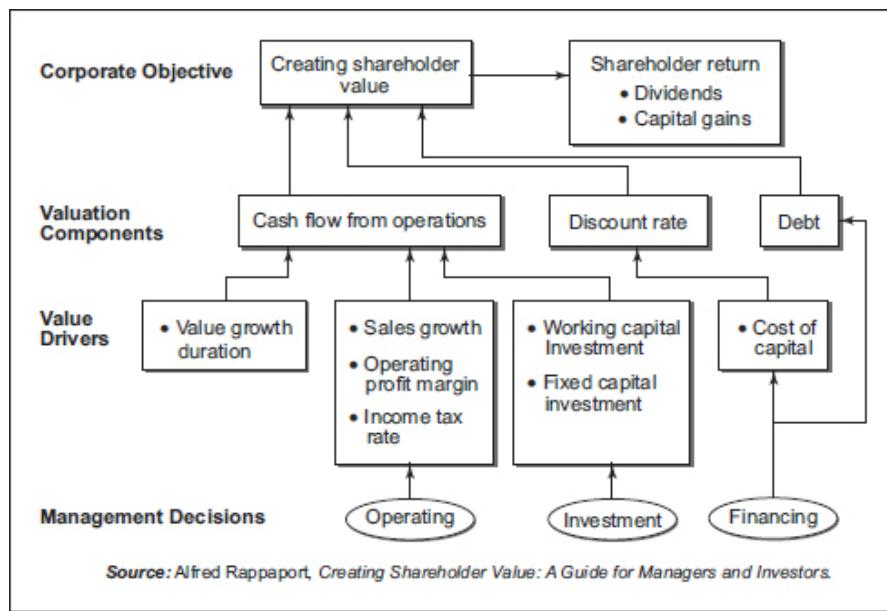
## Determinants of Shareholder Value

According to Rappaport, the following seven factors – he calls them “value drivers” – affect shareholder value:

- Rate of sales growth
- Operating profit margin
- Income tax rate
- Investment in working capital
- Fixed capital investment
- Cost of capital
- Value growth duration

While the first six “value drivers” are self-explanatory, the last one, viz., value growth duration, requires some explanation. It represents the period over which investments are expected to earn rates of return in excess of the cost of capital. It is an estimate reflecting the belief of management that competitive advantage will exist for a finite period. Thereafter, the competitive edge would be lost causing the rate of return to regress to the cost of capital. [Exhibit 33.1](#) represents the conceptual framework of the Alcar approach.

**Exhibit 33.1 Shareholder Value Creation Network**



## **Assessment of the Shareholder Value Impact of the Business Unit (Strategy)**

The procedure suggested by the Alcar approach for assessing the shareholder impact of a strategy involves the following steps:

<i>Steps</i>	<i>Elaboration</i>
1. Forecast the operating cash flow stream for the business unit (strategy) over the planning period.	The annual operating cash flow is defined as: Cash inflow [(Sales) (Operating profit margin) (1-Effective tax rate)] – Cash outflow [Fixed capital investment + Working capital investment]
2. Discount the forecasted operating cash flow stream using the weighted average cost of capital.	The weighted average cost of capital is: (Post-tax cost of debt) (Market value weight of debt)+(Post-tax cost of equity)(Market value weight of equity)
3. Estimate the residual value of the business unit (strategy) at the end of the planning period and find its present value.	The residual value is: $\frac{\text{Perpetuity cash flow}}{\text{Cost of capital}}$
4. Determine the total shareholder value.	The total shareholder value is: Present value of the operating cash flow stream + Present value of the residual value – Market value of the debt
5. Establish the pre-strategy value.	The pre-strategy value is: $\frac{\text{Cash flow before new investment}}{\text{Cost of capital}}$ – Market value of the debt
6. Infer the value created by the strategy.	The value created by the strategy is: Total shareholder value

## Pre-strategy value

The above procedure may be illustrated with the help of an example. The income statement for year 0 (the year which has just ended) and the balance sheet at the end of year 0 for Ventura Limited are as shown in the first column of [Exhibit 33.2](#).

Ventura Limited is debating whether it should maintain the *status quo* or adopt a new strategy. If it maintains the status quo:

- The sales will remain constant at 1,000.
- The gross margin and selling, general, and administrative expenses will remain unchanged at 25 percent and 10 percent respectively.
- Depreciation charges will be equal to new investments.
- The asset turnover ratios will remain constant.
- The discount rate will be 16 percent.
- The income tax rate will be 40 percent.

If Ventura Limited adopts a new strategy its sales will grow at a rate of 10 percent per year for five years. The margins, the turnover ratios, the capital structure, the income tax rate, and the discount rate, however, will remain unchanged. Depreciation charges will be equal to 10 percent of the net fixed assets at the beginning of the year.

What value will the new strategy create? As computed in [Exhibit 33.2](#), the value created by the new strategy is 58.

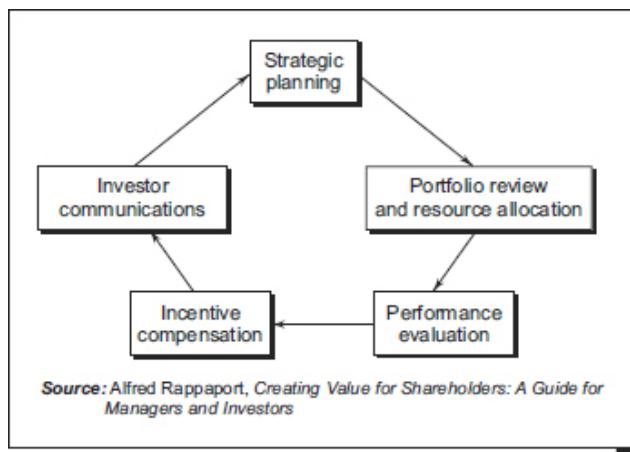
## **Exhibit 33.2** Determination of the Value Created by a New Strategy

	Current Values (year 0)	Income Statement Projections					Residual Value 5+
		1	2	3	4	5	
Sales	1000	1100	1210	1331	1464	1611	1611
Gross margin (25%)	250	275	303	333	366	403	403
S & G.A. (10%)	100	110	121	133	146	161	161
Profit before tax	150	165	182	200	220	242	242
Tax	60	66	73	80	88	97	97
Net profit	90	99	109	120	132	145	145
<i>Balance Sheet Projections</i>							
Fixed assets	300	330	363	399	439	483	483
Current assets	200	220	242	266	293	322	322
Total assets	500	550	605	665	732	805	805
Equity	500	550	605	665	732	805	805
<i>Cash Flow Projections</i>							
Profit after tax		99	109	120	132	145	145
Depreciation		30	33	36	40	44	48
Capital expenditure		60	66	73	80	88	48
Increase in current assets		20	22	24	27	29	0
Operating cash flow		49	54	59	65	72	145
Present value factor (at 16% discount)		0.862	0.743	0.641	0.552	0.476	
Present value of the operating cash flow		42	40	38	36	34	
Present value of the operating cash flow stream		= 190					
Residual value		= $145/0.16 = 906$					
Present value of the residual value		= $(0.476)906 = 431$					
Total shareholder value		= $190 + 431 - 0 = 621$					
Pre-strategy value		= $90/0.16 = 563$					
Value of the strategy		= $621 - 563 = 58$					

## Shareholder Value Management Cycle

A successful implementation of shareholder value management means that the firm: (i) selects a strategy that maximises the expected shareholder value, (ii) finds the highest valued use for all assets, (iii) bases performance evaluation and incentive compensation on shareholder value added, and (iv) returns cash to shareholders when value creating investments do not exist. [Exhibit 33.3](#) depicts the shareholder value management cycle.

**Exhibit 33.3 Shareholder Value Management Cycle**



### 33.3 ■ STERN STEWART APPROACH (EVA® APPROACH)<sup>3</sup>

Originally proposed by the consulting firm Stern Stewart & Co, Economic Value Added (EVA) is currently a very popular idea. Fortune magazine has called it “today’s hottest financial idea and getting hotter” and management guru Peter Drucker referred to it as a measure of total factor productivity. Companies across a broad spectrum of industries and across a wide range of countries have joined the EVA bandwagon.

EVA is essentially the surplus left after making an appropriate charge for the capital employed in the business. It may be calculated in any of the following, apparently different but essentially equivalent, ways:

$$\text{EVA} = \text{NOPAT} - \text{WACC} \times \text{CAPITAL} \quad (33.1)$$

$$\text{EVA} = \text{CAPITAL} (\text{ROC} - \text{WACC}) \quad (33.2)$$

$$\text{EVA} = [\text{PAT} + \text{INT} (1 - t)] - \text{WACC} \times \text{CAPITAL} \quad (33.3)$$

$$\text{EVA} = \text{PAT} - \text{COE} \times \text{EQUITY} \quad (33.4)$$

where EVA is the economic value added, NOPAT is the net operating profit after tax, WACC is the weighted average cost of capital, CAPITAL is the economic book value of the capital employed in the firm, ROC is the return on capital (NOPAT/CAPITAL), PAT is the profit after tax, INT is the interest expense of the firm,  $t$  is the marginal tax rate of the firm, COE is the cost of equity, and EQUITY is the equity employed in the firm.

To illustrate the calculation of EVA using the above formulae let us look at the balance sheet and profit and loss account of Melvin Corporation given in [Exhibit 33.4](#).

Melvin's cost of equity is 18 percent. The interest rate on its debt is 12 percent which, given a marginal tax rate of 30 percent, translates to a post tax cost of debt of 8.4 percent. Since Melvin employs debt and equity in equal proportions, its weighted average cost of capital is:  $0.5 \times 18.0 + 0.5 \times 8.4 = 13.2$  percent.

Melvin's NOPAT is: PBIT (1 – Tax rate) =  $42(1-0.3) = ₹ 29.4$  million. Given a CAPITAL of ₹ 200 million, Melvin's return on capital works out to  $29.4/200 = 0.147$  or 14.7 percent.

Based on the above information, Melvin's EVA may be computed in four different, yet equivalent, ways:

$$EVA = NOPAT - WACC \times CAPITAL$$

$$= 29.4 - 0.132 \times 200 = ₹ 3 \text{ million}$$

$$EVA = (ROC - WACC) \times INVESTED\ CAPITAL$$

$$= (0.147 - 0.132) \times 200 = ₹ 3 \text{ million}$$

$$EVA = [PAT + INT(1 - 0.3)] - WACC \times CAPITAL$$

$$= [21 + 12(1 - 0.3)] - 0.132 \times 200 = ₹ 3 \text{ million}$$

$$EVA = PAT - COE \times EQUITY$$

$$= 21 - 0.18 \times 100 = ₹ 3 \text{ million}$$

**Exhibit 33.4 Balance Sheet and Profit and Loss Account of Melvin Corporation**

Balance Sheet as on 31.3.20X0			Profit and Loss Statement for the Year Ending on 31.03.20X0		
Liabilities		Assets		(₹ in million)	
Equity	100	Fixed assets	140	Net sales	300
Debt	100	Net current assets	60	Cost of goods sold	258
	200		200	PBIT	42
				Interest	12
				PBT	30
				Tax (30%)	9
				PAT	21

## **What Causes EVA to Increase**

From the above analysis it is clear that EVA will rise if operating efficiency is improved, if value adding investments are made, if uneconomic activities are curtailed, and if the weighted average cost of capital is lowered. In more specific terms, EVA rises when:

- The rate of return on existing capital increases because of improvement in operating performance. This means that operating profit increases without infusion of additional capital in the business.
- Additional capital is invested in projects that earn a rate of return greater than the cost of capital.
- Capital is withdrawn from activities which earn inadequate returns.
- The weighted average cost of capital is lowered by altering the financing strategy.

## Market Value Added

The market value added (MVA) is the difference between the market value of a firm and the capital employed by the firm. For example, if the market value of a firm (the sum of the market value of its equity and debt) is 12,000 and its economic book value of capital is 10,000, the MVA is 2,000.

Conceptually, MVA is the present value of all the future EVAs;

$$MVA = \frac{EVA_1}{(1+WACC)^1} + \frac{EVA_2}{(1+WACC)^2} + \dots \quad (33.5)$$

It should be emphasised that MVA is a **stock measure**, whereas EVA is a **flow measure**.

## **Measuring NOPAT and CAPITAL: Adjusting for the Distortions of GAAP**

As we have seen, EVA is a function of net operating profit after tax (NOPAT), capital employed in the business (CAPITAL), and weighted average cost of capital (WACC). While WACC is measured as discussed in [Chapter 14](#), the measurement of NOPAT and CAPITAL calls for adjusting for the distortions of GAAP.

The gap between GAAP- based accounting information and economic reality stems from the extreme conservatism characterising accounting practice.

To calculate EVA that is a reliable guide to value creation, several adjustments are required to accounting earnings and accounting book value. The purpose of these adjustments is to derive a NOPAT figure that reflects economic performance and a CAPITAL figure that measures the capital contributed by shareholders and lenders.

Stern Stewart have identified more than 160 potential adjustments. These relate to things like intangible assets, strategic investments, market promotion outlays, goodwill, timing of expense and revenue recognition, off-balance sheet financing, passive investments in marketable securities, restructuring charges, bad debt recognition, inventory valuation, foreign currency translation, depreciation, taxes, and non-interest bearing liabilities.

In most real life situations, however, about 10 adjustments suffice. The more important ones tend to relate to the following.

**Research and Development** Outlays on R&D are truly investments in future products and processes. Yet GAAP require companies to expense (deduct from earnings) these outlays, as if they have no valuable payoff in future. Clearly, this is a very unrealistic treatment and it calls for correction.

For EVA purposes, the R&D outlays are capitalised (treated as assets on the balance sheet) and amortised (written off) over a period of time that represents the useful life of R&D. Stern Stewart normally use an amortisation period of five years.

**Goodwill** Under GAAP, goodwill is amortised over a period of time. Under the EVA system, goodwill is regarded as an intangible asset, which does not erode in value over time – perhaps its value increases over time. So, the periodic amortisation of goodwill is added to NOPAT and the cumulative goodwill amortisation is added to equity.

**Strategic Investments** Normally, under the EVA system the capital charge on an investment is deducted from the time the outlay is made - this injects the required discipline in investment decision making. Hence, managers may be reluctant to propose a strategic investment that has a gestation period of a few years. During this period, the investment does not produce any returns but carries a capital charge, thereby adversely affecting the EVA.

To check such managerial myopia, strategic investments are treated differently. Outlays on a strategic investment are held back in a suspense account. Capital charges on the balance in the suspense account are left out from the EVA calculation till the time the investment is expected to generate operating profits. In the meanwhile, capital charges are added to the suspense account so that the balance in that account reflects the full opportunity cost (original investment plus capital charges thereon) of the investment.

**Expense Recognition** Many companies incur substantial marketing costs to establish brands, enter new markets, expand customer base, and gain market share. Under GAAP, such outlays are normally treated as current period expenses though they are expected to generate benefits over a long period of time. Under the EVA system, these outlays are capitalised and amortised over an appropriate period.

**Depreciation** Often the straight line method of depreciation used in GAAP works reasonably well. However, for significant amounts of long-lived assets, the use of straight-line method of depreciation in calculating EVA can strongly bias against new investments. Why? Under the EVA system, the capital charge declines as the book value of the assets decreases on account of depreciation. Hence managers would be reluctant to replace 'cheap' old assets with 'expensive' new assets.

How can the distortion caused by the straight line method of depreciation be eliminated or mitigated? One solution is to replace straight line depreciation with sinking fund depreciation. Under the sinking fund method, the annual depreciation charge is small initially but rises over the life of the asset. It behaves like the principal payment in a mortgage. If the sinking fund method of depreciation is used, the sum of the depreciation charge and the EVA capital charge remains constant over time, exactly like the mortgage payment. [Exhibit 33.5](#) shows how the depreciation charge and capital charge are calculated under the straight line method and the sinking fund method for an equipment that costs 100,000 and has an

economic life of 5 years. It is assumed that the cost of capital is 15 percent and the salvage value is nil.

### Exhibit 33.5 Depreciation Charge and Capital Charge under Alternative Methods

Panel A : Straight Line Method					
	1	2	3	4	5
Capital	100000	80000	60000	40000	20000
Depreciation	20000	20000	20000	20000	20000
Capital charge	15000	12000	9000	6000	3000
Sum	35000	32000	29000	26000	23000
Panel B : Sinking Fund Method					
	1	2	3	4	5
Capital	100000	85167	68109	48492	25933
Depreciation	14833	17058	19617	22560	25933
Capital charge	15000	12775	10216	7273	3890
Sum	29833	29833	29833	29833	29823

**Restructuring Charges** Under GAAP, a restructuring charge is treated as a loss on an investment that has turned sour. Such a charge naturally leads to reduction in reported earnings and hence managers tend to postpone restructuring. Under the EVA system, however, a restructuring opportunity is welcomed as it facilitates a more productive deployment of capital.

To contrast how restructuring is treated under GAAP and under the EVA system, consider the case of Apex Limited which has a ₹ 100 million factory that produces nil operating profits. The firm's cost of capital is 12 percent. Under GAAP, the factory breaks even, but under the EVA system the factory has a negative EVA of ₹ 12 million. Apex can sell the factory for ₹ 60 million and distribute the proceeds as dividends to shareholders. If it does so, Apex's earnings diminish by ₹ 40 million under GAAP. The balance sheet total declines by ₹ 100 million as the factory is sold and ₹ 60 million is paid as dividends to shareholders. Concerned about the decline in earnings, managers would not sell the factory. They would not like to take a hit of ₹ 40 million in earnings, reduce the asset base by ₹ 100 million, and shrink operations as long as they continue to break even under GAAP.

Now look at the same situation under the EVA system. Apex removes ₹ 100 million of assets from its books. Instead of making a ₹ 40 million charge to its income statement, Apex adds a ₹ 40 million restructuring investment to its balance sheet. Capital declines not by ₹ 100 million but by ₹ 60

million, the amount paid to shareholders from the proceeds of the factory. What happens to EVA? EVA rises from minus 12 million to minus 4.8 million, since the capital charge drops from ₹ 12 million to ₹ 4.8 million. A manager whose bonus is linked to EVA changes would plump for the restructuring option.

**Taxes** Companies typically use an accelerated method of depreciation (like the written down value method) for computing profits for tax purposes and a slower method (straight line method) for shareholder reporting purposes. Hence the provision for income taxes used in GAAP earnings statement (referred to commonly as book taxes) differs from the cash taxes a company actually pays. Note that book values refer to what a company would owe in taxes if it used GAAP earnings on its tax return.

The difference between book taxes and cash taxes goes into a liability account called deferred taxes which are presumably payable in future, but rarely if ever paid. Since what matters is the tax the company pays, only cash taxes must be deducted to calculate NOPAT and deferred tax may be regarded as quasi-equity.

**Leasing** EVA capitalises leased assets. In other words, it treats leased assets as if they are owned. This neutralises comparison, irrespective of the mix of leased or own assets employed by the firm.

**Marketable Securities** Companies often hold marketable securities. Since these do not represent capital used for generating operating profit, the investment in them should be excluded from the capital employed in the firm. Likewise the income from these investments should not be included in NOPAT.

The proponents of EVA argue that it is an excellent bedrock on which an integrated financial management system can be constructed, as it has the following features or characteristics.

- It is a performance measure that ties directly, theoretically as well as empirically, to shareholder wealth creation.
- It converts accounting information into economic reality that is readily grasped by non-financial managers. It is a simple yet effective way of teaching business literacy to everyone.
- It serves as a guide to every decision from strategic planning to capital budgeting to acquisitions to operating decisions.
- As the basis for incentive compensation, it truly aligns the interest of managers with that of shareholders and makes managers think and

act like owners.

- It is an effective tool for investor communication.
- It serves as an anchor for an internal system of corporate governance that motivates everyone to work co-operatively and enthusiastically to achieve the best attainable performance.

## EVA and Capital Budgeting

The standard method used by companies for evaluating capital investments is the discounted cash flow (DCF) method which calls for evaluating a project on the basis of its NPV which is defined as:

$$NPV = \sum_{t=0}^n \frac{\text{Cash flow}_t}{(1 + \text{Discount rate})^t} \quad (33.6)$$

The NPV of a project using the EVA approach is defined as:

$$NPV = \sum_{t=1}^n \frac{EVA_t}{(1 + \text{Discount rate})^t} \quad (33.6)$$

Since the DCF method and the EVA method tie directly to shareholder wealth creation, the NPV of a project whether you use the DCF method or the EVA method must be the same. Indeed, this is so. This point is demonstrated by the example given in [Exhibit 33.6](#).

While the DCF and EVA methods come up with the same value of NPV, the EVA method seems to have certain advantages over the DCF method: (i) The EVA method generates a meaningful year to year performance measure whereas the DCF method doesn't do so because the original DCF analysis is divorced from everything else in the financial management system. (ii) The EVA method provides a useful basis for incentive compensation, whereas the DCF method does not. (iii) The EVA calculation is based on earnings and, hence, operating managers grasp it easily.

## EVA and Incentive Compensation

The purpose of an incentive compensation plan (bonus plan) is to motivate employees to work harder and smarter so that the organisational performance is maximised. Unfortunately, the incentive compensation plans used by most companies fail to accomplish these objectives. These plans induce managers to be more conservative than the shareholders; they diminish incentive and motivation by paying too little for outstanding performance or too much for inferior performance; they encourage managers to negotiate easily achievable targets, by ‘gaming’ the system; finally, they give managers an additional incentive to lower performance when there are signs that the actual performance may turn out to be significantly higher than the unambitious targets.

The centre piece of the EVA financial management system is a unique bonus plan that overcomes these limitations and aligns the interest of managers with that of shareholders. The key elements of the EVA bonus plan are:

- Bonus is linked to increases in EVA
- There is no floor or ceiling on the bonus
- The target bonus is generous
- Performance targets are set by formula, not negotiation
- A bonus bank is established.

**Bonus is Linked to Increases in EVA** If bonus is linked to increases in EVA, managers think and act like owners. They will enhance operating efficiency, make profitable investments, withdraw unproductive capital, and select financing strategies to reduce cost of capital. The particular EVA which determines the bonus, of course, will depend on the manager in question. For top management, the overall company EVA is the appropriate measure; for operating managers, the EVA of their area of responsibility is more relevant.

**There is No Floor or Ceiling on the Bonus** Under the traditional bonus plan, a target bonus is paid if the manager achieves budgeted profit. If the profit falls below the budgeted profit, the bonus declines but is subject to a floor of zero; if the profit rises above the budgeted profit, the bonus rises but is subject to a ceiling. [Exhibit 33.7 A](#) represents the traditional bonus plan. From this exhibit it is clear that the traditional bonus plan provides incentive only in a narrow range of outcomes. If the manager

knows that the profit for the year is likely to be less than 80 percent or more than 120 percent of the budgeted profit, he will have an incentive to lower performance.

### Exhibit 33.6 Capital Budgeting: DCF Method and EVA Method

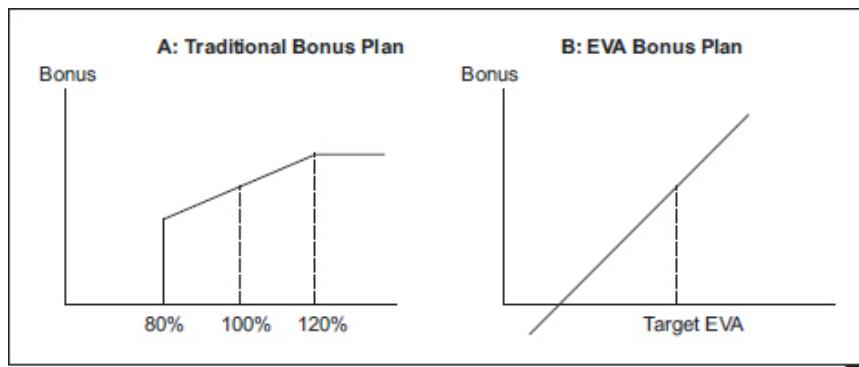
Part A : Project Details				
Investment :	100	Equity financing :	100	
Project life :	4 years	Depreciation :	Straight line	
Salvage value :	Nil	Tax rate :	50%	
Annual revenues	200	Annual costs :	135	
Cost of equity :	15%	(excluding depreciation, interest, and taxes)		
Part B : Cash Flow and EVA Projections				
	Year 1	Year 2	Year 3	Year 4
■ Revenues	200	200	200	200
■ Costs (excluding dep, interest, and taxes)	135	135	135	135
■ PBDIT	65	65	65	65
■ Depreciation	25	25	25	25
■ PBIT	40	40	40	40
■ NOPAT	20	20	20	20
■ Cash flow (NOPAT + Depreciation)	45	45	45	45
■ Capital at charge (Investment – Accumulated depreciation)	100	75	50	25
■ Capital charge	15	11.25	7.5	3.75
■ EVA (NOPAT – Capital charge)	5	8.75	12.5	16.25
Part C : NPV Calculation				
NPV = $\sum_{t=1}^n \frac{CF_t}{(1+k)^t} - I = \sum_{t=1}^n \frac{45}{(1.15)^t} - 100 = 28.475$				
NPV = $\sum_{t=1}^n \frac{EVA_t}{(1+k)^t} = \frac{5}{(1.15)} + \frac{8.75}{(1.15)^2} + \frac{12.5}{(1.15)^3} + \frac{16.25}{(1.15)^4} = 28.475$				

In the EVA bonus plan there is no floor or ceiling as shown in [Exhibit 33.7 B](#). Managers get a share of EVA improvement without limit, but the bonus can be negative as well. Hence, they have an incentive to maximise performance.

**The Target Bonus is Generous** The target bonus under the EVA bonus plan is more generous than that under the traditional bonus plan for

two good reasons. First, the EVA bonus plan is inherently more risky (as there is a potential for negative bonus) and hence it has to offer a higher target bonus. Second, a good incentive plan calls for increasing the proportion of variable compensation in total compensation.

### Exhibit 33.7 Bonus Behaviour



### Performance Targets Are Set by Formula, not Negotiation

Under the EVA bonus plan, managers earn their target bonus when they achieve the target level of EVA. This is similar to a conventional bonus plan. However, there is a crucial difference. Under the conventional bonus plan, the performance target is based on annual negotiation (which is characterised by a lot of gaming), whereas under the EVA bonus plan the EVA target is set and revised from year to year in accordance with a well thought out formula that is determined in advance. The **adaptive expectation model** given below is one such formula:

$$\text{Target EVA } (t+1) = \text{Target EVA } (t) + b [\text{Actual EVA}(t) - \text{Target EVA}(t)]$$

In this model  $b$  may be set between 0 and 1, say at 0.6.

One can even abandon the concept of an EVA target and base the bonus as a percent of the annual change in EVA and a percent of the level of EVA (but only if EVA is positive) as suggested by David Glassman. His bonus formula is:

$$\text{Bonus} = a_1 \% \times \text{Change in EVA} + a_2 \% \times \text{EVA}$$

In this formula,  $a_2 = 0$  if EVA is negative. Further  $a_1 > a_2$  to provide a powerful incentive for performance improvement and a strong penalty for performance decline. Under extraordinary circumstances like a windfall change in business conditions and/or a wellspring change in business strategy the company may override the formula.

**A Bonus Bank is Established** Under a bonus bank system the bonus earned for a year is added to the bonus bank and the bonus paid for the year is a fixed ratio of the cumulative balance in the bonus bank. [Exhibit 33.8](#) shows how this system works.

The idea of a bonus bank is to (a) moderate large swings in bonus payment, (b) ensure that managers get bonuses for sustained improvements in EVA, and (c) extend the time horizon of managerial decision making.

**Exhibit 33.8** **Bonus Bank System**

	<i>Normal year</i>	<i>Good year</i>	<i>Bad year</i>
Bonus earned	50	200	-100
Beginning bank	100	100	200
Cumulative balance	150	300	100
Payout ratio	1/3	1/3	1/3
Bonus paid	50	100	33.33
Bonus forward	100	200	66.67

## **Implementing the EVA System**

Implementing the EVA system involves several steps which are briefly described below:

**Develop Top Management Commitment** A crucial requirement of the EVA system is top management commitment. To build this commitment, the top management should be thoroughly grounded in the theory and practice of EVA.

**Customise the Definitions of EVA** A cross functional team of executives should arrive at a customised definition of EVA – in terms of NOPAT, CAPITAL, and EVA calculation – that is best suited to the firm considering its informational needs and accounting system.

**Identify EVA Centres** A firm may be divided into EVA centres – these are responsibility centres for which individual EVAs will be calculated on a continuing basis.

**Analyse the Drivers of EVA** EVA must be linked to various financial and non-financial variables which drive it. An understanding of these drivers helps managers to appreciate how their actions influence value.

**Tailor an Incentive Compensation System** The incentive compensation system must align the interest of managers with shareholders. Ideally, it should make managers think, act, and be compensated like owners.

**Train All the Employees** The employees at all levels of the organisation must be trained in the basics of EVA. They must know how EVA is calculated, what EVA means, and how their actions impact on EVA.

### **EVA Plan in the Godrej Group**

Godrej group instituted the EVA performance management framework in early 2000s in six of its key businesses: Godrej Agrovet, Godrej Consumer Products, Godrej Industries, Godrej Properties, Godrej Sara Lee, and Godrej Foods. What they tried to do, how they went about, and what their experience was, are described below briefly.

*Major Goals:* The major goals of the EVA plan were to improve capital efficiency and overall performance, encourage owner-like behaviour, and reduce the possibility of ‘gaming’ the system.

**Key Elements:** The key elements of the EVA plan have been EVA improvement targets and EVA-based incentive plan. "Stretch" EVA improvement targets have been derived on the basis of forward-looking expectations embedded in the market value of the businesses.

An EVA-based incentive plan with the classic Stern Stewart architecture has been introduced. The plan effectively links rewards for each of the businesses to their cumulative three-year EVA improvement targets; the plan has no caps or floors on bonuses; and the plan provides for a bonus "bank" to ensure that performance improvements are sustained in future.

**Key Challenge:** A major challenge was to obtain the buy in of key managers and employees and overcome their initial skepticism and fear, especially about longer-horizon stretch targets and bonus banking. This issue was tackled by spending a lot of effort on communication at various levels and ensuring that this was regarded as a business initiative, rather than a human resources or finance initiative.

**Experience:** By and large, Adi Godrej, the chairman of the Godrej group, believes that the EVA plan has brought about significant improvements in overall business performance, capital efficiency, and market share. It has discouraged managerial practices such as hockey-stick forecasts, trade loading, and inefficient use of capital. As Adi Godrej put it: "And because our EVA performance targets are completely divorced from the budgets, we have found that we now have more informative and productive annual budgeting conversations".

**Fine Tuning:** While the EVA plan in general was received well, some of the businesses have had negative bonus declarations. Perhaps even the EVA plan doesn't always distinguish between the effects of management and luck.

As Adi Godrej put it: "In hindsight, we may have been too aggressive both in setting the stretch targets for some of our businesses and in making the pay-for-performance profile too steep." Based on this experience, Godrej is fine-tuning the scheme to achieve a better fit with the Godrej group in particular and Indian conditions in general.

\*This write-up is based on a discussion with Adi Godrej, reported in an article titled "Creating Value at a Conglomerate: A Case of the Godrej Group," which appeared in the Winter 2004 issue of *Journal of Applied Corporate Finance*.

### **33.4 ■ BCG APPROACH**

Boston Consulting Group (BCG), an international consulting organisation, has developed an approach to shareholder value management that builds on the pioneering work of their specialist group HOLT Value Associates.

Two concepts are at the foundation of the BCG approach: total shareholder return and total business return. For applying these concepts, two performance metrics are used: cash flow return on investment and cash value added.

## Total Shareholder Return

The total shareholder return (TSR) is the rate of return shareholders earn from owning a company's stock over a period of time.

The TSR for a single holding period is computed as follows:

$$\text{TSR} = \left( \frac{\text{Dividend}}{\text{Beginning market value}} + \frac{\text{Ending market value} - \text{Beginning market value}}{\text{Beginning market value}} \right)$$

The TSR for a multiple holding period is computed using the conventional internal rate of return computation:

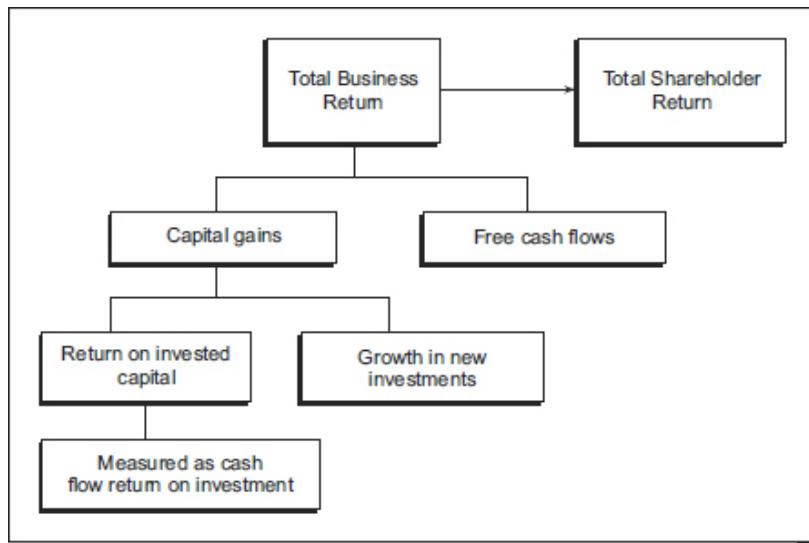
$$\begin{aligned} \text{Beginning market value} &= \frac{\text{Dividend}_1}{(1 + \text{TSR})^1} + \frac{\text{Dividend}_2}{(1 + \text{TSR})^2} + \frac{\text{Dividend}_3}{(1 + \text{TSR})^3} + \dots \\ &\quad + \frac{\text{Ending market value in year } n}{(1 + \text{TSR})^n} \end{aligned}$$

There are several reasons why BCG regards TSR as the most useful measure of value creation: (i) TSR is comprehensive as it includes dividends as well as capital gains. (ii) TSR is widely used by the investment community and also required by the Securities Exchange Commission.<sup>4</sup> (iii) TSR can be easily benchmarked against the market or peer groups. (iv) TSR is not biased by size. (v) TSR is difficult to manipulate.

## Total Business Return

If TSR is what matters to investors, an internal counterpart to it is needed for managerial purposes. For BCG, the total business return (TBR) is the internal counterpart of TSR. The link between TSR, TBR, and value drivers is shown in [Exhibit 33.9](#).

**Exhibit 33.9** TSR, TBR and the Value Drivers



The TBR for a single holding period is computed as follows:

$$TBR = \left( \frac{\text{Free cash flow}}{\text{Beginning value}} \right) + \left( \frac{\text{Ending value} - \text{Beginning value}}{\text{Beginning value}} \right)$$

The TBR for a multiple holding period is measured using the conventional internal rate of return computation:

$$\begin{aligned} \text{Beginning value} &= \frac{\text{Free cash flow}_1}{(1 + TBR)} + \frac{\text{Free cash flow}_2}{(1 + TBR)^2} + \dots \\ &\quad + \frac{\text{Free cash flow}_n}{(1 + TBR)^n} + \frac{\text{Ending value in year } n}{(1 + TBR)^n} \end{aligned}$$

The beginning and ending values are estimates of market values of the firm or business unit at the beginning and end of the period. They are estimated using one or more of the following:

- Value = Earnings × P/E multiple
- Value = Book value × M/B multiple
- Value = Free cash flow ÷ cost of capital
- Value = NPV of expected cash flow

BCG calculates TBR using a *time fade model* which assumes that a firm's return on invested capital and its growth rate will fade over time toward a national average due to competitive pressures. Bartley Madden of HOLT Value Associates explains as follows: "When businesses succeed in achieving above-average returns, competitors are attracted by above-average returns and try to serve the customer ever more effectively. The competitive process tends to force high-CFROI firms toward the average. Businesses earning CFROIs below the cost of capital are eventually compelled to restructure and / or downsize in order to earn at least the cost of capital, or eventually they cease operations."

*Inter alia*, BCG uses the TBR for strategic planning, resource allocation, and incentive compensation.

**Strategic Planning** Strategic planning involves choosing strategies and plans that create value. Alternative strategies and plans must be evaluated in terms of their TBR. This is the only measure that accurately reflects the tradeoffs among profitability, growth, and cash flows, the three drivers of value.

**Resource Allocation** In multi-business firms, resource allocation has a critical bearing on value creation. Resource allocation decisions should be based on the track record of various businesses and the promise of their strategic plans. BCG employs a perspective, depicted in [Exhibit 33.10](#), to guide resource allocation decisions.

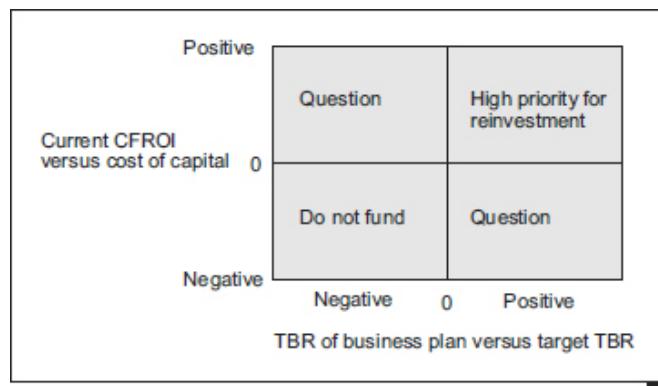
**Incentive Compensation** A well-founded incentive compensation system aligns the interest of managers with that of shareholders and promotes value creation. The TBR measure can be used for incentive compensation in two ways. First, TBR can be used as a comprehensive measure of value creation over a multi-year horizon (three to five years). Second, TBR can be employed as the basis for setting annual targets for traditional performance measures.

## Cash Flow Return on Investment (CFROI)

The TBR incorporates the returns (CFROIs) both for the assets in place and the assets to be created. Thus CFROI has an important bearing on TBR.

What is CFROI and how is it measured? BCG defines CFROI as “the sustainable cash flow a business generates in a given year as a percentage of the cash invested in the firm’s assets”. Sustainable cash flow is gross cash flow less economic depreciation.

### Exhibit 33.10 Resource Allocation Perspective



Thus,

$$\text{CFROI} = \frac{\text{Cash flow} - \text{Economic depreciation}}{\text{Cash invested}}$$

Note that economic depreciation is the amount of annual sinking fund payment earning cost of capital required to replace assets<sup>5</sup>.

To illustrate the calculation of CFROI, let us consider an example. A new plant entails an initial investment of ₹ 300,000, ₹ 250,000 toward fixed assets and the balance toward net working capital. The plant has an economic life of 14 years.

At the end of 14 years, fixed assets will fetch nothing but net working capital will be recovered in full. The annual depreciation charge on fixed assets will be ₹ 250,000/14 = ₹ 17,857. The plant is expected to produce a NOPAT of ₹ 21,080 each year. The cost of capital is 10 percent. It will cost ₹ 250,000 to replace the fixed assets.

[Exhibit 33.11](#) shows the CFROI of the project for three sample years, assuming that the actual performance is in line with forecast performance. It also shows two other return measures popularly used, viz.:

$$\text{Return on capital employed (ROCE)} = \frac{\text{NOPAT}}{\text{Book capital}}$$

$$\text{Return on gross investment (ROGI)} = \frac{\text{Cash flow}}{\text{Cash invested}}$$

**Exhibit 33.11 Annual Measurement of the Project in Three Sample Years**

	Year 1	Year 6	Year 12
1. NOPAT	21,080	21,080	21,080
2. Depreciation	17,857	17,857	17,857
3. Cash flow (1 + 2)	38,937	38,937	38,937
4. Economic depreciation	8,937	8,937	8,937
5. Sustainable cash flow (3 – 4)	30,000	30,000	30,000
6. Book capital (Beginning)	300,000	210,715	103,573
7. CFROI (%)	10.00	10.00	10.00
8. ROCE (%)	7.03	10.00	20.35
9. ROGI (%)	12.98	12.98	12.98

How accurate are the various measures of return? To judge the accuracy of these measures, they may be compared with the internal rate of return (IRR), the measure most commonly employed to assess investment projects. The IRR for the project is the value of  $r$  in the following equation.

$$300,000 = \frac{38,937}{(1+r)} + \frac{38,937}{(1+r)^2} + \dots + \frac{38,937 + 50,000}{(1+r)^{14}}$$

$r$  works out to 10 percent.

Comparing the three measures with IRR we find that:

- ROCE understates IRR in the initial years and overstates IRR in the later years. ROCE shows a rising trend over time, though the project is a constant cost-of-capital performer.
- Unlike ROCE, ROGI does not show a rising trend. However, it has a constant upward bias of about 3 percent as it does not take into account what must be withheld to replace the asset at the end of its economic life.
- CFROI equals IRR throughout. It takes into account the replacement need and provides the correct signal each year.

## Cash Value Added (CVA)

The CFROI is the key metric used by BCG for measuring performance and valuing a company. However, BCG has also developed a measure of economic profit: cash value added (CVA). BCG claims that CVA is superior to EVA because it removes the accounting distortion that may bias EVA.

CVA is measured as operating cash flow less economic depreciation less a capital charge on gross investment. Thus,

$$CVA = \text{Operating cash flow} - \frac{\text{Economic depreciation}}{\text{Investment}}$$

[Exhibit 33.12](#) shows the EVA and CVA for the new plant example.

Looking at [Exhibit 33.12](#) we find that while EVA rises over time – from minus 8,920 for year 1 to plus 10,723 for year 12 - CVA is zero for each year and this reflects properly the economic performance of the plant. Remember that this plant earns a rate of return that just equals the cost of capital. Hence it neither generates value nor destroys value.

### Exhibit 33.12 EVA and CVA Calculation

Panel A : EVA (₹)			
	Year 1	Year 6	Year 12
1. NOPAT	21,080	21,080	21,080
2. Book capital	300,000	210,715	103,573
3. Cost of capital	10%	10%	10%
4. Capital charge	30,000	21,072	10,357
EVA (1-4)	(8,920)	8	10,723

Panel B : CVA			
	Year 1	Year 6	Year 12
1. NOPAT	21,080	21,080	21,080
2. Depreciation	17,857	17,857	17,857
3. Cash flow	38,937	38,937	38,937
4. Economic depreciation	8,937	8,937	8,937
5. Cash invested	300,000	300,000	300,000
6. Cost of capital	10%	10%	10%
7. Capital charge	30,000	30,000	30,000
CVA = (3 - 4 - 7)	0	0	0

### 33.5 ■ LESSONS FROM THE EXPERIENCES OF VBM ADOPTERS

A number of companies have joined the VBM bandwagon, particularly in the U.S. What can we learn from these companies? The key lessons that can be gleaned from the experiences of VBM adopters are as follows:

- Top management support and involvement is essential
- A good incentive plan is necessary
- Employees should be properly educated
- The choice of value metric *per se* is not critical
- VBM works well in certain cases
- One size doesn't fit all

**Top Management Support** Top management must enthusiastically support the VBM programme. Ideally, the CEO and CFO must champion its cause, oversee its implementation, and lend continuing support to it. Without their active involvement and support, the VBM programme is likely to fail.

**Incentive Plan** A critical element of any VBM programme is the link between performance and compensation. According to Bennett Stewart, a good incentive plan has the following characteristics: (a) *Objectivity*: Managers are not allowed to negotiate the outcome. (b) *Simplicity*: The incentive plan is understood even by employees who are not financially educated. (c) *Variability*: A significant portion of an employee's compensation is linked to performance. (d) *Definitiveness*: Once the VBM programme is underway, goal posts can't be moved. Put differently, there is no discretion available.

**Education** Unless the employees understand it, the VBM programme cannot be used for transforming their behaviour. Hence, all employees must be given proper training that emphasises the need for improving the productivity of capital, that explains the basics of the VBM programme, and that shows how their efforts can contribute to value creation. Training must be an ongoing activity that prods employees continually about the effect of their actions on shareholder value.

**Choice of Metric** The metric chosen must be suited to the circumstances of the company. However, what is more important is the

effective implementation of the VBM programme. As Myers put it: “Much as hitting a good golf shot depends more on how you strike the ball than on what brand of club you use, achieving success through the use of any performance metric will depend more on how well you apply it than on which one you use.”

**Conducive Circumstances** Not all firms can benefit equally from a VBM programme. Firms which seem to gain most from a VBM programme are the ones that have substantial assets that are not productively employed and that have diversified into too many areas beyond their core competence. VBM seems to work best for firms that need to shed assets and achieve focus than for firms that have immense growth opportunities. VBM seems to make more sense for firms that depend more on physical capital than for firms that rely more on intellectual capital.

**Need for Customisation** One size doesn’t fit all. VBM adopters often review the VBM tools of different vendors and customise their own application. Based on their survey of VBM practices, Martin and Petty said: “Finally, we found that many managers do not accept what the vendors say at face value. They learn from the consultants but then adapt the methods to fit their own situation. In fact, in most instances, firms develop their systems in-house rather than hiring a consulting firm.”

## SUMMARY

- Creating value for shareholders is now widely accepted as the primary corporate objective. To facilitate the realisation of this objective, value-based management systems have been developed.
- The **Alcar approach** is based on discounted cash flow analysis. According to Alfred Rappaport, the principal architect of the Alcar approach, the following seven factors- he calls them “value drivers” – affect shareholder value: rate of sales growth, operating profit margin, income tax rate, investment in working capital, fixed capital investment, cost of capital, and value growth duration.
- **Economic value added (EVA)** is the surplus left after providing for a charge on all capital employed in the business.
- The EVA approach to financial management is based on the premise that EVA provides a single, unified, and accurate measure of value as well as performance. EVA is the right measure for goal setting and business planning, performance evaluation, bonus determination, investor communication, capital budgeting, and valuation.

- Two concepts are at the foundation of the **BCG's approach** to shareholder value management: **total shareholder return (TSR)** and **total business return (TBR)**. TSR is the rate of return shareholders earn from owning a company's stock over a period of time. TBR is the internal counterpart of TSR.
- For applying the TSR and the TBR, two performance metrics are used: **cash flow return on investment (CFROI)** and **cash value added (CVA)**.
- A number of companies have joined the VBM bandwagon, particularly in the U.S. Several Indian companies have initiated VBM programmes.

## QUESTIONS

1. What factors have stimulated interest in value-based management?
2. What are the determinants of shareholder value according to Rappaport? Present the shareholder value creation network.
3. Explain the procedure suggested by Alcar for assessing the impact of a strategy on shareholder value.
4. What are the four equivalent ways of calculating EVA?
5. Discuss the adjustments relating to research and development and strategic investments while measuring EVA.
6. How is the depreciation charge calculated under the sinking fund method?
7. Contrast how restructuring charges are treated under GAAP and under EVA.
8. What causes EVA to increase?
9. What are the features or characteristics of EVA which make it as an anchor for an integrated financial management system?
10. How will you calculate the NPV of a project using the EVA approach?
11. Discuss the key elements of the EVA bonus plan.
12. Illustrate how a bonus bank system works.
13. Discuss the steps involved in implementing the EVA system.
14. What is the total shareholder return (TSR)? Why does BCG regard TSR as the most useful measure of value creation?
15. What is the total business return (TBR)?
16. What is the cash flow return on investment (CFROI) and how is it measured?
17. What is economic depreciation?
18. How does CFROI differ from the return on gross investment (ROGI)?
19. What is the cash value added (CVA)? How does it differ from EVA?
20. Discuss the lessons that can be gleaned from the experience of VBM adopters.

## SOLVED PROBLEMS

- 33.1 The income statement for year 0 (the year which has just ended) and the balance sheet at the end of year 0 for Futura Limited are as follows:

<i>Income Statement</i>		<i>Balance Sheet</i>		
■ Sales	10,000	Equity	6000	Fixed assets
■ Gross margin (20%)	2,000			4000
■ Selling and general administration (10%)	1,000		Current assets	2000
■ Profit before tax	1,000			
■ Tax	300			
■ Profit after tax	700		6000	6000

Futura Limited is debating whether it should maintain the *status quo* or adopt a new strategy. If it maintains the *status quo*:

The sales will remain constant at 10,000.

The gross margin will remain at 20% and the selling, general, and administrative expenses will be 10% of sales.

- Depreciation charges will be equal to new investments.
- The asset turnover ratios will remain constant.
- The discount rate will be 15 percent.
- The income tax rate will be 30 percent.

If Futura Limited adopts a new strategy, its sales will grow at a rate of 20 percent per year for three years. The margins, the turnover ratios, the capital structure, the income tax rate, and the discount rate, however, will remain unchanged. Depreciation charges will be equal to 10 percent of the net fixed assets at the beginning of the year.

What value will the new strategy create?

*Solution* The value created by the new strategy is calculated below:

	<i>Current Values (Year 0)</i>	<i>Income Statement Projections</i>			<i>Residual Value</i>
		1	2	3	4
Sales	10,000	12,000	14,400	17,280	17,280
Gross margin (20%)	2,000	2,400	2,880	3,456	3,456
Selling and					
General administration (10%)	1,000	1,200	1,440	1,728	1,728
Profit before tax	1,000	1,200	1,440	1,728	1,728
Tax	300	360	432	518.4	518.4
Profit after tax	700	840	1008	1209.6	1209.6
<i>Balance Sheet Projections</i>					
Fixed assets	4,000	4,800	5,760	6,912	6,912
Current assets	2,000	2,400	2,880	3,456	3,456
Total assets	6,000	7,200	8,640	10,368	10,368
Equity	6,000	7,200	8,640	10,368	10,368
<i>Cash Flow Projections</i>					
Profit after tax		840	1008	1209.6	1209.6
+ Depreciation		400	480	576	691.2
- Capital expenditure		1200	1440	1728	691.2
- Increase in current assets		400	480	576	-
<b>Operating cash flow</b>	<b>(360)</b>	<b>(432)</b>	<b>(518.4)</b>	<b>1209.6</b>	
<ul style="list-style-type: none"> <li>■ Present value of the operating cash flow stream = 980.55</li> <li>■ Residual value = 1209.6/0.15 = 8064</li> <li>■ Present value of residual value = 8064/(1.15)<sup>3</sup> = 5301.21</li> <li>■ Total shareholder value = 5302.21 - 980.55 = 4321.66</li> <li>■ Pre-strategy value = 70/0.15 = 4667.67</li> <li>■ Value of the strategy = 4321.66 - 4667.67 = - 346.01</li> </ul>					

33.2 Multiplex Limited is considering a capital project for which the following information is available:

Investment outlay	: 5000	Depreciation	: Straight line
Project life	: 4 years	(for tax purposes)	
Salvage value	: 0	Tax rate	: 40%
Annual revenues	: 6000	Debt-equity ratio	: 4 : 5
Annual costs	: 4000	Cost of equity	: 18%
(excluding depreciation, interest, and taxes)		Cost of debt	: 9% (post-tax)

(a) Calculate the EVA of the project over its life.

(b) Compute the NPV of the project.

*Solution*

$$\text{Cost of capital} = \frac{4}{9} \times 9\% + \frac{5}{9} \times 18\% = 14\%$$

	1	2	3	4
Revenues	6000	6000	6000	6000
Costs	4000	4000	4000	4000
PBDIT	2000	2000	2000	2000
Depreciation	1250	1250	1250	1250
PBIT	750	750	750	750
NOPAT	450	450	450	450
Cash flow (4 + 6)	1700	1700	1700	1700
Capital at charge	5000	3750	2500	1250
Capital charge ( $8 \times 0.14$ )	700	525	350	175
<b>EVA (6 - 9)</b>	<b>-250</b>	<b>-75</b>	<b>100</b>	<b>275</b>

$$NPV = \sum_{t=1}^n \frac{Cash\ flow_t}{(1+k)^t} - I = \sum_{t=1}^n \frac{1700}{(1.14)^t} - 5000 = -46.2$$

$$NPV = \sum_{t=1}^n \frac{EVA_t}{(1+k)^t} = -250 \times .877 - 75 \times .769 + 100 \times .675 \\ + 275 \times .592 = -46.7$$

- 33.3 An equipment costs 2,000,000 and has an economic life of 4 years at the end of which its expected salvage value is 600,000. If the cost of capital is 12 percent, what will be the depreciation schedule under the sinking fund method?

*Solution*

Equipment cost = 2,000,000 Economic life = 4 years

Salvage value = 600,000 Cost of capital = 12%

Present value of salvage value =  $600,000 \times .636 = 381,600$

Present value of annuity =  $2,000,000 - 381,600 = 1,618,400$

$$\text{Annuity amount} = \frac{1,618,400}{PVIFA_{12\%, 4\text{year}}} = \frac{1,618,400}{3.037} = 532,894$$

#### Depreciation charge under sinking fund method

	1	2	3	4
Capital	2,000,000	1,707,106	1,379,065	1,011,659
Capital charge	240,000	204,853	165,488	121,399
Annuity amount	532,894	532,894	532,894	532,894
Depreciation	292,894	328,041	367,406	411,495

- 33.4 A new plant entails an investment of ₹ 300 million (₹ 250 million in fixed assets and ₹ 50 million in net working capital). The plant has an economic life of 14 years and is expected to produce a NOPAT of ₹ 21.085 million every year. After 14 years, the net working capital will be realised at par whereas fixed assets will fetch nothing. The cost of capital for the project is 10 percent. The straight line method of depreciation is used.

- (a) What will be the ROCE for year 5? Assume that the capital employed is measured at the beginning of the year.
- (b) What will be the ROGI for year 5?
- (c) What will be the economic depreciation for year 5?
- (d) What will be the CVA for year 5?

*Solution*

NOPAT = ₹ 21.085 million

Investment in fixed assets = ₹ 250 million

Economic life = 14 years

Salvage value = 0

Annual depreciation =  $250/14 = ₹ 17.86$  million

	End of Year				
	1	2	3	4	5
Net value of fixed assets	232.14	214.28	196.42	178.56	160.7
Investment in current assets	50	50	50	50	50
Total capital employed (book value)	282.14	264.28	246.42	228.56	210.70

(a) ROCE for year 5 =  $\frac{\text{NOPAT}}{\text{Capital employed}} = \frac{21.085}{210.70} = 10.00\%$

(b) ROGI for year 5 =  $\frac{\text{NOPAT} + \text{Depreciation}}{\text{Cash invested}} = \frac{21.085 + 17.86}{300} = 12.98\%$

(c) Economic depreciation

$$\begin{aligned}\text{₹ 250 million} &= x \times \text{FVIFA } 10\%, 14\text{years} \\ &= x \times 27.975 \\ x &= \text{₹ 8.937 million}\end{aligned}$$

(d) CVA for year 5 = (NOPAT + Depreciation) – Economic depreciation  
 $\quad \quad \quad$  – (Cash invested  $\times$  cost of capital)  
 $\quad \quad \quad$  =  $(21.085 + 17.86) - 8.937 - 30.0 \times 0.10$   
 $\quad \quad \quad$  = 0

## PROBLEMS

**33.1 Value of Strategy** The income statement for year 0 (the year which has just ended) and the balance sheet at the end of year 0 for Exotica Limited are as follows:

Income Statement		Balance Sheet			
Sales	2000	Equity	1200	Fixed assets	600
Gross margin	400			Current assets	600
Selling & gen. Admn (8%)	160				
Profit before tax	240				
Tax	72				
Net profit	168		1200		1200

Exotica Limited is debating whether it should maintain the *status quo* or adopt a new strategy. If it maintains the *status quo*:

- The sales will remain constant at 2000.
- The gross margin and selling, general, and administrative expenses will remain unchanged at 20 percent and 8 percent respectively.
- Depreciation charges will be equal to new investments.
- The asset turnover ratios will remain constant.
- The discount rate will be 15 percent.

If Exotica Limited adopts a new strategy its sales will grow at a rate of 12 percent per year for four years. The margins, the turnover ratios, the capital structure, and the discount rate, however, will remain unchanged. The tax rate is 30 percent.

What value will the new strategy create?

**33.2 Value of Forward Plan** ABC Software Limited expects to earn a supernormal rate of return of 40 percent on new investments to be made over the next 5 years. The projected new investment per year is ₹ 200 million. If the weighted average cost of capital for ABC software is 20 percent, what is the value of the forward plan?

**33.3 EVA and NPV** Acme Limited is considering a capital project for which the following information is available:

Investment outlay	1000	Debt-equity ratio	: 1:1
Project life (for tax purposes)	5 years	Depreciation	: Straight line
Salvage value	0		
Annual revenues	2000	Tax rate	: 40 percent
Cost of equity	18%	Annual cost	: 1400
Cost of debt (post-tax)	10%	(excluding depreciation, interest, and taxes)	

(a) Calculate the EVA of the project over its life.

(b) Compute the NPV of the project.

**33.4 Depreciation Schedule Under Sinking Fund** An equipment costs ₹ 1,000,000 and has an economic life of 4 years at the end of which its expected salvage value is ₹ 200,000. If the cost of capital is 14 percent, what will be the depreciation schedule under the sinking fund method?

**33.5 Economic Depreciation** A machinery costs ₹ 2 million and has an economic life of 10 years at the end of which it will have a nil salvage value. If the cost of capital is 15 percent, what is the annual economic depreciation charge?

**33.6 Economic Depreciation** A plant costs ₹ 5 million and has an economic life of 5 years at the end of which it will have a nil salvage value. What will be the depreciation schedule under the sinking fund method? What will be the annual economic depreciation charge if the cost of capital is 12 percent?

**33.7 ROCE, ROGI, CFROI, EVA, and CVA** Modern Foods is considering a new project involving an investment of ₹ 100 million (₹ 80 million towards fixed assets and the balance toward net working capital). The project has an economic life of 8 years at the end of which the residual value is expected to be ₹ 20 million (the net working capital). The project is expected to produce ₹ 21.618 million of cash flow each year. The cost of capital is 15 percent.

For tax and accounting purposes use the straight line method of depreciation.

Calculate the following for years 1 and 4.

(a) ROCE, ROGI, and CFROI

(b) EVA and CVA.

**33.8 Value of Forward Plan** Jason Limited expects to earn a supernormal rate of return of 50 percent on new investments to be made over the next 6 years. The projected new investment per year is ₹ 400 million. If the weighted average cost of capital for Jason is 15 percent, what is the value of the forward plan?

**33.9 EVA** Praxis is considering a project with an investment outlay of ₹ 2000 million. at a debt-equity ratio of 2:1. It is expected to generate an annual revenue of ₹ 3000 million over its life period of 5 years. The annual cost, excluding

depreciation, interest and taxes will be ₹ 1200 million. After 5 years, the salvage value of the project assets will be nil. The cost of equity will be 20 percent and the post-tax cost of debt 9 percent. Depreciation for tax purposes will be calculated under the straight line method. The effective tax rate is 30 percent.

- (i) What is the EVA of the project over its life?
- (ii) Compute the NPV of the project with and without using EVA.

**33.10 Sinking Fund Depreciation** Machinery for a project costs ₹ 10 million and has an economic life of 5 years. After 5 years its salvage value is expected to be ₹ 3 million. What is the depreciation schedule under the sinking fund method if the cost of capital is 16 percent?

**33.11 ROCE, ROGI, CFROI, EVA, and CVA** Fusion Industries is planning an investment of ₹ 400 million into a project out of which ₹ 300 million is for fixed assets and ₹ 100 million for net working capital. The project has an economic life of 10 years at the end of which while the fixed assets is not expected to have any salvage value the net working capital is expected to be recovered in full. The project is expected to produce an annual cash flow of ₹ 100 million of cash flow each year. The cost of capital is 16 percent. For tax and accounting purposes use the straight line method of depreciation. Calculate the following for years 1 and 5. (a) ROCE, ROGI, and CFROI (b) EVA and CVA.

## MINICASE

### EVA in Practice at Hindustan Unilever Limited (HUL)

In Hindustan Unilever Limited, the goal of sustainable long-term value creation for our shareholders is well understood by all the business groups. Measures to evaluate business performance and to set targets take into account this concept of value creation.

The EVA calculation for HUL as presented in 2017-18 annual report is given below:

#### EVA Trends : 2008-18 (Unaudited)

Particulars	I - GAP							IND AS		
	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
<b>Cost of Capital Employed (COCE)</b>										
1. Average Debt	342	119	2	0	0	0	0	0	0	0
2. Average Equity	1,928	2,497	3,118	3,462	4,018	3,715	4,338	5,664	5,831	6,181
3. Average Capital Employed (1) + (2)	2,270	2,616	3,120	3,462	4,018	3,715	4,338	5,664	5,831	6,181
4. Cost of Debt, post-tax %	3.91	3.95	5.36	6.20	6.02	6.36	5.56	5.43	4.90	5.21
5. Cost of Equity %	14.17	12.51	12.93	10.10	10.07	11.62	10.91	11.98	12.85	14.19
6. Weighted Average Cost of Capital % (WACC)	12.88	12.12	12.92	10.10	10.07	11.62	10.91	11.98	12.85	14.19
7. COCE: (3) x (6)	365	317	403	350	405	432	474	679	749	877
<b>Economic Value Added (EVA)</b>										
8. Profit after tax, before exceptional items	2,501	2,103	2,153	2,599	3,314	3,555	3,843	4,116	4,247	5,135
9. Add: Interest, after taxes	17	5	0	1	17	24	11	0	0	0
10. Net Operating Profit After Taxes (NOPAT)	2,518	2,108	2,153	2,600	3,331	3,579	3,854	4,1178	4,247	5,135
11. COCE, as per (7) above	365	317	403	350	405	432	474	679	749	877
12. EVA: (10) – (11)	2,154	1,791	1,750	2,250	2,926	3,147	3,380	3,438	3,498	4,258

**\*EVA = Net Operating Profit after Taxes (NOPAT) – Cost of Capital Employed (COCE), where,**

NOPAT = Profits after depreciation and taxes but before interest costs. NOPAT thus represents the total pool of profits available on an ungeared basis to provide a return to lenders and shareholders, and COCE = Weighted Average Cost of Capital (WACC) x Average Capital Employed

\*Cost of debt is taken at the effective rate of interest applicable to an “AAA” rated Company like HUL for a short-term debt, net of taxes. We have considered a pre-tax rate of 7.97% for 2017-18 (7.42% for 2016-17)

\*Cost of Equity is the return expected by the investors to compensate them for the variability in returns caused by fluctuating earnings and share prices.

Cost of Equity = Risk free return equivalent to yield on long-term Government Bonds (taken at 7.40% for 2017-18) + Market risk premium (taken at 9.80%) × Beta variant for the Company, (taken at 0.693) where Beta is a relative measure of risk associated with the Company’s shares as against the market as a whole.

Thus, HUL’s cost of equity =  $7.40\% + 9.8\% \times 0.693 = 14.19\%$

Critically comment on the EVA calculation in HUL.

## PRACTICAL ASSIGNMENT

For your chosen company, calculate the EVA for the past three years. Make suitable assumptions.

- 1 The consulting and education practices of the Alcar Group Inc. are now part of The LEK/Alcar consulting Group, LLC.
- 2 Published by the Free Press in 1998.
- 3 This section is based on : G. Bennett Stewart III, *The Quest for Value*, New York : Harper Business, 1991 and El Ehrbar, *EVA : The Real Key to Creating Wealth*, New York : John Wiley & Sons, 1998. Note that EVA is the registered trademark of Stern Stewart & Co. So read EVA as EVA®
- 4 The regulatory body for the capital market in the U.S.
- 5 To illustrate the calculation of economic depreciation, consider a plant that has an economic life of 14 years and costs ₹ 250,000 to replace. The cost of capital is 10%.

$$\text{Economic depreciation} \times \text{FVIFA} (14, 10\%) = ₹ 250,000$$

$$\text{Economic depreciation} = \frac{₹ 250,000}{\text{FVIFA} (14,10\%)} = \frac{₹ 250,000}{27.975} ₹ 8,937$$

### Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter33/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter33/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Mergers, Acquisitions, and Restructuring

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Explain different types of corporate restructuring transactions.
- ✓ Discuss the plausible and dubious reasons for mergers.
- ✓ Explain the mechanics of a merger.
- ✓ Value a potential acquisition.
- ✓ Explain the key provisions of the SEBI Takeover Code.
- ✓ Discuss the key steps in a disciplined acquisition programme.
- ✓ Explain various aspects of divestitures.

Corporate restructuring refers to a broad array of activities that expand or contract a firm's operations or substantially modify its financial structure or bring about a significant change in its ownership structure. *Inter alia*, it includes activities such as mergers, purchases of business units, takeovers, slump sales, demergers, and equity carveouts. We will refer to these activities collectively as mergers, acquisitions, and restructuring (a widely used, though not a very accurate, term) or just corporate restructuring.

Mergers, acquisitions, and restructuring have become a major force in the financial and economic environment all over the world. Essentially an American phenomenon till the mid-1970s, they have become a dominant global business theme since then. As David Sinclair put it: "It was once thought that states too sophisticated to fight each other would make war through sport. They do not. The real international battle ground these days is the boardroom. The weapon is **takeover**."

On the Indian scene, too, corporates are seriously looking at mergers, acquisitions, and restructuring which have indeed become the order of the day. Most of the business groups and their companies seem to be engaged in some kind of corporate restructuring or the other. From the house of Tata to the house of AV Birla, from an engineering giant like Larsen & Toubro to a

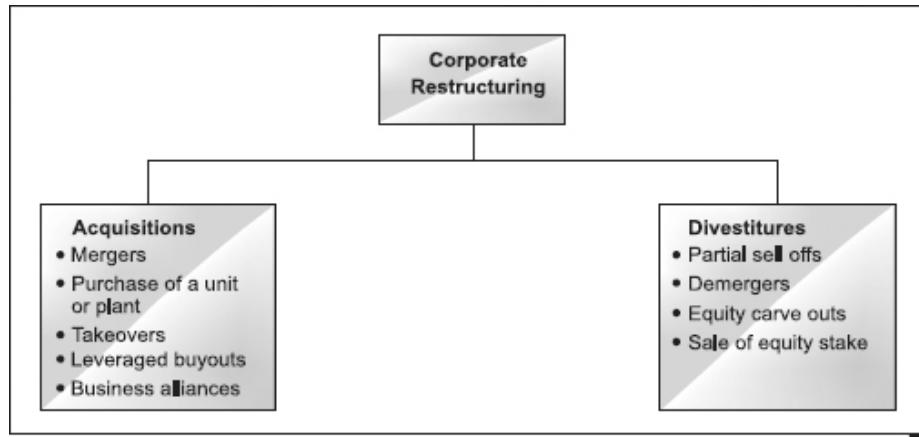
banking behemoth like State Bank of India, everyone seems to be singing the anthem of corporate restructuring. The pace and intensity of corporate restructuring has increased since the beginning of the liberalisation era, thanks to greater competitive pressures and a more permissive environment.

Mergers, acquisitions, and restructuring evoke a great deal of public interest and perhaps represent the most dramatic facet of corporate finance. They are the stuff of headlines in financial press and often receive a lot of attention as the drama characterising them unfolds.

## 34.1 ■ TYPES OF TRANSACTIONS

Corporate restructuring occurs in myriad ways. Sacrificing some rigour, these transactions may be classified as shown in [Exhibit 34.1](#). They are described as follows:

**Exhibit 34.1** Types of Corporate Restructuring Activities



## Acquisitions

Acquisition, a broad term, *inter alia*, subsumes the following transactions:

**Merger** A merger refers to a combination of two or more companies into one company. It may involve absorption or consolidation. In an **absorption**, one company acquires another company. For example, Hindustan Lever Limited absorbed Tata Oil Mills Company. Digital Equipment Corporation was absorbed by Compaq after it was acquired in 1997. In a **consolidation**, two or more companies combine to form a new company. For example, Hindustan Computers Limited, Hindustan Instruments Limited, Indian Software Company Limited, and Indian Reprographics Limited combined to form HCL Limited. Citigroup was the firm created when Citicorp and Traveler's Group consolidated. In India, mergers, called **amalgamations** in the legal parlance (hereafter we shall use the terms mergers and amalgamations interchangeably) are usually of the absorption variety. The acquiring company (also referred to as the amalgamated company or the merged company) takes over the assets and liabilities of the acquired company (also referred to as the amalgamating company or the merging company or the target company). Typically, the shareholders of the amalgamating company receive shares of the amalgamated company in exchange for their shares in the amalgamating company.

**Purchase of Division or Plant** A company may acquire a division or plant of another company. For example, SRF India bought the nylon cord division of CEAT Limited. Typically, the acquiring company acquires the assets and takes over the liabilities of the concerned division and it pays cash compensation to the selling company. For example, Abbott Laboratories acquired the pharmaceuticals business of Piramal Health Care for \$3.72 billion. Note that in a transaction of this kind only a portion of the assets and liabilities of one company are taken over by another company.

**Takeover** A takeover generally involves the acquisition of a certain stake in the equity (usually between 50 percent and 100 percent) capital of a company which enables the acquirer to exercise control over the affairs of the company. For example, HINDALCO took over INDAL by acquiring a 54 percent stake in INDAL from its overseas parent, Alcan. Subsequently, however, INDAL was merged into HINDALCO. Unlike a merger or purchase of division, a takeover does not involve transfer of assets and liabilities.

**Leveraged Buyout** A leveraged buyout is a variant of takeover or purchase of a division, effected substantially with the help of debt finance.

## **Divestitures**

While acquisitions lead to expansion of assets or increase of control, divestitures result in contraction of assets or relinquishment of control. The common forms of divestitures are briefly described below:

**Partial Selloff** A partial selloff involves the sale of a business division or plant of one company to another. It is the mirror image of a purchase of a business division.

**Sale of Equity Stake** In a sale of equity stake, one investor (or a group of investors) sells an equity stake, usually representing a controlling block, to another investor. For example, Alcan sold its 54 percent equity stake in INDAL to HINDALCO. This transaction is a mirror image of a takeover.

**Demerger** A demerger involves the transfer by a company of one or more of its business divisions to another company which is newly set up. For example, the Great Eastern Shipping Company transferred its offshore division to a new company called The Great Offshore Limited. The company whose business division is transferred is called the **demerged** company and the company to which the business division is transferred is called the **resultant company**.

**Equity Carveout** In an equity carveout, a parent company sells a portion of its equity in a wholly owned subsidiary. The sale may be to the general investing public or a strategic investor.

**PSU Disinvestment** Privatisation involves transfer of ownership (represented by equity shares), partial or total, of public enterprises from the government to individuals and non-government institutions.

## 34.2 ■ REASONS FOR MERGERS

Mergers may be classified into several types: horizontal, vertical, conglomerate, and co-generic. A **horizontal** merger represents a merger of firms engaged in the same line of business. A **vertical** merger represents a merger of firms engaged at different stages of production in an industry. A **conglomerate** merger represents a merger of firms engaged in unrelated lines of business. A **cogeneric** merger represents a merger of firms engaged in related lines of business.

The principal economic rationale of a merger is that the value of the combined entity is expected to be greater than the sum of the independent values of the merging entities. If firms  $A$  and  $B$  merge, the value of the combined entity,  $V(AB)$ , is expected to be greater than  $(V_A + V_B)$ , the sum of the independent values of  $A$  and  $B$ .

A variety of reasons like growth, diversification, economies of scale, managerial effectiveness, utilisation of tax shields, lower financing costs, strategic benefit, and so on are cited in support of merger proposals. Some of them appear to be plausible in the sense that they create value; others seem to be dubious as they do not create value.

## **Plausible Reasons**

The most plausible reasons in favour of mergers are: strategic benefit, economies of scale, economies of scope, economies of vertical integration, complementary resources, tax shields, utilisation of surplus funds, and managerial effectiveness.

**Strategic Benefit** If a firm has decided to enter or expand in a particular industry, acquisition of a firm engaged in that industry, rather than dependence on internal expansion, may offer several strategic advantages: (i) As a pre-emptive move it can prevent a competitor from establishing a similar position in that industry. (ii) It offers a special ‘timing’ advantage because the merger alternative enables a firm to ‘leap frog’ several stages in the process of expansion. (iii) It may entail less risk and even less cost. (iv) In a ‘saturated’ market, simultaneous expansion and replacement (through a merger) makes more sense than creation of additional capacity through internal expansion.

**Economies of Scale** When two or more firms combine, certain economies are realised due to the larger volume of operations of the combined entity. These economies arise because of more intensive utilisation of production capacities, distribution networks, engineering services, research and development facilities, data processing systems, so on and so forth. Economies of scale are most prominent in the case of horizontal mergers where the scope for more intensive utilisation of resources is greater. In vertical mergers, the principal sources of benefits are improved coordination of activities, lower inventory levels, and higher market power of the combined entity. Finally, even in conglomerate mergers there is scope for reduction or elimination of certain overhead expenses.

Can there be diseconomies of scale? Yes, if the scale of operations and the size of organisation become too large and unwieldy. Economists talk of the optimal scale of operation at which the unit cost is minimal. Beyond this optimal point the unit cost tends to increase.

**Economies of Scope** A company may use a specific set of skills or assets that it possesses to widen the scope of its activities. For example, Proctor and Gamble can enjoy economies of scope if it acquires a consumer product company that benefits from its highly regarded consumer marketing skills.

**Economies of Vertical Integration** When companies engaged at different stages of production or value chain merge, economies of vertical integration may be realised. For example, the merger of a company engaged in oil exploration and production (like ONGC) with a company engaged in refining and marketing (like HPCL) may improve coordination and control.

Vertical integration, however, is not always a good idea. If a company does everything in-house, it may not get the benefit of outsourcing from independent suppliers who may be more efficient in their segments of the value chain.

**Complementary Resources** If two firms have complementary resources, it may make sense for them to merge. For example, a small firm with an innovative product may need the engineering capability and marketing reach of a big firm. With the merger of the two firms it may be possible to successfully manufacture and market the innovative product. Thus, the two firms, thanks to their complementary resources, are worth more together than they are separately.

A good example of a merger of companies which complemented each other well is the merger of Brown Bovery and Asea that resulted in Asea Brown Bovery (ABB). Brown Bovery was international, whereas Asea was not. Asea excelled in management, whereas Brown Bovery did not. The technology, markets, and cultures of the two companies fitted well.

**Tax Shields** When a firm with accumulated losses and/or unabsorbed depreciation merges with a profit-making firm, tax shields are utilised better. The firm with accumulated losses and/or unabsorbed depreciation may not be able to derive tax advantages for a long time. However, when it merges with a profit-making firm, its accumulated losses and/or unabsorbed depreciation can be set off against the profits of the profit-making firm and tax benefits can be quickly realised.

Reduction of indirect taxes may be another source of tax savings. When Polyleofins Industries, which supplied 40,000 tonnes of ethylene to NOCIL, merged with NOCIL, a substantial savings on sales tax and excise duty was achieved.

**Utilisation of Surplus Funds** A firm in a mature industry may generate a lot of cash but may not have opportunities for profitable investment. Such a firm ought to distribute generous dividends and even buy back its shares, if the same is possible. However, most managements

have a tendency to make further investments, even though they may not be profitable. In such a situation, a merger with another firm involving cash compensation often represents a more efficient utilisation of surplus funds.

**Managerial Effectiveness** One of the potential gains of merger is an increase in managerial effectiveness. This may occur if the existing management team, which is performing poorly, is replaced by a more effective management team. Often a firm, plagued with managerial inadequacies, can gain immensely from the superior management that is likely to emerge as a sequel to the merger. Another allied benefit of a merger may be in the form of greater congruence between the interests of the managers and the shareholders.

A common argument for creating a favourable environment for mergers is that it imposes a certain discipline on the management. If lacklustre performance renders a firm more vulnerable to potential acquisition, existing managers will strive hard continually to improve their performance.

**Industry Consolidation** An important driver for mergers in many industries around the world has been the need for consolidation. When there are too many players and excess capacity, consolidation is necessary for improving efficiency. This has happened (and is happening) in sectors like banking, telecommunications, pharmaceuticals, cement, steel, automobiles, and so on all over the world. In India too, we are witnessing a similar trend. The fragmented capacity in many areas suggests that consolidation may be inevitable.

### RIL-RPL Merger

The merger of Reliance Petroleum Limited (RPL) with Reliance Industries Limited (RIL) in 2002 represented the largest ever merger in India creating the country's largest private sector company on various financial parameters, such as sales, assets, net worth, cash profits, and net profits.

Defending the merger, the management claimed that the merger will contribute to the following substantial benefits for RIL, thereby enhancing shareholder value:

- Scale
- Integration
- Global competitiveness
- Operational synergies
- Logistics advantages
- Cost efficiencies
- Productivity gains
- Rationalisation of business processes

- Optimisation of fiscal incentives

## Dubious Reasons for Mergers

Sometimes mergers are motivated by a desire to diversify, lower financing costs, and achieve a higher rate of earnings growth. *Prima facie*, these objectives look worthwhile, but they are not likely to enhance value.

**Diversification** A commonly stated motive for mergers is to achieve risk reduction through diversification. The extent to which risk is reduced, of course, depends on the correlation between the earnings of the merging entities. While negative correlation brings greater reduction in risk, positive correlation brings lesser reduction in risk.

How valuable is such risk reduction to investors? If investors can diversify on their own by buying stocks of companies which propose to merge, they do not derive any benefit from the proposed merger. Any investor who wants to reduce risk by diversifying between two companies, say, Kappa Company and Gamma Limited, may simply buy the stocks of these two companies and 'merge' them into a portfolio. The 'merger' of these companies is not necessary for him to enjoy the benefits of diversification. As a matter of fact, his 'home-made' diversification gives him far greater flexibility. He can combine the stocks of Kappa and Gamma in any proportion he likes as he is not confronted with a 'fixed' proportion that results from the merger.

Corporate diversification, however, may offer value at least in two special cases: (i) If a company is plagued with problems which can jeopardise its existence and its merger with another company can save it from potential bankruptcy. (ii) If investors do not have the opportunity of 'home-made' diversification because one of the companies is not traded in the marketplace, corporate diversification may be the only feasible route to risk reduction.

**Lower Financing Costs** The consequence of larger size and greater earnings stability, many argue, is to reduce the cost of borrowing for the merged firm. The reason for this is that the creditors of the merged firm enjoy better protection than the creditors of the merging firms independently. If two firms, *A* and *B*, merge, the creditors of the merged firm (call it firm *AB*) are protected by the equity of both the firms. While this additional protection reduces the cost of debt, it imposes an extra burden on the shareholders; shareholders of firm *A* must support the debt of firm *B*, and vice versa. In an efficiently operating market, the benefit to

shareholders from lower cost of debt would be offset by the additional burden borne by them – as a result there would be no net gain.

**Earnings Growth** A merger may create the appearance of growth in earnings. This may stimulate a price increase if the investors are fooled. An example may be given to illustrate this phenomenon.

Suppose Ram Limited acquires Shyam Limited. The pre-merger financial positions of Ram Limited and Shyam Limited are shown in columns 1 and 2 of [Exhibit 34.2](#). Ram Limited has superior growth prospects and commands a price-earnings multiple of 20. Shyam Limited, on the other hand, has inferior growth prospects and sells for a price-earnings multiple of 10. The merger is not expected to create any additional value. Based on the pre-merger market prices, the exchange ratio is fixed at 1:2, that is 1 share of Ram Limited is given in exchange for two shares of Shyam Limited.

If the market is ‘smart’ the financial position of Ram Limited, after the merger, will be as shown in column 3 of [Exhibit 34.2](#). Even though the earnings per share rises, the price-earnings ratio falls because the market recognises that the growth prospects of the combined firm will not be as bright as those of Ram Limited alone. So the market price per share remains unchanged at ₹ 40. Thus, the market value of the combined company is simply the sum of the market values of the merging companies.

If the market is ‘foolish’, it may regard the 33 percent increase in earnings per share as reflection of true growth. Hence, the price-earnings ratio will not fall. With a higher earnings per share and an unchanged price-earnings ratio, the market price per share of Ram Limited will rise to ₹ 53.4. This will lead to an increase in total market value from ₹ 600 million to ₹ 800 million.

### Exhibit 34.2 Financial Positions of Ram Limited and Shyam Limited

Particulars	Ram Ltd. before Merger	Shyam Ltd. before Merger	Ram Ltd. after Merger	
	(1)	(2)	The Market is ‘Smart’	The Market is ‘Foolish’
Earnings per share	₹ 2	₹ 2	₹ 2.67	₹ 2.67
Price per share	₹ 40	₹ 20	₹ 40	₹ 53.4
Price-earnings ratio	20	10	15	20
Number of shares	10 million	10 million	15 million	15 million
Total earnings	₹ 20 million	₹ 20 million	₹ 40 million	₹ 40 million
Total value	₹ 400 million	₹ 200 million	₹ 600 million	₹ 800 million

Thus, if the market is ‘foolish’, it may be mesmerised by the magic of earnings growth. Such an illusion may work for a while in an inefficient market. As the market becomes efficient the illusory gains are bound to disappear.

### **34.3 ■ MECHANICS OF A MERGER**

In India, mergers and acquisitions are regulated mainly under the Companies Act. The Companies Act 2013 introduced new provisions to replace the corresponding provisions of the Companies Act 1956. However, since the new provisions are yet to be notified as of date, the earlier provisions are still in force. Apart from company law, SEBI Act, and the Competition Act also regulate mergers and acquisitions. The Companies Act primarily seeks to protect the interest of creditors, the SEBI Act principally strives to protect the interest of minority shareholders, and the Competition Act mainly tries to ensure that the interest of consumers is not hurt on account of diminished competition arising out of merger.

A merger is a complicated transaction, involving fairly complex legal, tax, and accounting considerations. While evaluating a merger proposal, one should bear in mind the following legal, tax, and accounting provisions.

## **Legal Procedure**

Amalgamation involves a fairly long process. The procedure for amalgamation normally involves the following steps:

- 1. Examination of Object Clauses** The memorandum of association of both the companies should be examined to check if the power to amalgamate is available. Further, the object clause of the amalgamated company (transferee company) should permit it to carry on the business of the amalgamating company (transferor company). If such clauses do not exist, necessary approvals of the shareholders, boards of directors, and Company Law Board are required.
- 2. Intimation to Stock Exchanges** The stock exchanges where the amalgamated and amalgamating companies are listed should be informed about the amalgamation proposal. From time-to-time, copies of all notices, resolutions, and orders should be mailed to the concerned stock exchanges.
- 3. Approval of the Draft Amalgamation Proposal by the Respective Boards** The draft amalgamation proposal should be approved by the respective boards of directors who should pass a resolution authorising its directors/executives to pursue the matter further.
- 4. Application to the NCLT/s** After board approval each company should make an application to the National Company Law Tribunal (NCLT) of the state where its registered office is situated so that it can convene the meetings of shareholders and creditors for passing the amalgamation proposal. In the case of merger/amalgamation of a domestic company with a foreign company and vice versa, subject to some conditions, the permission of RBI should be obtained before approaching the NCLT.
- 5. Despatch of Notice to Shareholders and Creditors** After obtaining NCLT's approval, a notice and an explanatory statement along with a copy of the scheme and the prescribed details, should be despatched by each company to its shareholders and creditors at least 30 days in advance. The notice of the meetings should also be published in two newspapers (one English and one vernacular) and the websites of the company, SEBI, and the respective stock exchange. Also, various documents such as financials, NCLT order, scheme details, auditor certificate on accounting treatment etc. should be made available for inspection to the shareholders/creditors. An affidavit confirming that

all prescribed formalities for convening the meetings have been complied with, should be filed with the NCLT.

**6. Holding of Meetings of Shareholders and Creditors** A meeting of shareholders should be held by each company for passing the amalgamation scheme. At least 75 percent (in value) of shareholders, in each class, who vote either in person or by proxy or through postal ballot, must approve the scheme of amalgamation. Likewise, in a separate meeting, the creditors of the company must approve of the amalgamation scheme. Here too, at least 75 percent (in value) of the creditors who vote, either in person or by proxy, must approve of the scheme. Objections to the scheme can be raised only by persons holding 10 percent or more of shares or creditors with outstanding debt of 5 percent or more. Notices of the meetings should be given to Central Government, Registrar of Companies, Income Tax authorities, RBI, SEBI, Competition Commission of India, respective stock exchanges and any other authorities, as directed by NCLTs, who may make representations within 30 days. If no representation is received, their approval is presumed. Creditors' meeting can be dispensed with only if 90 percent or more agree/confirm the scheme by affidavit.

**7. Petition to NCLT for Confirmation and Passing of NCLT Orders** Once the amalgamation scheme is passed by the shareholders and creditors, the companies involved should present a petition to NCLT for confirming the scheme. NCLT will fix a date of hearing. A notice about the same has to be published in newspapers. NCLT will send notices of the hearing to the shareholders/creditors who have objected to the scheme as also to the Central Government and other regulators who have made representation. After hearing the parties concerned and ascertaining that the amalgamation scheme is fair and reasonable, NCLT will pass an order sanctioning the same. However, NCLT is empowered to modify the scheme and pass orders accordingly. There is also an option of simplified and fast track process of merger/demergers between two or more specified small companies, and holding companies and their wholly owned subsidiaries. In the simplified process, if the official liquidator and the shareholders/creditors have no objection and the scheme is approved by Central Government, there is no need to approach NCLT.

**8. Filing the Order with the Registrar** Certified true copies of the NCLT order must be filed with the Registrar of Companies.

- 9. Transfer of Assets and Liabilities** After the final orders have been passed by both the NCLTs, all the assets and liabilities of the amalgamating company will, with effect from the appointed date, have to be transferred to the amalgamated company.
- 10. Issue of Shares and Debentures** The amalgamated company, after fulfilling the provisions of the law, should issue shares and debentures of the amalgamated company (cash payment allowed in some cases). The new shares and debentures so issued will then be listed on the stock exchange.

## **Competition Issues**

Anti-trust and competition issues in India are governed by the Competition Act, 2002. Under the Competition Act, the Competition Commission ("Commission") can inquire into any monopolistic or restrictive trade practice. The Competition Act prohibits combinations which would cause appreciable effect on competition within the relevant market in India. Any person or enterprise which proposes to enter into a combination can approach the Commission for approving the combination within a period of seven days after the board of directors of concerned enterprises approve the combination or after any agreement or other document for acquisition is executed. If the Commission believes that the combination has or is likely to have an appreciable detrimental effect on competition within India then it can prohibit the combination. If pre-acquisition approval is not taken, the Commission has one year to look into the matter on its own or on an application by a third party.

## **Tax Aspects**

An amalgamation involves the merger of one or more companies into an existing company or to merger of two or more companies into a new company formed specifically for this purpose. The merging companies are called amalgamating companies and the merged company is called the amalgamated company. The amalgamated company is entitled to various tax benefits, if the following conditions are fulfilled: (a) all the properties and liabilities of the amalgamating company immediately before the amalgamation become the properties and liabilities of the amalgamated company by virtue of the amalgamation, (b) shareholders holding not less than 75 percent in value of the shares in the amalgamating company become shareholders of the amalgamated company by virtue of the amalgamation.

Tax concessions are granted to the amalgamated company only if the amalgamating company is an Indian company. Following deductions to the extent available to the amalgamating company and remaining unabsorbed or unfulfilled will be available to the amalgamated company:

- Capital expenditure on scientific research
- Expenditure or acquisition of patent-right, copy-right, and knowhow
- Expenditure for obtaining license to operate telecommunication services
- Amortisation of preliminary expenses
- Carry forward of losses and unabsorbed depreciation

In addition to income tax, you have to consider stamp duties. Some states (like Maharashtra and Gujarat) have their own stamp duty legislation, while others have adopted the Indian stamp duty with suitable amendments.

## **Accounting for Business Combinations<sup>1</sup>**

A business combination is a transaction or other event in which an acquirer obtains control of one or more businesses. An acquirer might obtain control of an acquiree in a variety of ways, for example:

- (a) by transferring cash, cash equivalents or other assets (including net assets that constitute a business);
- (b) by incurring liabilities;
- (c) by issuing equity interests; or
- (d) by providing more than one type of consideration.

A business combination may be structured in a variety of ways for legal, taxation, or other reasons.

Ind AS 103 applies to business combinations. Under Ind AS 103, two methods of accounting are used for business combinations: acquisition method and pooling method.

Applicable to all business combinations, other than common control business combinations, the *acquisition method* involves:

- (a) Identifying the acquirer,
- (b) Determining the acquisition date,
- (c) Recognising and measuring the identifiable assets acquired, the liabilities assumed and any non-controlling interest in the acquiree on the acquisition date at fair values, and
- (d) Recognising and measuring goodwill or a gain from a bargain purchase.

A *common control business transaction* is a business combination involving entities or businesses in which all the combining entities or businesses are ultimately controlled by the same party or parties both before and after the business combination, and that control is not transitory. For common control business combinations, the *pooling of interests method is used*.

The pooling of interest method involves the following:

- (a) The assets and liabilities of the combining entities are reflected at their carrying amounts.
- (b) No adjustments are made to reflect fair values, or recognise any new assets or liabilities. The only adjustments that are made are to harmonise accounting policies.

- (c) The difference in capital on account of the share swap ratio (exchange ratio) is adjusted in the reserves.

**Illustration** Beta Company (the transferor company) has agreed to merge with Alpha Company (the transferee company). The balance sheets of Alpha Company and Beta Company, prior to the merger, are shown in Part A of [Exhibit 34.3](#). The share swap ratio of 3:5 has been fixed. This means 3 shares of Alpha Company will be given for 5 shares of Beta Company. Since the par value per share is 10 for both the companies, the share capital of Alpha will increase by 600 after the merger.

**Exhibit 34.3 Balance Sheet of Alpha Company and Beta Company**

Liabilities	Part A: before Merger		Part B: after Merger	
	Alpha Company	Beta Company	Acquisition Method	Pooling Method
Share capital (10 par)	4000	1000	4600	4600
Capital reserve	–	–	1900	400
Share premium	2000	500	2000	2500
General reserve	5000	1000	5000	6000
P & L account	1000	500	1000	1500
Loan funds	4000	2500	6400	6500
Current liabilities and provisions	2000	1500	3600	3500
	<b>18000</b>	<b>7000</b>	<b>24500</b>	<b>25000</b>
<hr/>				
<b>Assets</b>				
Net fixed assets	7000	3000	10200	10000
Investments	3000	500	3400	3500
Current assets	7000	3000	9900	10000
Miscellaneous expenditure	1000	500	1000	1500
	<b>18000</b>	<b>7000</b>	<b>24500</b>	<b>25000</b>

Under the ‘acquisition method’ the assets and outside liabilities of the transferor company (Beta Company) are revalued. Suppose the assets and liabilities of Beta Company are revalued as follows:

Net fixed assets	:	3200
Investments	:	400
Current assets	:	2900
Current liabilities	:	1600
Loan funds	:	2400

Given these values and a purchase consideration in the form of a paid up capital of 600, the capital reserve (or goodwill) on merger is worked out as follows:

Value of assets of Beta Company	: 6500
(Fixed assets + Investments + Current assets)	
Less : Value of outside liabilities	: 4000
(Loan funds + Current liabilities and provisions)	
Net book value of assets over liabilities	<u>2500</u>
Less : Purchase consideration paid to shareholders of Beta	600
Net gain on amalgamation (capital reserve)	<u>1900</u>

The post-amalgamation balance sheet of Alpha Beta Company under the acquisition method is shown in the second column of Part B of [Exhibit 34.3](#).

Under the ‘pooling of interest’ method, the post-merger balance sheet of Alpha Company (the amalgamated company) would be as shown in the second column of Part B of [Exhibit 34.3](#).

## The Role of Investment Bankers

Investment banks are involved in mergers and acquisitions in various ways. First, they help arrange mergers. Second, when a company is attacked by a hostile raider, they develop and execute defensive tactics. Third, they help in valuing target companies. Fourth, they arrange acquisition financing. Fifth, they invest in arbitrage opportunities.

**Arranging Mergers** Most investment banks have an M&A (mergers and acquisition) group that identifies firms that might be attractive to others and firms that have surplus funds and inclination to acquire other firms. The M&A group tries to arrange a merger.

**Developing Defensive Tactics** If a target firm does not want to be acquired, it generally seeks the help of an investment banking firm, along with a law firm specialising in M&A, to ward off the potential raider by various means.

**Establishing a Fair Value** When a friendly merger is being worked out, it is important to establish that the agreed-upon price is a fair one; otherwise stockholders of either or both companies will challenge the merger in the court of law. Therefore, in most large mergers, each side will hire an investment-banking firm to help in establishing the fair price.

**Financing Mergers** To thrive in the mergers and acquisitions (M&A) business, investment bankers must be able to offer a financing package to clients. Acquirers may need capital for acquisitions. Target companies, interested in warding off a takeover threat, may need capital for stock repurchases.

**Arbitrage Operations** An arbitrage generally means simultaneous purchase and sale of a security (or currency) in different markets to derive benefit from price differential, in a risk-free manner. Investment bankers and other investors, however, may engage in a different kind of arbitrage as they speculate in the stocks of companies that are potential takeover targets.

## 34.4 ■ COSTS AND BENEFITS OF A MERGER

When firm  $A$  acquires firm  $B$ , it is making a capital investment decision and firm  $B$  is making a capital divestment decision. What is the net present value of this decision to firm  $A$ ? What is the net present value of this decision to firm  $B$ ?

To calculate the net present value to firm  $A$  we have to identify the benefit and the cost of the merger. The benefit of the merger is the difference between the present value (PV) of the combined entity  $PV_{AB}$  and the present value of the two entities if they remain separate ( $PV_A + PV_B$ ). Hence,

$$\text{Benefit} = PV_{AB} - (PV_A + PV_B) \quad (34.1)$$

The cost of the merger, from the point of view of firm  $A$ , assuming that the compensation to firm  $B$  is paid in cash, is equal to the cash payment made for acquiring firm  $B$  less the present value of firm  $B$  as a separate entity. Thus,

$$\text{Cost} = \text{Cash} - PV_B \quad (34.2)$$

The net present value (NPV) of the merger from the point of view of firm  $A$  is the difference between the benefit and the cost as defined above. So

$$\begin{aligned} \text{NPV to } A &= \text{Benefit} - \text{Cost} \\ &= [(PV_{AB} - (PV_A + PV_B)) - (\text{Cash} - PV_B)] = PV_{AB} - PV_A - \text{Cash} \end{aligned} \quad (34.3)$$

The net present value of the merger from the point of view of firm  $B$  is simply the cost of the merger from the point of view of firm  $A$ . Hence,

$$\text{NPV to } B = (\text{Cash} - PV_B) \quad (34.4)$$

Let us illustrate this with an example. Firm  $A$  has a value of ₹ 20 million and firm  $B$  has a value of ₹ 5 million. If the two firms merge, cost savings with a present value of ₹ 5 million would occur. Firm  $A$  proposes to offer ₹ 6 million cash compensation to acquire firm  $B$ . Calculate the net present value of the merger to the two firms.

In this example  $PV_A = ₹ 20$  million,  $PV_B = ₹ 5$  million,  $PV_{AB} = ₹ 30$  million,  $\text{Cash} = ₹ 6$  million. Therefore,

$$\text{Benefit} = \text{PV}_{AB} - (\text{PV}_A + \text{PV}_B) = ₹ 5 \text{ million}$$

$$\text{Cost} = \text{Cash} - \text{PV}_B = ₹ 1 \text{ million}$$

$$\text{NPV to } A = \text{Benefit} - \text{Cost} = ₹ 4 \text{ million}$$

$$\text{NPV to } B = \text{Cash} - \text{PV}_B = ₹ 1 \text{ million}$$

## Compensation in Stock

In the above discussion we assumed that the acquiring firm pays cash compensation to the acquired firm. In practice, however, compensation is usually paid in the form of stock. When this happens, the cost component in the present value calculation needs to be calculated with care. To illustrate this, let us consider an example.

Firm *A* plans to acquire firm *B*. The relevant financial details of the two firms, prior to the merger announcement, are:

	<i>A</i>	<i>B</i>
Market price per share	₹ 50	₹ 20
Number of shares	1,000,000	500,000
Market value of the firm	₹ 50 million	₹ 10 million

The merger is expected to bring gains which have a present value of ₹ 10 million. Firm *A* offers 250,000 shares in exchange for 500,000 shares to the shareholders of firm *B*.

The apparent cost of acquiring firm *B* is:

$$250,000 \times 50 - 10,000,000 = ₹ 2,500,000$$

The true cost, however, is greater than ₹ 2,500,000. While calculating the true cost you must recognise that *B*'s shareholders end up owning a fraction of the share capital of the combined firm.

The true cost, when *B*'s shareholders get a fraction  $\alpha$  of the share capital of the combined firm, is equal to:

$$\text{Cost} = \alpha PV_{AB} - PV_B \quad (34.5)$$

In our example, the share of *B* in the combined entity will be:

$$\alpha = \frac{250,000}{1,000,000 + 250,000} = 0.2$$

Assume that the market values of the two firms just before the merger announcement are equal to their present values as separate entities and the benefit of merger is ₹ 10 million. Then,

$$PV_{AB} = PV_A + PV_B + \text{Benefit}$$

$$= 50 + 10 + 10$$

$$= ₹ 70 \text{ million}$$

$$\text{Cost} = \alpha PV_{AB} - PV_B$$

$$= 0.2 \times 70 - 10 = ₹ 4 \text{ million}$$

$$\text{NPV to } A = \text{Benefit} - \text{Cost}$$

$$= 10 - 4 = ₹ 6 \text{ million}$$

$$\text{NPV to } B = \text{Cost} = ₹ 4 \text{ million}$$

Clearly, there is an important difference between cash and stock compensation. If the compensation is paid in cash, the cost of the acquisition is independent of the gains of the acquisition. On the other hand, if the compensation is paid in stock, the cost of the acquisition is dependent on the gains of the acquisition.

## **Cash vs. Stock Compensation**

Whether to pay for an acquisition in cash or in stock is an important decision. When an acquisition is paid for in cash, the roles of the buyer and seller are clear-cut; but when an acquisition is paid for in stock, it is far less clear who is the buyer and who is the seller. The choice between stock or cash compensation depends on four factors, in the main.

**Overvaluation** If the acquiring firm's stock is overvalued relative to the acquired company's stock, paying in stock can be less costly than paying in cash.

**Taxes** From the point of view of the shareholders of the acquired firm, cash compensation is a taxable transaction whereas stock compensation is not.

**Sharing of Risks and Rewards** If cash compensation is paid, shareholders of the acquired company neither bear the risks nor enjoy the rewards of the merger. On the other hand, if stock compensation is paid, shareholders of the acquired company partake in the risks as well as the rewards of the merger.

**Discipline** Empirical evidence suggests that acquisitions financed by cash tend to succeed more compared to acquisitions financed by stock. Why? Perhaps cash buyers are more disciplined, circumspect, and rigorous in their evaluation.

## **34.5 ■ EXCHANGE RATIO IN A MERGER**

Typically, in a merger the acquiring firm offers its shares in exchange for the target firm's shares. The offer is expressed in the form of exchange ratio (or swap ratio) which is defined as the number of shares the acquiring firm is willing to give in exchange for one share of the target firm. For example, an exchange ratio of 0.5 means that the acquiring firm is willing to give half a share for every share of the target firm.

## Bases for Determining the Exchange Ratio

What are the bases on which the exchange ratio is determined? The commonly used bases for establishing the exchange ratio are: book value per share, earnings per share, market price per share, dividend discounted value per share, and discounted cash flow value per share.

**Book Value Per Share** The relative book values per share of the two firms may be used to determine the exchange rate. For example, if the book value per share of the acquiring company is ₹ 25 and the book value per share of the target company is ₹ 15, the book value based exchange ratio is 0.6 (15/25).

The proponents of book value contend that it provides a very objective basis. This, however, is not a very plausible argument because book value is influenced by accounting policies which reflect subjective judgements. There are still more serious objections against the use of book value:

- Book values do not reflect changes in purchasing power of money.
- Book values often are highly different from true economic values.

**Earnings Per Share** Suppose the earnings per share of the acquiring firm are ₹ 5.00 and the earnings per share of the target firm ₹ 2.00. An exchange ratio based on earnings per share will be 0.4(2/5). This means four shares of the acquiring firm will be exchanged for ten shares of the target firm.

While earnings per share reflect *prima facie* the earning power, there are some problems in an exchange ratio based solely on the current earnings per share of the merging companies because it fails to take into account the following:

- The difference in the growth rate of earnings of the two companies.
- The gains in earnings arising out of merger.
- The differential risks associated with the earnings of the two companies.

Moreover, there is the measurement problem of defining the normal level of current earnings. The current earnings per share may be influenced by certain transient factors like a wind fall profit, or an abnormal labour problem, or a large tax relief. Finally, how can earnings per share, when they are negative, be used?

**Market Price Per Share** The exchange ratio may be based on the relative market prices of the shares of the acquiring firm and the target firm. For example, if the acquiring firm's equity shares sell for ₹ 50 and the target firm's equity shares sell for ₹ 10, the market price based exchange ratio is 0.2 (10/50). This means that one share of the acquiring firm will be exchanged for five shares of the target firm.

When the shares of the acquiring firm and the target firm are actively traded in a competitive market, market prices have considerable merit. They reflect current earnings, growth prospects, and risk characteristics. When the trading is meagre, market prices, however, may not be very reliable and, in the extreme case, market prices may not be existent if the shares are not traded. Another problem with market prices is that they may be manipulated by those who have a vested interest.

**Dividend Discounted (DD) Value Per Share** The dividend discounted value per share is the present value of the expected stream of dividends.

The relative DD values per share of the merging companies may be used to determine the exchange ratio. For example, if the acquiring firm's DD value per share is ₹ 40 and the target firm's DD value per share is ₹ 25, the DD value based exchange ratio is 0.625.

The DD value approach makes sense when the dividend streams of the merging firms can be predicted with a reasonable degree of confidence; otherwise it is not much useful.

**Discounted Cash Flow (DCF) Value Per Share** The DCF value per share is:

$$\text{DCF value per share} = \frac{\text{Firm value using the DCF method} - \text{Debt value}}{\text{Number of equity shares}}$$

The relative DCF values per share of the merging companies may be used to determine the exchange rate. For example, if the acquiring company's DCF value per share is ₹ 20 and the target company's DCF value per share is ₹ 15, the DCF value based exchange ratio is 0.75.

The DCF value approach is ideally suited when fairly credible business plans and cash flow projections are available for a period of five to ten years for the merging companies. This approach, however, overlooks the value of options embedded in the business.

## Boundaries for Exchange Rate Determination

Since the exchange ratio is the most critical issue in a merger deal, the acquiring firm would try to keep it as low as possible, whereas the target firm would seek to keep it as high as possible. Larson and Gonedes<sup>2</sup> have developed a model which defines the boundaries for exchange rate determination. Their model holds that each firm will ensure that its equivalent price per share will be at least maintained as a sequel to the merger. Their model has been presented in somewhat simpler terms by Conn and Nielson<sup>3</sup>, employing the following symbols: ER is the exchange ratio,  $P$  is the price per share, EPS is the earnings per share, PE is the price-earnings multiple,  $E$  is the earnings,  $S$  is the number of outstanding equity shares, and AER is the actual exchange ratio.

In the discussion that follows, the acquiring, acquired, and combined firms will be referred to by subscripts 1, 2, and 12 respectively.

Firm 1 would insist that the wealth of its shareholders is preserved. This implies that the price per share of the combined firm is at least equal to the price per share of firm 1 prior to the merger:

$$P_{12} \geq P_1 \quad (34.6)$$

For the sake of simplicity, the equality relationship will be used:

$$P_{12} = P_1 \quad (34.6a)$$

The market price per share of the combined firm is expressed as the product of price earnings ratio and earnings per share:

$$P_{12} = (\text{PE}_{12})(\text{EPS}_{12}) = P_1 \quad (34.7)$$

The earnings per share of the combined firm is expressed as:

$$\text{EPS}_{12} = \frac{E_1 + E_2}{S_1 + S_2(\text{ER}_1)} \quad (34.8)$$

In Eq. (34.8),  $\text{ER}_1$  represents the number of shares of firm 1 given in lieu of one share of firm 2.

Given the above expression for  $\text{EPS}_{12}$ , Eq. (34.7) may be restated as:

$$P_1 = \frac{(\text{PE}_{12})(E_1 + E_2)}{S_1 + S_2(\text{ER}_1)} \quad (34.9)$$

Solving Eq. (34.9) for  $\text{ER}_1$  yields:

$$\text{ER}_1 = \frac{-S_1}{S_2} + \frac{(E_1 + E_2)\text{PE}_{12}}{P_1 S_2} \quad (34.10)$$

To understand the nature of Eq. (34.10) and some other relationships, let us look at a numerical example. Firms 1 and 2 are discussing a merger deal in which firm 1 will acquire firm 2. The relevant information about the firms are given in Exhibit 34.4.

#### Exhibit 34.4

#### Relevant Information for Firms 1 and 2

	<i>Firm 1</i>	<i>Firm 2</i>
Total earnings, $E$	₹ 18 bln	₹ 6 bln
Number of outstanding shares, $S$	9 bln	₹ 6 bln
Earnings per share, EPS	₹ 2	₹ 1
Price/earnings ratio, PE	12	8
Market price per share, $P$	₹ 24	₹ 8

Plugging the data from Exhibit 34.4 in Eq. (34.10), we get:

$$\begin{aligned} ER_1 &= \frac{-9}{6} + \frac{(18+6)}{24(6)} PE_{12} \\ &= -1.5 + 1/6 PE_{12} \end{aligned} \quad (34.11)$$

The maximum exchange ratio acceptable to the shareholders of firm 1 for some illustrative values of  $PE_{12}$  is shown below:

$PE_{12}$	9	10	11	12	15	20
Max $ER_1$	0	0.17	0.33	0.50	1.0	1.83

Having discussed the maximum exchange ratio acceptable to the shareholders of firm 1, let us now turn our attention to the minimum exchange ratio required by the shareholders of firm 2 in order to preserve their wealth. The basic requirement here is:

$$P_{12} (ER_2) \geq P_2 \quad (34.12)$$

Using the equality form of relation (34.12) and expressing  $P_{12}$  as the product of  $EPS_{12}$  and  $PE_{12}$  we get:

$$(PE_{12}) (EPS_{12}) ER_2 = P_2 \quad (34.13)$$

Replacing  $EPS_{12}$  in Eq. (34.13) with its value as given in Eq. (34.8), yields:

$$PE_{12} = \frac{E_1 + E_2}{S_1 + S_2(ER_2)} \times ER_2 = P_2 \quad (34.14)$$

Solving Eq. (34.14) for  $ER_2$  gives:

$$ER_2 = \frac{P_2 S_1}{(PE_{12})(E_1 + E_2) - P_2 S_2} \quad (34.15)$$

Plugging the data given in [Exhibit 34.4](#) in [Eq. \(34.15\)](#) we get:

$$\begin{aligned}
 ER_2 &= \frac{(8)9}{24 PE_{12} - 8(6)} \\
 &= \frac{72}{24 PE_{12} - 48} \\
 &= \frac{3}{PE_{12} - 2}
 \end{aligned} \tag{34.16}$$

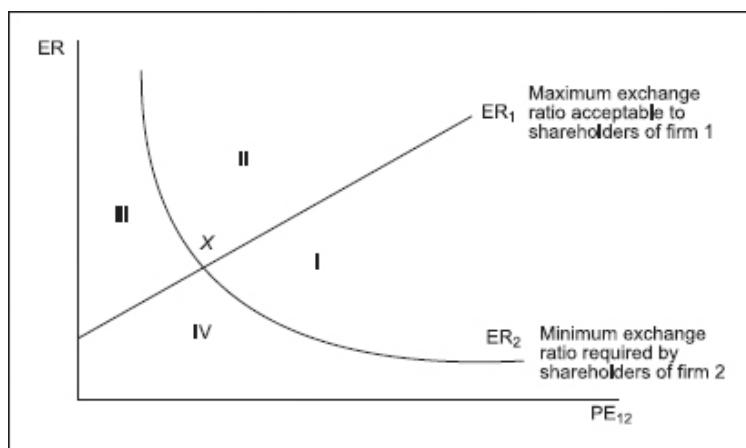
The minimum exchange ratio acceptable to the shareholders of firm 2 for some illustrative values of  $PE_{12}$  is given below:

$PE_{12}$	3	9	10	11	12	15	20
Min $ER_2$	3	0.43	0.38	0.33	0.30	0.23	0.17

[Exhibit 34.5](#) shows how maximum  $ER_1$  and minimum  $ER_2$  behave with changes in  $PE_{12}$ . From [Exhibit 34.5](#) we find that:

- The lines  $ER_1$  and  $ER_2$  intersect at X. At that point  $ER_1 = ER_2 = 0.333$ . The  $PE_{12}$  corresponding to this point is the weighted arithmetic average of the PE ratios of the firms 1 and 2, wherein the weights correspond to the respective earnings of the two firms ( $PE_{12} = 18/24 PE_1 + 6/24 PE_2$ ).
- Four quadrants are formed by the two lines  $ER_1$  and  $ER_2$  : I, II, III, and IV. Given the wealth constraint, the actual exchange ratio (AER) should lie in quadrant I in which shareholders of both the firms benefit from the merger. In the remaining three quadrants, shareholders of either or both the firms will suffer a loss of wealth. Hence they do not represent feasible quadrants.

### Exhibit 34.5 Influence of $PE_{12}$ on Merger Gain and Losses



## 34.6 PURCHASE OF A DIVISION/PLANT

With the step-up in corporate restructuring activity, purchase and sale of divisions or plants are becoming commonplace. Here are some prominent examples of recent years:

- Lafarge bought the cement plant of TISCO.
- SRF Limited bought the nylon tyre cord division of CEAT.
- Heinz India Limited bought the foods division of Glaxo India Limited.
- Abbot Laboratories bought the domestic formulations business of Piramal Healthcare in 2010 for ₹ 17000 crore (\$ 3.72 Billion).

The counterpart of purchase is divestiture. If firm *A* purchases a plant or factory or business division of firm *B*, from the point of firm *B*, it represents a divestiture. Purchases (and divestitures) are expected to grow in importance in the years to come as firms restructure themselves with greater freedom in the more liberalised economic environment.

How should such a purchase be valued? In principle, the value of a purchase is equal to future benefits (free cash flow plus horizon value) discounted at the opportunity cost of capital. This section discusses a procedure for valuing a purchase as per this principle, presents a numerical example to illustrate the procedure, and explores alternative ways of getting a handle over the horizon value (which is often the most significant component of valuation).

## Valuing a Purchase

When a company purchases a division of another company or when a company takes over another company by acquiring a controlling equity stake, it has to put a value on the ownership position acquired – in the case of purchase of a division the bidder company acquires hundred percent ownership, whereas in the case of a takeover of a firm, the bidder firm often acquires a lower ownership position (usually 30 to 80 percent).

The value of the ownership position in the target entity (division or firm) is:

$$\text{Proportion of ownership acquired} \left[ \frac{\text{Enterprise value of the target entity}}{\text{target entity}} - \frac{\text{Value of the debt of the target entity}}{\text{target entity}} \right]$$

As the proportion of ownership acquired and the value of the debt of the target entity can be easily defined, our discussion will focus on determining the enterprise value of the target entity. The valuation of an acquisition is conceptually similar to the valuation of any firm. However, it often becomes more complex because of the existence of control and synergy premiums. A good way to value an acquisition target is to start with the *status quo* value and then add the value for control and the value for synergy.

## **Status Quo Value**

Two methods are commonly used to determine the *status quo* value: discounted cash flow (DCF) method and the market multiple method.

**DCF Method** The DCF value of a firm (or business division) is the present value of the free cash flows generated in future. In practice, future is divided into two parts, the explicit forecast period and the balance period. The explicit forecast period is the period (usually 5 to 10 years) during which the firm is expected to evolve rapidly. The balance period is the remaining period in which the firm is expected to be in a “steady state”.

The DCF method of firm valuation involves three basic steps.

**Step 1** *Define the present value of the free cash flow from the purchase.* The free cash flow (FCF) from a purchase is the cash flow generated by it after providing for additional investments required for its operations. It is generally defined from the perspective of total funds committed to the project (which, here, is in the nature of a purchase). It is expressed as:

Net operating profit adjusted for taxes (NOPAT) – Net investment

NOPAT is equal to: Profit before interest and tax (1 – tax rate). ‘Net investment’ is simply: Gross investment in fixed assets and current assets – Depreciation.

The time horizon ( $H$ ) for defining the free cash flow is selected in such a way that beyond the horizon period the growth rate of free cash flow is constant. Thus, if after six years the growth rate of free cash flow is expected to be constant, say 8 percent, the time horizon for defining the free cash flow will be 6 years.

The present value of the FCF from the purchase is:

$$PV(FCF) = \frac{FCF_1}{(1+r)} + \frac{FCF_2}{(1+r)^2} + \dots + \frac{FCF_H}{(1+r)^H}$$

The discount rate,  $r$ , must reflect the opportunity cost of capital.

**Step 2** *Establish the horizon value and discount it to the present time.* The horizon value ( $V_H$ ) of a purchase refers to the value placed on it on the horizon date, which is simply the terminal point of the horizon period used for defining the free cash flow. Since the free cash flow is expected to grow at a constant rate beyond the horizon period, the horizon value is equal to:

$$V_H = \frac{FCF_{H+1}}{r-g}$$

The present value of the horizon value is:

$$\frac{V_H}{(1+r)^H}$$

**Step 3** Add the present value of free cash flow and horizon value to get the value of purchase. The value of the purchase,  $V_0$  is simply:

$$V_0 = \underbrace{\frac{FCF_1}{(1+r)} + \frac{FCF_2}{(1+r)^2} + \cdots + \frac{FCF_H}{(1+r)^H}}_{PV \text{ (free cash flow)}} + \underbrace{\frac{V_H}{(1+r)^H}}_{PV \text{ (horizon value)}}$$

The DCF method may be illustrated with the help of an example. Global Limited is interested in acquiring the foods division of Regional Company. The forecast of free cash flow for the proposed purchase, as developed by Global Limited, is shown in [Exhibit 34.6](#). It is based on the following assumptions: (i) the growth rate in assets and revenue will be 20 percent for the first three years, 12 percent for the next two years, and 8 percent thereafter and (ii) the ratio of NOPAT to net assets would be 0.12. The opportunity cost of capital is 11 percent.

Looking at [Exhibit 34.6](#) we find that after six years the free cash flow is expected to grow at a constant rate of 8 percent. So, we set the horizon period at six years.

### Exhibit 34.6 Free Cash Flow

Year	₹ in million)						
	1	2	3	4	5	6	7
Asset value(Beg)	50.00	60.00	72.00	86.40	96.77	108.38	117.05
NOPAT	6.00	7.20	8.64	10.37	11.61	13.00	14.05
Net investment	10.00	12.00	14.40	10.37	11.61	8.67	9.36
FCF	(4.00)	(4.80)	(5.76)	–	–	4.33	4.69
Growth rate(%)	20	20	20	12	12	8	8

$$PV(FCF) = \frac{-4.00}{(1.11)} + \frac{-4.80}{(1.11)^2} + \frac{-5.76}{(1.11)^3} + \frac{0}{(1.11)^4} + \frac{0}{(1.11)^5} + \frac{4.33}{(1.11)^6} \\ = -₹ 9.40 \text{ million}$$

The horizon value at the end of six years, applying the constant growth model, is:

$$V_H = \frac{FCF_{H+1}}{r-g} = \frac{4.69}{0.11-0.08} = ₹ 156.33 \text{ million}$$

The present value of  $V_H$  is:

$$\frac{156.33}{(1.11)^6} = ₹ 83.58 \text{ million}$$

Adding the present value of free cash flow and the present value of horizon value, gives the value of acquisition:

$$V_0 = -9.40 + 83.58 = ₹ 74.18 \text{ million}$$

In the above illustration, the present value of horizon value is equal to 113 percent of the value of acquisition [ $PV(V_H)/V_0 = 1.13$ ]. Does it not make you uncomfortable? A little further analysis reveals that the horizon value changes sharply with changes in the underlying assumptions. For example, if the long-term growth rate is 9 percent, rather than 8 percent, the horizon value rises to ₹ 234.5 million. Likewise, if the long-term growth rate is 7 percent, and not 8 percent, the horizon value falls to ₹ 117.25 million.

Given the sensitivity of horizon value to changes in the underlying factors, you can be mechanically correct but practically wrong in applying the constant growth model to estimate the horizon value. It is helpful to look at some other methods as well to get a handle over the horizon value. Financial analysts commonly use the market multiple method.

**Market Multiple Method** Common sense and economic logic tell us that similar assets should sell at similar prices. Based on this principle, you can value a business by looking at the valuation of similar businesses.

Suppose you want to value the cement division of a conglomerate company which is currently producing a NOPAT of ₹ 500 million. Looking at the valuation of cement companies, you find that companies which have comparable cement plants are trading in the market at 6 times their NOPAT. So, as a first approximation you may put a value of ₹ 3000 million on the cement division under review.

In the above example, you looked at the market value – NOPAT multiple. Financial analysts consider other multiples as well, such as the market value – sales multiple, market value – PBDIT multiple, and market value – book value multiple.

Admittedly, the market multiple method has its own limitations. One can argue that the multiples have weak and ill-defined conceptual underpinnings; that there are problems in measuring true profit; that distortions are created by arbitrary accounting policies; that there are difficulties in finding comparable companies and so on.

Not notwithstanding these limitations, the perspectives provided by the market multiples are very useful. To reject them would be to ignore relevant

evidence.

## **Value of Control and Value of Synergy**

**Value of Control** Acquiring firms often are willing to pay a price that is higher than the *status quo* value for the right to control the management of target firms.

The value of control stems from the changes that can be made to improve performance. Investments can be made for debottlenecking capacity, redundant assets can be liquidated, operations can be streamlined, financing structure can be changed, managerial systems and processes can be strengthened, more competent people can be brought in, so on and so forth. The value of control can be defined as follows:

$$\text{Value of control} = \text{Value of the firm, if it is optimally managed} - \text{Value of the firm with current management}$$

Clearly, the value of control is substantial if the firm is currently being run very inefficiently and the scope for improvements is considerable. On the other hand, the value of control is negligible if the firm is being managed efficiently.

**Value of Synergy** In most acquisitions, there is a potential for synergy which may come in one or more of the following ways:

- Lower operating costs due to economies of scale
- Savings in outlays on R & D, advertising, marketing, and various shared services
- Higher growth rate because of greater market power of the combined entity
- Longer growth period from enhanced competitive advantages
- Lower cost of capital due to higher debt capacity
- Better utilisation of tax shelters

Valuing synergy may not be easy because synergy is easy to imagine but difficult to realise.

## **Biases in Valuation**

The process of acquisition valuation is susceptible to biases because the managements of both the bidder and target firms want to justify their positions to their shareholders. The bidder firm seeks to convince its shareholders that it is buying the target firm cheaply. In a friendly acquisition, the target firm strives to tell its shareholders that it is getting a fair price (i.e., it is getting at least what it is worth). In a hostile acquisition, the roles reverse. The bidder firm tries to convince the shareholders of the target firm that they are getting a fair price and the target firm argues otherwise.

If the DCF method is used, variables like return on invested capital, growth rate trajectory, and cost of capital may be tweaked to justify a given valuation figure. If the market multiple method is used, the choice of the comparable firm and the choice of the market multiple may be tailored to rationalise the conclusion one wants to reach.

## 34.7 ■ TAKEOVERS

A takeover generally involves the acquisition of a certain block of equity capital of a company which enables the acquirer to exercise control over the affairs of the company. In theory, the acquirer must buy more than 50 percent of the paid-up equity of the acquired company to enjoy complete control. In practice, however, effective control can be exercised with a smaller holding, usually between 30 and 40 percent, because the remaining shareholders, scattered and ill-organised, are not likely to challenge the control of the acquirer. A takeover is **friendly** if the incumbent management supports it and is **hostile** if it opposes it.

Takeovers have become commonplace in the Indian corporate world. Some of the prominent transactions of recent years are the takeover of INDAL by HINDALCO, IPCL by Reliance Industries, VSNL by Tatas, BALCO by Sterlite Industries, and Ranbaxy Laboratories by Daichi Sankyo.

A takeover may be done through the following ways:

*Open market purchase* The acquirer buys the shares of the listed company in the stock market. Generally, hostile takeovers are initiated in this manner.

*Negotiated acquisition* The acquirer buys shares of the target company from one or more existing shareholders – who are likely to be promoter shareholders – in a negotiated transaction.

*Preferential allotment* The acquirer buys shares of the target company through a preferential allotment of equity shares. Obviously, such an acquisition is a friendly acquisition meant to give the acquirer a strategic stake in the company and also infuse funds into the company.

## Pros and Cons

Takeovers often generate a lot of controversy. As DePamphilis put it: “The corporate takeover has been dramatised in Hollywood as motivated by excessive greed, reviled in the press as a destroyer of jobs and of local communities, sanctified on Wall Street as a means of dislodging incompetent management, and often heralded by shareholders as a source of windfall gains. The reality is that corporate takeovers may be a little of all of these things.”<sup>4</sup>

Proponents of takeover argue that takeovers improve the quality of management, facilitate forward and backward linkages with the other operations of the acquirer, and afford scope for realising synergistic benefits. T. Boone Pickens, Jr., a very eloquent votary of takeovers regards them as a device for punishing weak managements and protecting the interests of the small shareholders. The leitmotif of a book<sup>5</sup> written by him is that companies should be run in the interest of shareholders and not management or, as some executives claim, “the society at large”. He defends takeovers as a device to protect the interest of shareholders.

Pickens’ view, of course, has been disputed vigorously by the opponents of takeovers. Warren Law<sup>6</sup>, in a very incisive criticism, challenged the premise of Pickens that takeovers help in rescuing poorly managed companies from inept managers. According to Law, managers do much more for their companies and shareholders than the raiders (or predators) who are primarily motivated by a desire to make a ‘fast buck’ and see their pictures on magazine covers. Peter Drucker<sup>7</sup>, too, strongly opposed takeovers. He argued forcefully that if managers have a responsibility towards shareholders, then the latter should also have a reciprocal responsibility towards the former for the larger good of society.

Scientific research, however, supports takeovers. Michael Jensen and Richard S. Ruback<sup>8</sup>, who have summarised the scientific evidence, say: “In brief, the evidence seems to indicate that corporate takeovers generate positive gains, that target firm shareholders benefit, and that bidding firm shareholders do not lose. Moreover, the gains created by corporate takeovers do not appear to come from the creation of market power. Finally, it is difficult to find managerial actions related to corporate control that harm shareholders.”

## **Regulation of Takeovers**

Takeovers may be regarded as a legitimate device in the market for corporate control provided they are properly regulated by the following principles:

**Transparency of the Process** A takeover affects the interests of many parties and constituents such as shareholders, employees, customers, suppliers, contending acquirers, creditors, and others. Hence it should be conducted in an open manner. If the process is transparent, takeovers will be regarded by various constituents as a legitimate device in the market for corporate control.

**Interest of Small Shareholders** In a takeover the ‘controlling block’ which often tends to be between 30 and 60 percent is usually acquired from a single seller (occasionally it may be acquired from several sellers through market purchases). Typically the ‘controlling block’ is bought at a negotiated price which is higher than the prevailing market price. What happens to the other shareholders? The takeover code should ensure that the other shareholders should not suffer any disadvantage.

**Realisation of Economic Gains** The primary economic rationale for takeovers should be to improve efficiency of operations and promote better utilisation of resources. In order to facilitate the realisation of these economic gains, the acquirer must enjoy a reasonable degree of latitude to restructure the operations, widen the product range, redeploy the resources, and so on. In addition, suitable fiscal incentives, particularly when takeovers contribute to rehabilitation of ailing units, must be provided.

**No Undue Concentration of Market Power** While the regulatory framework must be conducive to the realisation of economic gains, it must prevent concentration of market power. The acquirer should not, as a result of the takeover, enjoy undue market power which can be used to the detriment of customers and others.

In this context, an index like the Herfindahl – Hirschman Index (HHI) used by the Department of Justice in the U.S. may be examined. This index takes into account the market shares of all the firms in the industry. For example, if three firms hold a 20 percent market share each and 10 firms hold 4 percent market share each, the HHI would be:  $3 (20)^2 + 10 (4)^2 = 1,360$ . On the other hand, if one firm holds a 52 percent market share and 12 firms

hold 4 percent market share each the HHI would be:  $(52)^2 + 12(4)^2 = 2,896$ . The HHI reflects inequality as well as the degree of concentration.

**Financial Support** If takeovers are regarded as useful devices for improving the quality of management and efficiency of operations, they should not remain the preserve of those who are financially strong. Suitable financial mechanisms should be developed to enable competent persons, irrespective of their financial resources, to participate in takeover exercises. Successful entrepreneurs and managers with proven abilities and track record should have access to funds provided by financial institutions or investors through the capital market to support their takeover proposals.

## **SEBI Takeover Code**

The key provisions of the SEBI Takeover Code are as follows:

- 1. Disclosure** Any acquirer who acquires shares or voting rights in a company (hereinafter called holdings), which when aggregated with the existing stock of such holdings of the acquirer in the company exceed 5 percent, shall disclose at every stage of the aggregate of the holdings to the company and to the concerned stock exchange(s). The stock exchanges shall put such information under public display immediately.
- 2. Trigger Point** No acquirer shall acquire holdings which, when aggregated with the existing stock of such holdings of the acquirer in the company, equal or exceed 25 percent of the total, unless such an acquirer makes a public announcement to acquire shares through a public offer to the extent stipulated in the code (currently 26 percent).
- 3. Merchant Banker** Before announcing a public offer, the acquirer has to appoint a Category I merchant banker registered with SEBI. The merchant banker should ensure that the public announcement of the offer is made in terms of the regulations, the acquirer is able to implement the offer, and that firm arrangements for funds to fulfill the obligations under the offer are in place.
- 4. Public Announcement** The merchant banker should make a public announcement within four working days of the agreement or the decision to acquire shares/voting rights in excess of the specified percentages. The public announcement shall, *inter alia*, provide information about the number of shares proposed to be acquired, the minimum offer price, object of acquisition, the date by which the letter of offer will be posted, and the opening and closing dates of the offer.
- 5. Offer Price** The offer price to the public is subject to certain guidelines.
- 6. Obligations of the Acquirer** The acquirer must ensure that the letter of offer reaches shareholders within 45 days from the date of public announcement and payment is made to shareholders who have accepted the offer within a period of 30 days from the date of the closure of offer.
- 7. Obligations of the Board of the Target Company** Unless the approval of the general body of shareholders is obtained after the date of the public announcement of the offer, the Board of Directors

of the target company cannot dispose assets, issue capital, enter into material contracts, or appoint additional directors during the period of public offer.

8. **Competitive Bids** Subject to certain conditions, competitive bids can be made within a period of 21 days of the public announcement of the first offer and, in response, the acquirer who made the earlier offer can revise the offer.
9. **Provision of Escrow** As a security for performance, the acquirer is required to deposit at least 25 percent of the consideration payable for the public offer upto ₹ 100 crore and 10 percent of the consideration exceeding ₹ 100 crore in an escrow account. When an offer is subject to a minimum level of acceptance, the acquirer is required to deposit at least 50 percent of the consideration payable for the public offer in an escrow account. The escrow account should consist of cash deposits, or bank guarantee in favour of the merchant banker, or deposit of acceptable securities with appropriate margin with the merchant banker.
10. **Creeping Acquisition** No acquirer together with persons acting in concert can acquire more than 5 percent of holdings in any financial year ending 31<sup>st</sup> March without complying with the open offer requirements, if the existing holdings are between 15 percent and 75 percent. In other words, such acquirer who already has more than 15 percent can do a creeping acquisition of up to 5 percent per year without triggering off the open offer requirements. However, any such purchase or sale transaction amounting to 2 percent or more of the share capital of the target company shall be reported within two days in the same manner as described in the above point relating to disclosure.

The purpose of SEBI guidelines is to (i) impart greater transparency to takeover deals, (ii) ensure a greater amount of disclosure through public announcement and offer document, and (iii) protect the interest of small shareholders.

## Pricing Guidelines Under SEBI Takeover Code

The minimum price for the open offer shall be the highest of the following:

- The highest negotiated price per share of the target company for any acquisition under the agreement attracting the obligation to make a public announcement of an open offer.
- The volume-weighted average price paid or payable for acquisitions, whether by the acquirer or by any person acting in concert with him, during the fifty-two weeks immediately preceding the date of the public announcement.
- The highest price paid or payable for any acquisition, whether by the acquirer or by any other person acting in concert with him, during the twenty-six weeks immediately preceding the date of the public announcement.
- The volume-weighted average market price of such shares for a period of sixty trading days, immediately preceding the date of the public announcement as traded on the stock exchange where the maximum volume of trading in the shares of the target company, are recorded during such period, provided such shares are frequently traded. “Frequently traded shares” means shares of a target company, in which the traded turnover on any stock exchange during the twelve calendar months preceding the calendar month in which the public announcement is made, is at least ten percent of the total number of shares of such class of the target company.
- Where the shares are not frequently traded, the price determined by the acquirer and the manager to the open offer taking into account valuation parameters including book value, comparable trading multiples, and such other parameters as are customary for valuation of shares of such companies.

The new takeover code requires acquirers to make an open offer for an additional 26 percent equity stake after purchasing 25 percent stake. This enables acquirers an easier opportunity to gain control of target companies. So, one can expect more hostile takeovers in future. Companies which have hidden values like IPR (intellectual property rights), huge real estate, and unlisted subsidiaries would perhaps be more vulnerable to such hostile takeovers.

However, in a country where most companies are run by promoters who manage to safeguard their position by various means, hostile bids would

face hurdles. For example, the first such move made by Lord Swaraj Paul who tried to wrest control of Escorts and DCM was thwarted by the incumbent promoters. More recently, EIH prevented ITC, which had accumulated EIH shares in the last few years, from launching a takeover bid by selling a stake in the company to Reliance Industries Limited. Apart from such hurdles, funds for hostile bids are not easily available at present.

### **How a Swiss Multinational Acquired Control of ACC**

Ambuja Cement India Ltd (ACIL), a subsidiary of Gujarat Ambuja Cements Ltd (GACL), was holding 13.82 percent of the equity voting capital of ACC. Holcim, through its Mauritius subsidiary Holderind Investments Ltd. first bought 40 percent of ACIL's equity held by three private investment companies based there. A preferential allotment of equity was then made by ACIL to Holcim's Indian investment company Holdcem Cements Private Limited, in such a way that GACL's stake therein came down from 60 to 33 percent and that of Holcim group went upto 67 percent. Also, ACIL issued cumulative redeemable preference shares for about ₹ 8100 million to Holderind Investments Ltd to fund its acquisition of ACC shares. An open offer at ₹ 370 per share was then made to the shareholders of ACC, aiming to increase its total equity voting capital in ACC to 52.66 percent. This issue got a reasonable response resulting in ACIL increasing its equity voting stake to 34.71 percent, giving it and, through it, Holcim, effective control of ACC.

## **Anti-takeover Defences**

A wide range of anti-takeover defences have been employed by target companies to ward off bidders, particularly in the U.S. which has a long and colourful history of takeovers. These defences which fall into two broad categories, viz., pre-offer defences and post-offer defences, are briefly described below.

### **Pre-offer Defences**

<i>Staggered board</i>	The board comprises of three equal groups of directors. Each year one group is elected.
<i>Super majority clause</i>	A very high percentage of votes, usually 80 percent or so, is required to approve a merger.
<i>Poison pills</i>	Existing shareholders are granted the right to buy bonds or preference stock that get converted into the stock of the acquiring firm, in the event of a merger, on very favourable terms.
<i>Dual class</i>	A new class of equity shareholders which enjoys superior voting rights is created.
<i>Golden parachute</i>	The incumbent management is entitled to receive fabulous compensation in the event of takeover.

### **Post-offer Defences**

<i>Greenmail</i>	The target company agrees to buy the shares acquired by the bidder at a premium in exchange for the bidder's promise to refrain from hostile takeover.
<i>Pacman defence</i>	The target company makes a counter bid for the stock of the bidder.
<i>Litigation</i>	The target company files a suit against the bidding company for violating anti-trust or securities laws.
<i>Asset restructuring</i>	The target company sells its most precious assets, the 'crown jewels', and/or buys assets the bidder does not want or that may pose anti-trust problems for it.
<i>Liability restructuring</i>	The target company repurchases its own shares at substantial premium or issues shares to a friendly third party.

Most U.S. firms employ at least one anti-takeover defence. The two popular defences are the staggered board and the poison pill. The former is employed by nearly 60 percent of the large companies to prevent an acquirer from changing the entire board at will. The latter, employed by about 50 percent of the large companies, makes a company a prohibitively expensive target.

**Anti-takeover Defences in India** Companies in India have fewer anti-takeover defences available to them, compared to their U.S. counterparts. In order to ward off a takeover attempt, companies in India presently invoke one or more of the following defences.

*Make Preferential Allotment* A company may allot equity shares or convertible securities on a preferential basis to the promoter group so that its equity stake is enhanced.

*Effect Creeping Enhancement* As per SEBI guidelines, the promoter group can raise its equity holding by creeping enhancements, subject to limits, without invoking the provision to make an open market offer.

*Amalgamate Group Companies* Two or more companies promoted by the same group may be amalgamated to form a larger company. Other things being equal, a larger company is less vulnerable to a takeover in comparison to a smaller company.

*Sell the Crown Jewels* If the raider is tempted by certain valuable assets of the target company, the target company may sell those assets to make itself unattractive.

*Search for a White Knight* A company under siege may look for support and help from its friends. It may solicit a white knight to rescue it from the clutches of the raider.

## 34.8 ■ LEVERAGED BUYOUTS

A leveraged buyout involves transfer of ownership consummated mainly with debt. While some leveraged buyouts involve a company in its entirety, others involve a business unit of a company. Often the business unit is bought out by its management and such a transaction is called a management buyout (MBO). After the buyout, the company (or the business unit) invariably becomes a private company.

To illustrate the essence of a leveraged buyout transaction, a simple example may be given. Trilok Limited has three divisions, namely the plastics division, the textiles division, and the garments division. Trilok is interested in divesting the plastics division. While the assets of this division have a replacement cost of ₹ 140 million, they will fetch only ₹ 90 million if liquidated. Trilok is willing to sell the division if it gets ₹ 100 million. Four key executives of the plastics division are keen on acquiring it through a leveraged buyout operation. They are willing to invest ₹ 8 million. They approach Financial Engineering Limited (FEL), a merchant banking firm, for assistance. FEL prepares projections for the plastics division on the assumption that it will be run as an independent company by the four key executives. FEL figures out that the cash flows of this operation would support a debt of ₹ 100 million. FEL finds a finance company which is willing to provide debt finance to the extent of ₹ 85 million for the project. FEL also locates a private investor who is prepared to invest ₹ 7 million in the equity of this project. The plastics division of Trilok is acquired by an independent company, run by the four key executives, which is financed through ₹ 85 million of debt and ₹ 15 million of equity (₹ 8 million is contributed by the four key executives and ₹ 7 million by the private investor).

**What Does Debt Do?** A leveraged buyout entails considerable dependence on debt. What does it imply? Debt has a bracing effect on management, whereas equity tends to have a soporific influence. Debt spurs management to perform, whereas equity lulls management to relax and take things easy. As G. Bennett Stewart III and David M. Glassman put it: “Debt is ‘just-in-time’ financial system. The precise obligation to repay it is another mechanism to squeeze operating inefficiencies. Leaving no margin the consequences of making a mistake ensures that fewer mistakes are made.”<sup>9</sup> In a similar vein they added: “Equity is soft, debt hard. Equity is

forgiving, debt insistent. Equity is a pillow, debt a sword. Equity and debt are the yin and yang of corporate finance.”<sup>10</sup>

**Risks and Rewards** The sponsors of a leveraged buyout are lured by the prospect of wholly (or largely) owning a company or a division thereof, with the help of substantial debt finance. They assume considerable risks in the hope of reaping handsome rewards. The success of the entire operation depends on their ability to improve the performance of the unit, contain its business risks, exercise cost controls, and liquidate disposable assets. If they fail to do so, the high fixed financial costs can jeopardise the venture.

**How Is Value Created?** Three factors, in the main, seem to help create value in an LBO:

- Operational improvements increase the enterprise value.
- Operating cash flows are used to repay debt, thereby increasing the equity shareholders' share of enterprise value.
- The interest on debt brings tax shield.

**What Makes a Good LBO Candidate** The following characteristics of a firm or division make it a good LBO candidate.

- Good management team.
- Stable cash flows.
- Potential for operational improvement.
- Flexibility in disposing redundant assets.
- Limited capital expenditure needs.
- Ease of exit.

**KKR's Success Formula** Kohlberg Kravis Robert & Co (KKR, hereafter) is a holding company which has acquired majority equity stakes in a number of companies including giants like RJR, the tobacco major, Safeway, a large grocery chain, Owen - Illinois, the largest manufacturer of glass in the U.S., and Duracell, the well known battery company.

Though its record is not without blemishes, KKR has been remarkably successful in creating value from wholly unrelated acquisitions despite paying substantial premiums.

What factors have contributed to the success of KKR? Three factors seem to stand out: a highly decentralised structure; an aggressive use of debt; a dynamic, not static, use of debt.

*Highly decentralised structure* KKR is an almost totally decentralised structure with a very small staff. It has to be that way. As Bennett Stewart

says: "KKR manages by motivation, not by mandate; by empowerment, not by punishment."<sup>11</sup>

*Aggressive use of debt* KKR borrows aggressively. However, its borrowings are decentralised, not centralised. It does not borrow at the parent level. Instead it borrows at the subsidiary level, so that the debts of individual LBO units are independent.

*Dynamic, not static use of debt* KKR does not try to maintain a fairly stable capital structure as many companies do. Instead, it strives to repay its LBO debt as soon as possible. However, once a KKR company retires its debt it is likely to try the risky LBO strategy once again. At KKR, LBOs are a way of life, not one-shot transactions.

### LBO of Tetley

Tata Tea acquired the Tetley brand in 2000 for £271 million. The modus operandi of this buyout was as follows:

- Tata Tea set up a special purpose vehicle (SPV) called Tata Tea (Great Britain).
- The SPV's equity of £70 million was subscribed to by Tata Tea (£ 60 million) and Tata Tea Inc. (£ 10 million). Tata Tea Inc. is a US based subsidiary of Tata Tea.
- The SPV raised £ 235 million of debt in four tranches, A, B, C, and D, of tenors varying from 7 to 9.5 years at a coupon of around 11 percent (424 basis points above LIBOR).
- The balance sheet of the SPV after the acquisition of Tetley brand was as follows:

		Million £	
<i>Liabilities</i>		<i>Assets</i>	
■ Equity	70	■ Tetley assets	271
■ Debt	235	■ Expenses	9
	305	■ Working capital	25
	305		305

## 34.9 ■ ACQUISITION FINANCING

Corporate India has been aggressively pursuing overseas acquisitions in recent years. Some of the prominent transactions have been Dr. Reddy's Laboratories' acquisition of Betapharm for \$570 million, Suzlon Energy's acquisition of Hansen Transmission for \$565 million, Tata Steel's acquisition of Corus for \$12.9 billion, Hindalco's acquisition of Novelis for \$ 6 billion, and Bharti Airtel's acquisition of Zain's African assets for \$ 10.7 billion. Aiding and abetting such transactions is the acquisition financing provided by banks like Citi, Deutsche Bank, Stanchart, and ICICI Bank, which now have dedicated teams for acquisition financing. The common features of acquisition financing are as follows:

- The loan is given either to the overseas subsidiary of the Indian company or a special purpose vehicle formed overseas for the purpose of acquisition.
- Financing is provided by foreign banks and overseas entities of Indian banks on the strength of the guarantee provided by the Indian parent.
- Lenders take a view on the acquirer's cash flow to determine their support. The quantum of financing normally ranges between 3 to 6 times EBITDA, depending on factors like quality of products, quality of management, regulatory environment, and sustainability of cash flows.
- The cost of financing depends on the strength of the acquisition target, the resourcefulness of the parent company, the legal recourse available to the lenders and the layer of debt the bank is participating in – senior debt, mezzanine debt, subordinated debt, or junk debt (this is yet to catch on). Typically, the cost of acquisition financing is about 200 basis points (with a range of 25 basis points to 500 basis points) higher than the normal financing costs.

**Financing of Tata Steel's Acquisition of Corus** In October 2006, Tata Steel Limited submitted a bid to acquire the UK based steel making company viz., Corus Group plc (Corus). After several twists and turns and increase in the bid price, the acquisition was completed on April 2, 2007 for a net consideration of \$ 12.9 billion, through Tata Steel UK Limited, a wholly-owned indirect investment subsidiary of Tata Steel Limited.

Tata Steel UK Limited raised \$12.9 billion as follows: an infusion of \$ 4.1 billion as equity by Tata Steel Limited, a long-term debt of \$ 6.14 billion from a consortium of banks (with a non-recourse provision as far as Tata Steel is concerned), and the balance amount of \$ 2.66 billion through a long tenor quasi-equity or debt instrument.

To meet its contribution to the equity of Tata Steel UK Limited, Tata Steel Limited raised about \$ 4.2 billion: \$ 700 million from internal generation, \$ 500 million from external commercial borrowings, \$ 640 million from a preferential issue of equity shares to Tata Sons Limited, \$ 862 million from a rights issue of equity shares, \$ 1000 million from a rights issue of convertible preference shares, and about \$ 500 million from a foreign issue of equity-related instrument.

## 34.10 ■ BUSINESS ALLIANCES

Business alliances such as joint ventures, strategic alliances, equity partnerships, licensing, franchising alliances, and network alliances have grown significantly. In many situations, well-designed business alliances are viable alternatives to mergers and acquisitions. No wonder they have become commonplace in diverse fields like high-technology, media and entertainment, automobiles, pharmaceuticals, oil exploration, and financial services. Here are some conspicuous examples:

- General Motors and Toyota entered into an unprecedented joint venture agreement in the 1980s.
- Merck has over 100 R&D alliances with a variety of entities.
- In 1999, IBM announced business alliances worth \$ 30 billion with companies like Cisco and Dell computers.
- Oracle has over 15,000 alliances with its business partners.

Business alliances come in a variety of forms. The most commonly used forms are: joint ventures, strategic alliances, equity partnerships, licensing, franchising alliances, and network alliances.

## **Rationale for Business Alliances**

Business alliances are motivated by a desire to share risks and gain access to new markets, reduce costs, receive favourable regulatory treatment, or acquire (or exit) a business.

**Sharing Risks and Resources** Developing new technologies can be a very risky and expensive proposition. Further, such endeavours require pooling technical capabilities of different organisations. Hence, firms in high technology industries form business alliances so that diverse know-how can be pooled, adequate funding can be arranged, and acceptable risk sharing mechanisms can be worked out.

**Access to New Markets** The cost of accessing a new market may be prohibitive because huge outlays are required on advertising, promotion, warehousing, and distribution. To solve this problem, a company may enter into an alliance to market its products or services through the sales force, distribution outlets, or Internet site of another firm.

**Cost Reduction** Business alliances can help in reducing costs through sharing or combining of facilities in joint manufacturing operations and mutually beneficial purchaser-supplier relationships.

**Favourable Regulatory Treatment** Regulatory authorities like the Department of Justice in the U.S. generally look upon JVs more favourably than mergers or acquisitions.

**Prelude to Acquisition or Exit** A joint venture or strategic alliance may be a prelude to acquiring another company. Alternatively it may be used as a means for exiting a business.

## **What Makes a Business Alliance Succeed**

The following factors are critical to the success of a business alliance:

- The partners have complementary strengths.
- The cost of developing a new product is exorbitant for a single firm.
- The partners have the ability to cooperate with one another.
- There is clarity of purpose, roles, and responsibilities.
- The apportionment of risks and rewards are perceived as equitable by all parties.
- The partners have similar time horizons and financial expectations.

## 34.11 ■ MANAGING ACQUISITIONS

Several studies have shown that more often than not acquisitions destroy value for the shareholders of the acquiring company. For example, a 2008 BCG report said: “The key question is not whether deal volumes and values will fall or rise, but whether it is still [ever] possible to generate [any] value from [M&A] transactions!.. More than half of mergers destroy value for acquirer’s shareholders!”

### Collective Wisdom on Mergers and Acquisitions

The extensive research on mergers and acquisitions suggests the following:

- Mergers and acquisitions thrive during periods of stock market buoyancy.
- 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.
- Serial acquirers are likely to succeed more than infrequent buyers.
- Compared to purchase of public companies, acquisition of private companies is a more reliable way of adding value and generating superior returns for buyers.
- Related acquisitions are likely to generate higher returns than unrelated purchases.
- Integration is hard to pull off.

## **Five Sins of Acquisitions**

It appears that acquisitions are plagued by five sins: straying too far afield, striving for bigness, leaping before looking, overpaying, and failing to integrate well.

**Straying Too Far Afield** Very few firms have the ability to successfully manage diverse businesses. The temptation to stray into unrelated areas that appear exotic and very promising is often strong. However, the reality is that such forays are often very risky.

**Striving for Bigness** Size is perhaps a very important yardstick by which most organisations, business or otherwise, judge themselves. Hence, there is a strong tendency on the part of managers, whose compensation is significantly influenced by size, to build big empires. The concern with size may lead to unwise acquisitions.

**Leaping Before Looking** Failure to investigate fully the business of the seller is rather common. The problems here are: (i) the seller may exaggerate the worth of intangible assets (brand image, technical know-how, patents and copyrights, and so on), (ii) the accounting reports may be deftly window-dressed, and (iii) the buyer may not be able to assess the hidden problems and contingent liabilities or may simply brush them aside because of its infatuation with the target company.

**Overpaying** In a competitive bidding situation, the naïve ones tend to bid more. Often the highest bidder is one who overestimates value out of ignorance. Though he emerges as the winner he happens to be in a way the unfortunate winner. This is referred to as the "winner's curse" hypothesis.

**Failing to Integrate Well** Even the best strategy can be ruined by poor implementation. A precondition for the success of an acquisition is the proper post-acquisition integration of two different organisations. This is a complex task which may not be handled well.

## A Disciplined Acquisition Programme

Acquisitions are unique investment decisions because there are no dry runs, the entire money has to be paid upfront, exit costs after integration are prohibitively high, and managing a synergy in many ways is akin to managing a complex new venture. No wonder, acquirers have lost with impunity billions of dollars in their pursuit of poorly understood acquisitions. Given this empirical reality, Warren Hellman, a seasoned investment banker, says skeptically: "So many mergers fail to deliver what they promise that there should be a presumption of failure."

As acquisition premiums typically range between 20 percent and 60 percent of the pre-acquisition market value, an acquiring firm must formulate a clear and coherent strategy that will enable the firm to earn the premium that it will most probably have to pay. To improve the prospects for creating value, a company must:

- Focus on right targets
- Estimate synergies properly
- Negotiate in a disciplined manner
- Plan and control the integration

**Focus on Right Targets** Focus on where you have the potential to create value. For example, if your company is best in class in operations, consider under-performing companies that can be turned around, or if your company has a unique sales channel, search for companies with great products but weak sales capabilities. Develop a data base of prospective acquisition targets and update it periodically. Narrow the list by applying suitable screening criteria. For example, an acquirer may eliminate companies that are too large, or too small, or engaged in an unrelated business, or quoting at a high price-earnings multiple, or not amenable to acquisition, or culturally alien.

**Estimate Synergies Properly** Each candidate ought to be valued as realistically as possible. Valuation should not be clouded by wishful thinking and it should not be vitiated by an obsession to acquire the target company. Most important, valuation must not be exaggerated by considerations of 'synergistic benefits' which may be elusive rather than real. As Mark L. Sirover argues in his well-researched book *The Synergy Trap*<sup>12</sup>, the synergy trap opens for 8 out of 10 companies involved in major acquisitions because of poor pre-acquisition planning. He says that it is unrealistic to hope to gain two customers, but rather easy to lose two, as Unisys (the merger of

Burroughs and Sperry) and Novell (on its acquisition of Wordperfect) learned the hard way.

**Negotiate in a Disciplined Manner** Even when synergies are properly estimated, acquirers may succumb to the temptation to overpay. The process of negotiating acquisitions is notoriously susceptible to rising commitments. As Warren Buffett says, the thrill of the chase may blind the acquirer to the outcome thereof. Given this inherent pitfall, it makes sense to divide the task of acquisition analysis and negotiation between two teams. The first team should evaluate the acquisition target from the strategic, operating, and organisational points of view and prepare a game plan of what needs to be done to improve the overall performance. Ideally, it should consist of operating managers who would be entrusted with the responsibility of actually running the business if the deal goes through. The second team should consist of financial and legal persons entrusted with the task of carrying out the actual negotiations. It must retain the emotional capacity to withdraw from the deal unless the financial and legal terms are attractive.

**Plan and Control the Integration** The path of acquisition is strewn with problems. They may arise on account of differences in visions, strategies, values, culture, production methods and standards, accounting systems, administrative procedures, and so on. More important, they stem from personality clashes and the reaction of people affected by the acquisition.

The merging firms, obsessed by the merger passion, may cavalierly brush aside such problems. Yet, what needs to be done is precisely the opposite. A thoughtful attempt has to be made to think through the implications of the merger, anticipate problems that may arise, understand the nature of these problems, and hammer out a sensible and mutually acceptable way to handle these problems. Remember the advice of Willard F. Rockwell, Jr., a veteran of mergers: "The more thorns we extract at the outset, the less chance of infection later on."

## **34.12 ■ DIVESTITURES**

Mergers, asset purchases, and takeovers lead to expansion in some way or the other. They are based on the principle of synergy which says  $2 + 2 = 5!$  Divestitures, on the other hand, involve some kind of contraction. They are based on the principle of anergy which says  $5 - 3 = 3!$

Among the various methods of divestiture, the more important ones are partial sell-off, demerger (spinoff and split-up), and equity carveout. Note that some scholars define divestitures rather narrowly as partial selloff. We define divestitures more broadly to include partial selloffs, demergers, sale of equity stake, and so on.

## Partial Selloff

A partial selloff, also called slump sale, involves the sale of a business unit or plant of one firm to another. It is the mirror image of a purchase of a business unit or plant. From the seller's perspective, it is a form of contraction; from the buyer's point of view it is a form of expansion. For example, when Coromandal Fertilisers Limited sold its cement division to India Cement Limited, the size of Coromandal Fertilisers contracted whereas the size of India Cements Limited expanded.

### Biocon's Divestment of Enzymes Division

Biocon Limited started in 1978 with a focus on speciality enzymes. In 1998, it shifted course by leveraging its microbial enzyme fermentation technology to develop lovastatin, a cholesterol reducing small molecule whose patent was to expire in 2001. This move heralded Biocon's entry into biopharmaceuticals.

Thanks to the rapid growth of its biopharmaceuticals business, by 2007 its enzymes business, though quite profitable, accounted for less than 10 percent of its consolidated turnover. The opportunities in the enzymes business were huge but they called for substantial investment. At that critical juncture, Biocon decided to divest its successful and profitable enzymes business to Novozyme A/S, a global enzymes major for a consideration of \$115 million, to garner resources to move up the value chain in the biopharmaceuticals business.

**Motives for Selloff** Selloff decisions are prompted by a variety of motives. The more important ones are discussed below:

- *Raising capital* A common motive for sell-off is to raise capital. Cash strapped firms seem to resort to divestiture to shore up their liquidity. CEAT, for example, sold its nylon tyre cord plant at Gwalior to SRF for ₹ 3250 million so that it could settle its outstandings and raise funds to concentrate on tyre manufacturing.
- *Curtailment of losses* A prominent reason for sell-off is to cut losses. More broadly it may imply that the unit that is proposed to be divested is earning a sub-normal rate of return.
- *Strategic realignment* The seller may divest a unit which no longer fits with its strategic plan. Often such a unit tends to be in an unrelated line and may demand a lot of managerial time and attention. After divestment, the seller can concentrate on its core business. ICI appears to be a good example. It sold its fibre division to Terene Fibres India, fertilisers division to Chand Chap Fertilisers

and Chemicals, and seeds division to Hysum India. These sell-offs were meant to sharpen ICI's thrust on paints and industrial chemicals, in line with its parent's global strategy.

- **Focus** When unrelated activities are divested, the firm becomes more focused. Investment bankers believe that conglomerates sell at a discount because equity analysts find them difficult to follow. Michael Sherman argued differently: "It's not that conglomerates are difficult for analysts to understand. We worry that conglomerates are difficult for management to understand."
- **Efficiency gain** A sell-off results in an efficiency gain when the unit divested is worth more as part of some other firm or as a stand-alone business. This happens when there is a reverse synergy, sometimes referred to as 'anergy'. This means that the value of the parts is greater than the whole. In simple arithmetic, it implies that  $5 - 3 = 3!$  Remember that a merger is motivated by the possibility of synergistic benefit, where the whole is expected to be more valuable than the sum of the parts:  $2 + 3 = 6!$

**Financial Evaluation of a Sell-off** Typically, when a firm sells a division (or plant) to another company, it transfers the assets of the division along with the liabilities of the division, with the concurrence of the creditors. This means that the selling firm (referred to hereafter as the parent firm), in essence, transfers its ownership position in that division. To assess whether it is worth doing so from the financial point of view, the following procedure may be followed:

**Step 1 Estimate the divisional post-tax cash flow** The parent firm should estimate the post-tax cash flow relating to the operations of the division and the rest of the operations of the parent firm. The relevant issue in this context is: What happens to the post-tax cash flow of the parent company with the division and without the division? The difference between the two represents the post-tax cash flow attributable to the division.

**Step 2 Establish the discount rate for the division** The discount rate applicable to the post-tax cash flow of the division should reflect its risk as a stand-alone business. A suggested procedure is to look at the cost of capital of some firm (or a group of firms) engaged solely or substantially in the same line of business and that is about the same size and use it as a proxy for the division's cost of capital.

*Step 3 Calculate the division's present value* Using the discount rate determined in Step 2 calculate the present value of the post-tax cash flow developed in Step 1. This represents the current worth of the cash flow generating capability of the division.

*Step 4 Find the market value of the division-specific liabilities* The market value of the division-specific liabilities is simply the present value of the obligations arising from the liabilities of the division. Remember that the market value of the division-specific liabilities will be different from the book value of the division-specific liabilities if the contracted interest rates on those liabilities are different from the current interest rates.

*Step 5 Deduce the value of the parent firm's ownership position in the division* The value of the ownership position (VOP) enjoyed by the parent firm in the division is simply:

Present value of the division's – cash flow (Step 3)	Market value of the division-specific liabilities (Step 4)
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*Step 6 Compare the value of ownership position (VOP) with the divestiture proceeds (DP)* When a parent firm transfers the assets of a division along with its liabilities, it receives divestiture proceeds (DP) as compensation for giving up its ownership position in the division. So, the decision rule for divestiture would be as follows:

DP > VOP	Sell the division
DP = VOP	Be indifferent
DP < VOP	Retain the division

**Tax Aspects of a Sell-Off** A sell-off, called a slump sale in the tax parlance, refers to the transfer of one or more undertakings as a result of the sale for a lump sum consideration without assigning values to the individual assets and liabilities of the undertaking. Any profit or gains arising from the slump sale effected in the previous year shall be chargeable to tax as long term capital gains and shall be deemed to be the income of the previous year in which the transfer takes place. Where, however, any capital assets being one or more undertakings owned and held by the assessee for not more than 36 months is transferred under a slump sale, then the resulting capital gains shall be deemed as short term capital gains. Capital gain would be the difference between the sale consideration and net worth

of the undertaking transferred. Net worth is the aggregate value of total assets. Fixed assets shall be taken at the written down value determined for income tax purposes. The benefit of indexation will not be available in case of long term capital gains. However the benefit of a concessional rate of tax for long term capital gains [of 20%] would be available.

## **Demergers**

A demerger results in the transfer by a company of one or more of its undertakings to another company. The company whose undertaking is transferred is called the **demerged** company and the company (or the companies) to which the undertaking is transferred is referred to as the **resulting** company.

A demerger may take the form of a spinoff or a splitup. In a **spinoff** an undertaking or division of a company is spun off into an independent company. After the spinoff, the parent company and the spun off company are separate corporate entities. For example, the Information Technology Division of WIPRO Limited was spun off as a separate company in the late 1980s<sup>13</sup>. In a **splitup**, a company is split up into two or more independent companies. As a sequel, the parent company disappears as a corporate entity and in its place two or more separate companies emerge. For example, the Ahmedabad Advance Mills was split up into two separate companies, viz., the New Ahmedabad Advance Mills and the Tata Metal Strips. Though spinoffs and splitups are different in form, their economic substance is the same.

**Rationale** Spinoffs and splitups are regarded as devices for enhancing corporate values by raising efficiency and performance. The principal sources of efficiency gain and performance improvement are as follows:

*Sharper focus* A spinoff<sup>14</sup> may facilitate a sharper business focus by removing a poor business “fit”. When GE Shipping demerged its offshore oilfield services business in 2005, K.M. Sheth, Executive Chairman, GE Shipping said: “The entire restructuring of the business through the demerger route is aimed at providing a greater focus to each of the businesses of the company as well as to unlock shareholder value.”

*Improved incentives and accountability* A spinoff strengthens managerial incentives and heightens its accountability. For example, the CEO of Peabody International justified the spinoff of GEO International as follows: “Speaking from personal experience, one of the most exciting benefits has been a rekindling of the entrepreneurial spirit and initiative within both Peabody and GEO. Managers in both companies now feel that their individual efforts can make a significant difference in bottom line results”.

*Division of a business empire* Demerger is an effective way of dividing a business empire and resolving the issue of succession. In the demerger

plan of Reliance Group, Mukesh Ambani acquired control of Reliance Industries, IPCL, and Reliance Industrial Infrastructure and Anil Ambani got Reliance Capital, Reliance Power, and Reliance Telecom. While a demerger is a convenient way of hammering out settlements, promoters are also driven by the prospect of value creation.

**Tax Aspects of a Demerger** A demerger in relation to companies means a transfer, pursuant to a scheme of arrangement, by a demerged company of one or more of its undertakings to the resulting company. The demerger, to be entitled to tax concessions, must fulfill the following conditions:

- All the properties of the undertaking being transferred by the demerged company should become the property of the resulting company.
- All the liabilities relatable to the undertaking being transferred by the demerged company should become the liabilities of the resulting company.
- The properties and the liabilities of the undertaking being transferred by the demerged company are transferred at values appearing in its books of account immediately before the demerger.
- The resulting company issues shares to the shareholders of the demerged company on a proportionate basis as a consideration for the demerger.
- The shareholders holding not less than three-fourth in value of shares in the demerged company become shareholders of the resulting company.

### Restructuring Plan for Larsen and Toubro

After protracted negotiation and discussion between Larsen and Toubro and Grasim Industries (which had 15.7 percent equity stake in Larsen and Toubro) the following restructuring plan was hammered out in 2003.

- Larsen and Toubro will hive off its cement division into an independent company called CEMCO. Larsen and Toubro will hold 20 percent of the equity of CEMCO and distribute the remaining 80 percent of CEMCO's equity to the shareholders of Larsen and Toubro on a proportionate basis. As a result, Grasim Industries, which has a stake of 15.7 percent in the equity of Larsen and Toubro, will get 12.6 percent equity of CEMCO.
- Grasim Industries will pick up 8.5 percent equity of CEMCO from Larsen and Toubro at ₹ 171.30 per share for which it will pay an aggregate compensation of ₹ 360 crore.

- Grasim Industries will make an open offer at ₹ 171.30 for 30 percent of the equity of CEMCO to raise its stake in CEMCO to 51.1 percent. For this it will incur a cost of ₹ 1280 crore.
- Larsen and Toubro will set up an employee trust which will buy Grasim Industries' 15.7 percent in Larsen and Toubro for ₹ 470 crore.
- Larsen and Toubro will sell its 11.5 percent equity in CEMCO between April 2004 and December 2009.

If all the conditions are fulfilled and the demerged company is an Indian company then all the concessions available in an amalgamation to the amalgamated company would also be available to the resulting company.

## **Equity Carveout**

In an equity carveout, a parent company sells a portion of its equity in a wholly owned subsidiary. The sale may be to the general investing public or to a strategic investor.

An equity carveout differs from a spin off in the following ways: (a) In a spinoff the shares of the spun off company are distributed to the existing shareholders of the parent company, whereas in an equity carveout the shares are sold to new investors. (b) An equity carveout brings cash infusion to the parent company, whereas a spin off does not.

Equity carveouts are undertaken to bring cash to the parent and to induct a strategic investor in a subsidiary.

## 34.13 ■ HOLDING COMPANY

A holding company owns the stocks of other companies to exercise control over them. The advantages of a holding company operation are:

- **Control with fractional ownership** A holding company need not own 100 percent equity of the investee company. Often, it can exercise effective working control over the operations of another company with an equity stake which may be as low as 25 percent (or sometimes even lower than this), provided it can manage the relationship with other shareholders.
- **Isolation of risk** In a holding company system, various operating companies are separate entities, making their obligations separate. Thus the losses of one unit cannot legally become the claims on the assets of other units.
- **Enormous financial leverage** The holding company structure can be used to obtain the benefit of magnified financial leverage. To illustrate this point, consider a two-tier holding company structure. At the bottom of this structure is an operating company with assets of ₹ 1000 million, financed by ₹ 500 million of equity and ₹ 500 million of debt. The first tier holding company owns ₹ 250 million of the equity of the operating company giving it 50 percent equity ownership, sufficient to exercise control. The first tier holding company, in turn, is financed by ₹ 125 million of equity and ₹ 125 million of debt. The apex holding company owns ₹ 62.5 million of the equity of the first tier holding company, sufficient to exercise control. Thus, the apex holding company with an investment of just ₹ 62.5 million can control an operating company with assets of ₹ 1000 million. Imagine what happens if there are some more tiers of intermediary holding companies.

The disadvantages of a holding company system are:

- **Partial multiple taxation** The dividends received by a holding company from its subsidiary may be taxable. So the shareholders of the holding company, in effect, may be subject to an additional tax burden.
- **Parental responsibility** While legally the debt of a subsidiary company is not the liability of the parent company, the latter may feel

morally obligated to pay the debt of the former. After all its reputation and long-term business interests are at stake.

- **Magnified risk** The huge financial leverage of a holding company structure makes it highly vulnerable. Because of the high consolidated leverage, a small decline in the performance of an operating company can bring down the whole structure like a pack of cards.

A noteworthy trend in the corporate restructuring scene is the growing popularity of the holding company concept. Vedanta Resources and the Jindals have already chosen this structure. ADAG, too, has similar plans. The responsibility of the holding company is to develop strategies for the group, allocate resources, monitor performance, and build brands. Tata Sons seems to be playing this role for the Tata group.

## SUMMARY

- A **merger** occurs when two or more firms combine to form a single company. The most plausible reasons for a merger are economies of scale, strategic benefit, complementary resources, tax shields, utilisation of surplus funds, and managerial effectiveness.
- A **horizontal** merger is a merger of firms engaged in the same line of business. A **vertical** merger is a merger of firms engaged in different stages of production in an industry. A **cogeneric** merger is a merger of firms engaged in related lines of business. A **conglomerate** merger is a merger of firms engaged in unrelated lines of business.
- The plausible reasons for merger are strategic benefit, economies of scale, economies of scope, economies of vertical integration, complementary resources, tax shields, utilisation of surplus funds, and managerial effectiveness. The dubious reasons for mergers are diversification, lower financing costs, and higher earnings growth.
- Mergers involve a fairly long **legal procedure** and have important **tax implications**.
- An amalgamation can be in the nature of merger or acquisition. From the accounting point of view, for a merger the **pooling of interest method** is used and for an acquisition the **purchase method** is to be used.
- The benefit of a merger is the difference between the present value of the combined entity and the present value of the combining entities if they remain separate.
- Larson and Gonedes have developed a model of the **exchange ratio determination**. Their model holds that each firm will ensure that its equivalent price per share will be at least maintained as a sequel to the merger.

- In practice, the commonly used bases for establishing the exchange ratio are: earnings per share, market price per share, book value per share, and DCF value per share.
- A **takeover** generally involves the acquisition of a certain block of equity capital of a company which enables the acquirer to exercise control over the company. A takeover is **friendly** if the incumbent management supports it and is **hostile** if it opposes it.
- The key provisions of the **SEBI Takeover Code** relate to disclosure, trigger point, offer price, contents of the public announcement, and creeping acquisition.
- A wide-range of **anti-takeover defences** have been employed by target companies to ward off bidders.
- A **joint venture** is an arrangement between firms forming a cooperative partnership linking parts of their business by mutual commitment of resources for achieving common objectives.
- Acquisitions are plagued by five sins: straying too far afield, striving for bigness, leaping before looking, overpaying, and failing to integrate well.
- To improve the prospects of creating value, the acquiring company must focus on right targets, estimate synergies properly, negotiate in a disciplined manner, and plan and control the integration.
- Mergers, asset purchases, and takeovers lead to expansion in some way or the other. They are based on the principle of '**synergy**' which says  $2 + 2 = 5!$ . Portfolio restructuring, on the other hand, involves some kind of contraction through a divestiture or a demerger. It is based on the principle of '**anergy**' which says  $5 - 3 = 3!$
- A **demerger** may take the form of a **spinoff** or a **splitup**. In a spinoff, an undertaking or division of a company is spun off into an independent company. In a **splitup**, a company is split-up into two or more independent companies.
- A **leveraged buyout** involves concentration of equity in a few hands with the help of debt.
- A **holding company** owns the stocks of other companies to exercise control over them.

## QUESTIONS

1. What are the different forms of mergers, acquisitions and restructuring?
2. Discuss the plausible reasons for mergers.
3. Explain the dubious reasons for mergers.
4. Discuss the various steps involved in a merger (amalgamation).
5. What are the important tax provisions relating to amalgamations?
6. What conditions should be fulfilled for an amalgamation in the nature of a merger?

7. Explain the ‘pooling of interest’ method and the ‘purchase’ method of accounting for amalgamations.
8. What is the cost of a merger from the point of view of the acquiring company?
9. What is the present value of a merger from the point of view of the acquiring firm?
10. Derive the equations for  $ER_1$  and  $ER_2$  in the Larson and Gonedes model of exchange ratio determination.
11. What are the bases on which the exchange ratio is commonly determined in practice? Critically evaluate them.
12. Describe the procedure for valuing a purchase.
13. Discuss the approaches used for establishing the horizon value.
14. What should the framework for regulating takeovers seek to achieve?
15. What are the salient features of SEBI’s regulations relating to substantial acquisition of shares and takeovers?
16. Briefly describe the anti-takeover defences employed in the U.S.
17. What defences do companies in India invoke to ward off potential takeover attempts?
18. Illustrate the essence of a leveraged buyout transaction with the help of an example.
19. What does debt do in the context of acquisition?
20. What are risks and rewards of a leveraged buyout?
21. What factors have contributed to the success of KKR?
22. What is the rationale for joint ventures?
23. Explain the five sins in acquisitions.
24. Discuss the key steps involved in managing the acquisitions programme.
25. What are the common motives for divestiture?
26. How would you evaluate a divestiture from the financial point of view?
27. What is a demerger? What forms can it take? What is the rationale for demergers?
28. Discuss the tax aspects of demerger.
29. Explain the pros and cons of a holding company operation.

## SOLVED PROBLEMS

- 34.1 Videsh Limited is keen on reporting an earnings per share of ₹ 6.00 after acquiring Swadesh Limited. The following financial data are given.

	<i>Videsh Limited</i>	<i>Swadesh Limited</i>
Earnings per share	₹ 5.00	₹ 5.00
Market price per share	₹ 60.00	₹ 50.00

## Number of shares

There is an expected synergy gain of 5 percent. What exchange ratio will result in a post-merger earnings per share of ₹ 6.00 for Videsh Limited?

*Solution*

Total earnings of Videsh Limited = ₹ 5,000,000

Total earnings of Swadesh Limited = ₹ 4,000,000

Synergy gain = 5%

Total earnings of the combined entity =  $9,000,000 \times 1.05 = ₹ 9,450,000$

Earnings per share of the combined entity has to be ₹ 6

$$\text{So, } \frac{₹ 9,450,000}{1,000,000 + \text{ER} \times 800,000} = ₹ 6$$

$$1,000,000 + \text{ER} \times 800,000$$

$$\text{So, ER} = 0.71875$$

- 34.2 Black & Co. plans to acquire White & Co. The relevant financial details of the two firms prior to the merger announcement are:

	<i>Black &amp; Co</i>	<i>White &amp; Co</i>
Market price per share	₹ 70	₹ 32
Number of outstanding shares	20 million	15 million

The merger is expected to generate gains which have a present value of ₹ 200 million. The exchange ratio agreed to is 0.5.

What is the true cost of the merger from the point of view of Black & Co.?

*Solution*

Shareholders of White & Co. will get 7.5 million shares of Black & Co. So they will get

$$\alpha = \frac{7.5}{20 + 7.5} = \frac{3}{11} \text{ share of Black & Co.}$$

The present value of Black & Co. after the merger will be:

$$(₹ 70 \times 20 \text{ million}) + (₹ 32 \times 15 \text{ million}) + ₹ 200 \text{ million} = ₹ 2080 \text{ million}$$

The true cost of merger will be:

$$\alpha \times ₹ 2080 \text{ million} - ₹ 480 \text{ million} = ₹ 87.27 \text{ million}$$

- 34.3 Alpha Corporation plans to acquire Beta corporation. The following information is available

	<i>Alpha Corporation</i>	<i>Beta Corporation</i>
■ Total current earnings, $E$	₹ 50 million	₹ 20 million

■ Number of outstanding shares, $S$	20 million	10 million
■ Market price per share, $P$	₹ 30	₹ 20

- (a) What is the maximum exchange ratio acceptable to the shareholders of Alpha Corporation if the PE ratio of the combined entity is 12 and there is no synergy gain?
- (b) What is the minimum exchange ratio acceptable to the shareholders of Beta Corporation if the PE ratio of the combined entity is 11 and there is a synergy benefit of 5 percent?
- (c) Assuming that there is no synergy gain, at what level of PE multiple will the lines  $ER_1$  and  $ER_2$  intersect?

*Solution*

- (a) Maximum exchange ratio from the point of the shareholders of Alpha Corporation

$$ER_1 = \frac{-S_1}{S_2} + \frac{PE_{12}(E_{12})}{P_1 S_2} = \frac{-20 \text{ million}}{10 \text{ million}} + \frac{10 \times 70 \text{ million}}{30 \times 10 \text{ million}} = 0.80$$

- (b) Minimum exchange ratio from the point of the shareholders of Beta Corporation

$$\begin{aligned} ER_2 &= \frac{P_2 S_1}{(P_{12})(E_{12}) - P_2 S_2} \\ &= \frac{20 \times 20 \text{ million}}{11 \times (70 \text{ million} \times 1.05) - 20 \times 10 \text{ million}} \\ &= \frac{400 \text{ million}}{808.5 \text{ million} - 200 \text{ million}} = 0.657 \end{aligned}$$

- (c) Assuming that there is no synergy gain, the lines  $ER_1$  and  $ER_2$  will intersect at the weighted average of the two price-earnings multiples, wherein the weights correspond to the respective earnings of the two firms.

$$PE_{12} = \frac{50}{70} PE_1 + \frac{20}{70} PE_2 = \frac{50}{70} \times 12 + \frac{20}{70} \times 10 = 11.43$$

## PROBLEMS

- 34.1 Pooling and Purchase Methods** Box Company (the transferor company) and Cox Company (the transferee company) amalgamate in an exchange of stock to form Cox and Box Company. The pre-amalgamation balance sheets of Cox Company and Box Company are as follows:

	Cox Company ₹ in million)	Box Company ₹ in million)
Fixed assets	25	10

Current assets	20	7.5
Total assets	45	17.5
Share capital (₹ 10 face value)	20	5
Reserves and surplus	10	10
Debt	15	2.5
	45	17.5

For each share held in Box Company, two shares of Cox Company were given in exchange (face value: ₹ 10, share premium : ₹ 20) as the market price of Cox's equity shares is ₹ 30. The fair market value of the fixed assets and current assets of Box Company was assessed at ₹ 20 million and ₹ 10 million respectively. Prepare the post-amalgamation balance sheet of Cox & Box Company under the 'pooling' and 'purchase' methods.

- 34.2 Exchange Ratio** The International Corporation is keen on reporting earnings per share of ₹ 2.50 after acquiring the National Corporation. The following financial data are given:

	<i>International Corporation</i>	<i>National Corporation</i>
Earnings per share	₹ 2.00	₹ 2.00
Market price per share	₹ 20.00	₹ 12.00
Price-earnings ratio	10	6
Number of shares	100,000	100,000

There is no gain from the merger.

Required: What exchange ratio will raise the post-merger earnings per share of the International Corporation to ₹ 2.50?

- 34.3 NPV of Merger** Alpha Company has a value of ₹ 25 million and Beta Company has a value of ₹ 10 million. If the two companies merge, cost savings with a present value of ₹ 4 million would occur. Alpha proposes to offer ₹ 11 million cash compensation to acquire Beta. What is the net present value of the merger to the two firms?

- 34.4 Cost and NPV of Merger** Ajeet Company plans to acquire Jeet Company. The relevant financial details of the two firms, prior to merger announcement, are given below:

	<i>Ajeet Company</i>	<i>Jeet Company</i>
Market price per share	₹ 60	₹ 25
Number of shares	300,000	200,000

The merger is expected to bring gains which have a present value of ₹ 4 million. Ajeet Company offers one share in exchange for every two shares of Jeet Company.

Required : (a) What is the true cost of Ajeet Company for acquiring Jeet Company? (b) What is the net present value of the merger to Ajeet Company?

(c) What is the net present value of the merger to Jeet Company?

**34.5 Benefit and Cost of Merger** As the financial manager of Multibex Company you are investigating the acquisition of Unibex Company. The following facts are given:

	Multibex Company	Unibex Company
Earning per share	₹ 6.00	₹ 2.00
Dividend per share	₹ 3.00	₹ 1.20
Price per share	₹ 45.00	₹ 12.00
Number of shares	5,000,000	2,000,000

Investors currently expect the dividends and earnings of Unibex to grow at a steady rate of 5 percent. After acquisition this growth rate would increase to 7 percent without any additional investment.

Required: (a) What is the benefit of this acquisition? (b) What is the cost of this acquisition to Multibex Company if it (i) pays ₹ 15 per share cash compensation to Unibex Company and (ii) offers one share for every three shares of Unibex Company?

**34.6 Post-merger Price-earnings Ratio** Companies A and B are valued as follows:

	A	B
Earnings per share	₹ 9.00	₹ 2.00
Price per share	₹ 18.00	₹ 12.00
Number of shares	5,000	2,000

A acquires B by offering two shares of A for every three shares of B. If there is no economic gain from the merger, what is the price-earnings ratio of A's stock after the merger?

**34.7 Exchange Ratio** Alpha Limited is planning to acquire Beta Limited. The management of Alpha Limited estimates its equity-related post tax cash flows, without the merger, to be as follows:

Year	1	2	3	4	5
Cash flow (₹ in million)	50	55	60	64	70

Beyond year 5, the cash flow is expected to grow at a rate of 6 percent per year for ever.

If Beta Limited is acquired, the equity-related cash flows of the combined firm are expected to be as follows:

Year	1	2	3	4	5
Cash flow (₹ in million)	80	90	105	120	135

Beyond year 5, the cash flow is expected to grow at a compound rate of 5 percent per year. The number of outstanding shares of Alpha Limited and Beta Limited prior to the merger are 10 million and 8 million respectively. If the management wants to ensure that the net present value of equity-related cash

flows increase by at least 5 percent, as a sequel to the merger, what is the upper limit on the exchange ratio acceptable to it if the discount rate is 12 percent?

**34.8 Maximum and Minimum Exchange Ratio** Vijay Limited and Ajay Limited are discussing a merger deal in which Vijay will acquire Ajay. The information about the firms is given as follows:

	Vijay	Ajay
Total earnings, $E$	₹ 36 mln	₹ 12 mln
Number of outstanding shares	12 mln	8 mln
Earnings per share, EPS	₹ 3	₹ 1.5
Price-earnings ratio, PE	10	6
Market price per share, $P$	₹ 30	₹ 9

- (a) What is the maximum exchange ratio acceptable to the shareholders of Vijay Limited if the PE ratio of the combined firm is 8?
- (b) What is the minimum exchange ratio acceptable to the shareholders of Ajay Limited if the PE ratio of the combined firm is 9?
- (c) At what point do the lines  $ER_1$  and  $ER_2$  intersect?

**34.9 Value of Acquisition** Hatari Industries is acquiring the frozen foods division of Safari Industries. Hatari has developed the following forecasts for the frozen foods division of Safari Industries. What value should they put on this division? Assume a discount rate of 12 percent.

Year	1	2	3	4	5	6	7	8	(₹ in million)
Asset value	100	130	162.5	195.0	222.3	253.4	278.7	301.0	
NOPAT	14	18.2	22.8	27.3	31.1	35.5	39.0	42.1	
Net investment	30	32.5	32.5	27.3	31.1	25.3	22.3	24.1	
Free cash flow	(16.0)	(14.30)	(9.7)	–	–	10.2	16.7	18.0	
Growth rate (%)	30	25	20	14	14	10	8	8	

## MINICASE

Modern Pharma is a fairly diversified pharmaceutical company that has presence in most of the therapeutic segments. It has grown at a healthy rate over the past fifteen years, thanks to a balanced programme of internal growth and acquisitions.

In a recent strategy session, the management of Modern Pharma identified the cardiovascular segment as a thrust area for the next few years. Though Modern Pharma has a reasonable presence in this segment, the management is keen on pursuing aggressive growth opportunities in this segment, especially through acquisitions. On the advice of the management, the business development group at the head office examined several independent pharmaceutical companies with a

primary focus on the cardiovascular segment. This group looked at things like revenues, growth rate, profit margin, market capitalisation, attitude of incumbent management, and so on. Based on such analysis, it zeroed in on Magnum Drugs as a potentially suitable candidate for acquisition by Modern Pharma.

Magnum Drug is a two decade old company with a turnover of ₹ 1520 million last year. Magnum has had a chequered history, with a general upward trend.

The financial statements of Modern Pharma and Magnum Drugs for last year are given below:

### **Modern Pharma Balance Sheet**

(₹ in million)

Shareholders' Funds (20 million shares, ₹ 10 par)	2300	Fixed assets (net)	1650
Loan funds	300	Investments	250
	2600	Net current assets	700
			2600

### **Modern Pharma Profit and Loss Account**

(₹ in million)

Sales	4840
Profit before depreciation, interest, and taxes	960
Depreciation	250
Profit before interest and taxes	710
Interest	40
Profit before tax	670
Tax	220
Profit after tax	450

### **Magnum Drugs Balance Sheet**

(₹ in million)

Shareholders' Funds (10 million shares, ₹ 10 par)	650	Fixed assets (net)	540
Loan funds	250	Investments	50
	900	Net current assets	310
			900

### **Magnum Drugs Profit and Loss Account**

(₹ in million)

Sales	1520
Profit before depreciation, interest, and taxes	230
Depreciation	70
Profit before interest and taxes	160
Interest	30
Profit before tax	130
Tax	35
Profit after tax	95

The market price per share of Modern Pharma is ₹ 320 and the market price per share for Magnum Drugs is ₹ 102.

- (a) Calculate the exchange ratio that gives equal weightage to book value per share, earnings per share, and market price per share.
- (b) What is the limitation of earnings per share as the basis for determining the exchange ratio?
- (c) If the merger is expected to generate a synergy gain of 5 percent, what is the maximum exchange ratio Modern Pharma should accept to avoid initial dilution of earnings per share?
- (d) What will be the post-merger EPS of Modern Pharma if the exchange ratio is 1:4? Assume that there is no synergy gain.
- (e) What is the maximum exchange ratio acceptable to the shareholders of Modern Pharma if the PE ratio of the combined entity is 13 and there is no synergy gain?
- (f) What is the minimum exchange ratio acceptable to the shareholders of Magnum Drugs if the PE ratio of the combined entity is 12 and there is a synergy benefit of 2 percent?
- (g) Assuming that there is no synergy gain, at what level of the PE ratio will the lines  $ER_1$  and  $ER_2$  intersect?

## Appendix 34A

### **The “India Way” of Managing Overseas Acquisitions**

Since the beginning of this millennium, Indian companies have used overseas acquisitions as a key element of their globalisation strategy. According to Prashant Kale, the distinctive features of what he calls the “India Way” of managing acquisitions are as follows:

1. **Structure: Keep it Separate** Western multinationals generally “merge” the acquired entity into its own, whereas Indian acquirers have kept the acquired company separate.
2. **People: Retain Most of Them** Western multinationals typically replace the senior management team of the acquired company so that they can rapidly align the practices of the acquired company with that of the parent. In contrast, Indian acquirers generally retain the senior management of the acquired company and for good reasons.
3. **Process: Intervene Selectively to Enable Sharing and Synergies** Western multinationals typically integrate the process and activities of the acquired company with the parent company, to derive the benefits of fusion. Indian acquirers however, intervene “selectively” rather than achieve a tight and complete integration of process between the two companies.
4. **Speed: Go Easy and Slow** Western multinationals such as General Electric and Cisco tend to rapidly absorb and integrate the acquired companies so that they can quickly realise the potential synergies. In contrast, Indian acquirers tend to go slowly and take measured steps.

### **PRACTICAL ASSIGNMENT**

Review the annual reports of your chosen company for the last 5-10 years and comment on its strategy and initiatives with respect to mergers, acquisitions, and restructuring.

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<sup>1</sup> This part has been contributed by Prof. Sundararajan of Indian Institute of Management, Bangalore.

<sup>2</sup> K.D. Larson and N.J. Gonedes, “Business Combinations: An Exchange Ratio Determination Model”, *Accounting Review*, October 1969.

- 3 R.L. Conn and J.F. Nielson, "An Empirical Test of the Larson - Gonedes Exchange Ratio Determination Model", *Journal of Finance*, June 1977.
- 4 Donald Depamphilis, *Mergers, Acquisitions, and Other Restructuring Activities*, Academic Press, San Diego: 2001.
- 5 T. Boone Pickens Jr., *Boone*, New York: Haughton Mifflin Co., 1988.
- 6 Warren Law, "A Corporation is More Than Its Stock," *Harvard Business Review*, vol 64, No.3.
- 7 Peter F. Drucker, "To End the Raiding Roulette Game", *Across the Board*, April, 1986.
- 8 Michael C. Jensen and Richard S. Ruback, "The Market for Corporate Control - The Scientific Evidence," *Journal of Financial Economics*, vol 11, No. 1.
- 9 G. Bennett Stewart III and David M. Glassman, "The Motives and Methods of Corporate Restructuring; Part II" in Donald H Chew, Jr. (ed.) *The New Corporate Finance: Where Theory Meets Practice*, New York, McGraw Hill, Inc., 1993.
- 10 *Op. cit*
- 11 G. Bennett Stewart, III, *The Quest for Value*, Harper Business, New York, 1991.
- 12 Mark. L. Sirover *The Synergy Trap*, New York : Free Press, 1998.
- 13 In the late 1990s, however, it was merged back into the parent company.
- 14 Since spinoffs are similar to splitups from the economic point of view, what is said of a spinoff applies to a split-up as well.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter34/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter34/index.html)

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Additional Self-Test Problems</li><li>• Chapters Excel</li><li>• Answer Key</li></ul> | <ul style="list-style-type: none"><li>• Additional Solved Problems</li><li>• Excel on Solved Problems</li></ul> |
|---|---|



## Corporate Governance and Executive Compensation

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Discuss the devices for containing agency costs.
- ✓ Discuss the features of corporate governance in India.
- ✓ Discuss the ways and means of reforming corporate governance.
- ✓ Explain the salient features of Clause 49 of the Listing Agreement.
- ✓ Discuss the key guidelines to be followed in designing an incentive compensation plan.

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*, one of the most widely cited papers in finance.

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.

This chapter discusses various agency considerations in financial management and explores in some detail the issues of corporate governance and executive compensation which are important mechanisms or instruments for minimising agency costs.

## 35.1 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 business on these courses, which are too often misguided.”

## Exhibit 35.1 | Different Yardsticks

<i>Types of Decisions</i>	<i>Management's Yardstick</i>	<i>Shareholders' Yardstick</i>	<i>Areas of Possible Conflict</i>
Performance Measurement	Cash flow return	Shareholder 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

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<sup>1</sup>, are as shown in [Exhibit 35.1](#).

## **35.2 ■ DEVICES FOR CONTAINING AGENCY COSTS**

To mitigate agency costs, a variety of devices have evolved. Some are internal and some external.

## **Internal Devices**

The key internal devices for containing agency costs are: internal monitoring and incentive compensation contracts.

**Internal Monitoring** Most organisations have fairly well developed internal systems of performance monitoring and responsibility accounting. Workers are supervised by lower level managers. Lower level managers are monitored by middle level managers who, in turn, are supervised by top level management. Finally, the top level management is accountable to the board of directors. The hierarchical monitoring structure tends to reduce the agency costs within the firm.

**Incentive Compensation Contracts** Agency problems arise because of lack of alignment of the interests of shareholders and management. To make these interests more congruent, managerial compensation may be linked to shareholder returns. A number of firms seek to provide incentive to management in the form of stock options, performance bonuses, and so on, to reduce agency costs.

## **External Devices**

There are two important external devices for containing agency costs: the market for corporate control and the managerial labour market.

**Market for Corporate Control** When internal control devices do not work, the market for corporate control may act as a deterrent on managerial behaviour that dissipates shareholder value. Also referred to as the takeover market, it is a market in which the right to control - represented by a chunk of equity holding that is sufficient to wield control - is traded. Proponents of takeover argue that an active market for control is a good external disciplining device. Defending raiders, who seek to wrest control by acquiring a sufficient equity stake, Boone Pickens says that they help in rescuing hapless shareholders from the clutches of inept management.

**Managerial Labour Market** Along with the market for corporate control, the market for managers tends to check agency problems. In their search for better prospects, managers participate in the managerial labour market now and then. Hence, they have an interest in establishing a reputation and track record for performance. Spendthrifts and wastrels, who destroy shareholder wealth, obviously have a weak demand for their services in the managerial labour market. Thus this market can make a manager pay a price for self-serving behaviour. However, many argue that this market may not be a very effective disciplining device because of the difficulty of isolating the effect of managerial action from other influences which shape a firm's performance.

### **35.3 ■ CORPORATE GOVERNANCE IN INDIA**

Corporate governance is concerned basically with the agency problem that arises from the separation of finance and management (or, in popular terms, ownership and control). It refers to the mechanisms and arrangements employed by financiers (shareholders and lenders) to induce managers, who tend to acquire considerable residual control rights in practice, to care for their interest. As Andrei Shleifer and Robert W. Vishny say: "Much of the subject of corporate governance deals with constraints that managers put on themselves, or that investors put on managers, to reduce the *ex post* misallocation and thus to induce investors to provide more funds *ex ante*."<sup>2</sup> It deals with questions like: How do financiers exercise control over managers? How do financiers ensure that managers do not steal the resources placed with them, or squander them on uneconomic projects? More specifically, corporate governance covers issues like the legal rights of financiers, the role of large investors, the method of electing boards of directors, the responsibilities of the board, the composition of the board, the composition of various sub-committees of the board, the appointment of the auditors, the ability of the board to maintain surveillance, the system of checks and balances instituted over managerial behaviour, the incentives offered to managers to protect financiers from dissipation of capital, the standards of financial reporting and corporate disclosure, and so on.

We may divide our discussion on corporate governance in India into three parts. The first looks at corporate governance in general, the second deals with corporate governance in the private sector, and the third dwells on corporate governance in the public sector.

## **General Features of Corporate Governance in India**

The general features of corporate governance in India are as follows:

1. Patterned after the English common law, the Indian legal system, on paper, provides a very high level of investor protection. According to a widely cited 1998 study of Rafael La Porta *et.al*, India has a “shareholder rights index” of 5 (the maximum possible score being 6), the highest of any country in that study, and a “creditor rights index” of 4 (the maximum possible), higher than that of U.S., Canada, Australia, and New Zealand.

However, the *de facto* protection of investors' rights in India is considerably less than the *de jure* protection, thanks to rampant corruption and dilatory judicial processes.
2. The economic reforms of the early 1990s created four new institutions, viz., Securities and Exchange Board of India (SEBI), National Stock Exchange (NSE), National Securities Clearing Corporation Limited (NSCL), and National Securities Depository Limited (NSDL). SEBI has taken a number of initiatives to protect investors. NSE has led the charge in transforming the securities market from an opaque, outcry system to a transparent, screen-based system. NSDL, India's first depository (it was followed by CSDL) ushered the age of dematerialisation in India – SEBI has made dematerialised trading compulsory for all the stock exchanges in the country. NSCL which serves as the counterparty to net obligations of each brokerage firm has eliminated counterparty risk and the possibility of payments crisis.
3. India Inc's track record on disclosure and transparency has improved, courtesy regulations, guidelines, and international law. Here are some pointers:
  - Material developments are reported within reasonable time periods.
  - Consolidated accounts are now included in the annual report.
  - A whistle blower policy has been instituted companies to encourage employees to disclose personal knowledge of fraudulent activity, without fear of discriminatory action.
  - Annual reports now feature a certificate from the CEO and the CFO in which they affirm that financial statements do not contain any misleading statements.

- An active market for corporate control, which potentially improves
- 4. corporate governance, has largely failed to emerge in India.
- 5. The corporate governance landscape in India has seen positive developments in the last decade, particularly with the enactment of clause 49 of the listing agreement and the legal changes meant to strengthen the enforceability of creditor rights. We are also witnessing the emergence of companies like Infosys and HDFC that are not influenced by a dominant family or group and have made the ordinary shareholder the focus of their governance.

## **Corporate Governance in the Private Sector**

The distinctive features of corporate governance in the private sector are as follows:

1. There are three broad categories of shareholders: promoters (or foreign parent companies in case of multinationals), financial institutions (including mutual funds), and individual investors. Earlier, the three categories of shareholders were more or less equally important, though there were wide variations across companies. However, in recent years the stakes of promoters and institutions have gone up largely at the expense of individual shareholders. Indeed, in many cases it may be a misnomer to call them public limited companies because the general public may have a stake of less than 10 to 15 percent. SEBI's recent guideline, specifying a minimal 25 percent public shareholding in listed companies, is trying to redress this problem.
2. India has a somewhat unique system of promoters who own and manage much of the corporate sector. Some of the well-known names are Tatas, Ambanis, Birlas, Mahindras, Bajajs, Goenkas, Godrejs, Munjals, Mittals, and Jindals. And they have been there for generations. This is in striking contrast to the U.S., where most of the entrepreneur-promoted companies move on to being run by non-promoter professional managers. Look at the Rockfellers, Carnegies, and Waltons. Even in relatively new companies such as Microsoft, eBay, Yahoo, and Google, the promoters have given way to professional managers.
3. Understandably, the list of non-promoter companies is quite short. Among the larger companies there are just a few such as ITC, L&T, ICICI Bank, and HDFC.
4. Cross-holding is commonly used by Indian business groups to maintain control over different group companies. For example, while Tata Sons (the holding company of the Tata business group) is the largest shareholder of Tata Steel and Tata Motors, Tata Steel and Tata Motors may have shareholding in each other.
5. Successful business groups in India have been able to perform the role of institutions like capital market and labour market (which are somewhat under-developed in India) and create wealth for shareholders.

- Unlike in the U.S. where the conglomeration wave of the 1960s and 1970s gave way to more focused companies, conglomerates seem to thrive in India and many other economies. This seems to be mainly due to (a) family ownership, (b) somewhat underdeveloped institutional structures, and (c) limited local market. By diversifying into different business, an affluent family can reduce its risk, achieve growth, overcome to a great extent the institutional weaknesses existing in the country, and deal effectively with the regulatory environment and the government.
6. Promoter dominance is likely to continue for a while in India because of dynastic tendency in Indian society, substantial ownership stakes of promoters in companies controlled by them, absence of a strong countervailing institutional investor base, and the comfort that the banking system has in dealing with promoters (banks typically require minimum promoter shareholding and sometimes promoter guarantees).
  7. Promoters in India, in general, take a longer view and provide a more solid foundation for developing the companies.
  8. For electing the directors, the majority rule voting system is typically followed. The proportionate rule voting system (also referred to as the cumulative voting system) is rarely, if ever, followed.
  9. Company boards generally comprise of three types of directors: promoter directors (or functional directors in the case of professionally managed companies), professional directors, and institutionally nominated directors. Promoter directors belong to the promoter group. Professional directors are persons of eminence who are invited by the promoters mainly on the basis of favourable personal equations. Institutionally nominated directors are either senior executives of the institutions or persons of repute. Given the manner in which the professional directors are invited by the promoters and the weak incentives that institutionally nominated directors have, candour and forthrightness may be compromised at the altar of courtesy and politeness. These tendencies are further strengthened by the dynamics of small groups where the promoter directors may pay attention to cultivate others. However, with the general improvement in the corporate governance climate, independent directors in many companies have begun to wield more influence.

11. In general, institutional investors have been supportive of promoters. They seem to implicitly subscribe to what P.L. Tandon referred to as the “management by chromosomes” principle. They interfere only when a crisis develops or when there is clear evidence of *malafide* behaviour on the part of management, or when there is a directive to monitor the behaviour and performance of the management seriously. Of late, however, institutional investors have become more assertive. ICICI Bank, for example, has forced companies to undertake restructuring initiatives aimed at protecting the interest of institutional investors. Similarly UTI has started the practice of asking companies to make regular presentations.
12. Individual shareholders have, by and large, been benign, tolerant, and ignorant. Though there are some knowledgeable shareholders who raise sensible queries in the annual general meetings, they are not able to accomplish much because the management enjoys an informational advantage and knows how to retain the support of most of the shareholders by offering sops here and there and portraying a glowing picture that enthuses them. Scattered and ill-organised, individual shareholders are not in a position to play a meaningful role in electing directors. Further, the majority rule voting system prevents even a well-organised substantial minority to have any say in the election of board of directors.
13. Family managed companies, in general, seem to display greater entrepreneurial vigour, act more proactively, and exercise stricter control. However, the virtually unchallenged control of the family provides enormous scope for self-dealing and opportunity for personal enrichment at the expense of the company. The degree to which these aberrations occur depends on the level of integrity of the controlling family.
14. Professionally managed companies, in general, react somewhat slowly to new opportunities and challenges, put greater emphasis on systems, favour the interest of incumbent management over that of shareholders, and set relatively easy performance targets.

The corporate governance system in the private sector may therefore be characterised as the “entrenched system”, given the firm hold of the promoters over the companies managed by them and the disinclination and/or inability of others to challenge them. Hence the principal conflict in India is not between the interests of shareholders on the one hand and the

interests of managers on the other. Rather, it is between the interests of dominant shareholders (promoters), who are also managers, on the one hand and the interests of the remaining shareholders on the other. The dominant shareholder may exploit minority shareholders. This phenomenon is referred to as **tunneling** – the dominant shareholder may tunnel into the firm and benefit at the expense of minority shareholders. This may be true of companies controlled by families or multinational parents or even the government. There is evidence of significant “tunneling” activity, mainly in the form of related party transactions, that leads to transfer of assets and cash flows from minority shareholders to controlling shareholders. Tunneling is facilitated with widespread pyramiding, cross-holding, and the use of private companies and non-public trusts for owning shares in various group companies. Further, diversified business groups tend to increase the “opacity” of fund flows within the group, increasing the scope for tunneling.

## **Corporate Governance in the Public Sector**

The salient features of corporate governance in the public sector are as follows:

1. The equity shares are owned wholly or substantially (meaning 51 percent or more) by the government. (Technically, of course, the shares of the central public sector enterprises are held in the name of the President of India).
2. The boards of public sector enterprises(PSEs), appointed for all practical purposes by the controlling administrative ministry, comprise of three categories of directors: (i) functional directors, who are full time employees of the concerned public sector undertaking, (ii) government directors who are bureaucrats from the controlling administrative ministry, and (iii) outside directors.
3. PSEs traditionally suffered from political interference and bureaucratic norms that marred their performance. An important change occurred in 1987, with the introduction of MOU (Memorandum of Understanding) between the PSEs and the government. Under the MOUs, PSEs enjoy greater operating autonomy. In return they have a commitment to meet more challenging performance targets particularly with respect to profitability. The partial privatisation of a number of PSEs from 1991-1992, which exposed them to the discipline of the capital market, has further heightened their profit orientation.
4. PSEs are constrained by various regulations and administrative guidelines. Further, they are subject to the CAG audit and are accountable to parliament. This leads to an excessive emphasis on observing rules, regulations, and guidelines. Efficiency and performance are often sacrificed at the altar of propriety.
5. Chief executives of PSEs have short tenures, often one to five years. It is uncommon to find a chief executive (typically designated as Chairman and Managing Director) who has been at the helm of affairs for more than five years. Such a short tenure, coupled with limited freedom, may lead to a myopic outlook. It is, therefore, rare to find a visionary leader guiding the destiny of a public sector undertaking with a long planning horizon. Most of the chief executives seem to be concerned with fulfilling short-term targets emanating from the Memorandum of Understanding (MOU).

In general, performance standards are soft, compensation levels low,  
6. incentives for performance poor, and 'real' accountability weak. Of late, things have been improving.

In summary, the corporate governance system in the public sector may be characterised as the 'transient system' with the key players, viz., politicians, bureaucrats, and managers taking a somewhat myopic view of things.

## 35.4 ■ LEGAL PROVISIONS AND SEBI CODE

### Legal Provisions under the Companies Act

The key legal provisions with respect to corporate boards are as follows:

- **Strength** A public limited company must have at least three directors.
- **Meetings** The board of directors must meet at least once in a quarter.
- **Composition** There is no fixed number of non-executive directors. No person can be a director of more than twenty companies.
- **Powers** The board of directors has the powers to (a) borrow, lend, and invest funds, (b) recommend dividends, and (c) appoint the managing director.
- **Remuneration** The total remuneration of the directors is subject to a ceiling of 11 percent of net profits. In addition, board members can be paid a sitting fees upto ₹ 100,000 per meeting.
- **Duties** The board has the duty to present the annual report to the members.
- **Liabilities** The board is punishable for breach of trust, dishonesty, and fraud.

### Corporate Governance Philosophy of Infosys

We believe that sound corporate governance is critical to enhance and retain investor trust. Accordingly, we always seek to ensure that we attain our performance with integrity. Our Board exercises its fiduciary responsibilities in the widest sense of the term. Our disclosures always seek to attain the best practices in international corporate governance. We also endeavor to enhance long-term shareholder value and respect minority rights in all our business decisions.

## **Corporate Governance Provisions Applicable to Listed Companies**

Clause 49 of the Listing Agreement spells out the corporate governance provisions applicable to listed companies. The salient provisions of Clause 49 are as follows:

- **Board of Directors** 1. The Board of Directors shall have at least one woman director. 2. Where the chairman of the board is a non-executive director, at least one-third of the board should comprise of independent directors. In case the chairman is an executive director or in case the non-executive chairman is a promoter or related to any promoter or person occupying management position at board level or one level below the board, at least half of the board should comprise of independent directors. 3. All fees/compensation, if any, paid to non-executive directors, including independent directors, shall be fixed by the board and shall require previous approval of shareholders in a general meeting. 4. The board shall meet at least four times a year, with a maximum time gap of 120 days between any two meetings. 5. The information to be placed before the board should, inter alia, consist of operating plans and budgets, quarterly reports, minutes of the sub-committees of the board, information on recruitment and remuneration of senior officers just below the board level, material default in financial obligation to and by the company, joint venture or collaboration agreements, significant labour problems and their proposed solutions, sale of material nature of investments in subsidiaries and assets, foreign exchange exposures and steps to mitigate them, non-compliance of any regulatory, statutory, or listing requirements, and deficiencies in shareholders' services. 6. The independent directors shall hold at least one meeting in a year, without the attendance of non-independent directors and members of management. 7. An individual shall not serve as an independent director in more than seven listed companies and in case he is also serving as a whole-time director in any listed company then can serve as independent director in not more than 3 listed companies. 8. An independent director shall be held liable in respect of acts by a company that occur with his knowledge or if an independent director doesn't act diligently on the requirements of the listing agreement. 9. A director shall not be a member in more than 10 committees or act

as chairman of more than five committees across all companies in which he is a director. 10. It would be obligatory for the board of a company to lay down the code of conduct for all board and senior management of a company. The code should be posted on the website of the company. 11. The company shall establish a vigil system for directors and employees to report concerns about unethical behaviour, actual or suspected fraud and violation of the company's code of conduct or ethics policy. Adequate safeguards must be provided against victimisation of individuals who utilise such mechanism to report any concerns.

- **Audit Committee** 1. A qualified and independent audit committee shall be set up. 2. The audit committee shall have a minimum of three directors as members. Two-thirds of the members of audit committee shall be independent directors. 3. The chairman of the audit committee shall be an independent director and he shall be present at the annual general meeting to answer shareholder queries. 4. The company secretary shall act as the secretary of the audit committee. 5. The audit committee shall meet at least four times in a year and not more than four months shall elapse between two meetings. 6. The audit committee shall have powers to seek information from any employee, to obtain outside legal or other professional advice, and to secure attendance of outsiders with relevant expertise. 7. The audit committee's role is to maintain oversight of the company's financial reporting process; recommend to the board the appointment, reappointment, or replacement of the statutory auditor and audit fees; review with the management the annual financial statements and the quarterly financial statements before submitting the same for board approval; review and monitor the auditor's independence and performance, and effectiveness of the audit process; approval or any subsequent modification of transactions of the company with related parties; evaluation of internal financial controls and risk management systems; review the adequacy of internal audit function; review 'Management Discussion and Analysis' of financial condition and results of operations, statement of significant related party transactions, management letters/letters of internal control weaknesses issued by the statutory auditors, and appointment, removal and terms of remuneration of the chief internal auditor.

**Nomination and Remuneration Committee** The company through

- its Board of Directors shall constitute a ‘Nomination and Remuneration’ Committee which shall comprise of at least three non-executive directors, half of which should be independent. The chairman of the committee shall be an independent director.
- **Risk Management** The Board of Directors shall be responsible for framing, implementing, and monitoring the risk management plan for the company and (for the top 100 listed companies by market capitalisation) constituting a risk management committee.
- **Related Party Transactions** The company shall formulate a policy on materiality of related party transactions and also on dealing with related party transactions. All related party transactions shall require prior approval of the audit committee.
- **Disclosures** 1. Where the company deviates from a prescribed Accounting Standard, the same shall be disclosed in the financial statements, together with the management’s explanation for the same. 2. As part of the directors’ report or as an addition thereto, a ‘Management Discussion and Analysis’ report should form part of the Annual Report to the shareholders. It should discuss the following matters within the limits set by the company’s competitive position: industry structure and developments; opportunities and threats; segment-wise or product-wise performance; outlook; risks and concerns; internal control systems and their adequacy; financial performance; and material developments in human resources and industrial relations area. 3. All pecuniary relationships or transactions of the non-executive directors vis-à-vis the company shall be disclosed in the Annual Report. 4. There shall be a separate section on Corporate Governance in the Annual Report with a detailed compliance report. This section shall provide information on the board of directors, audit committee, remuneration, Corporate Governance and Executive Compensation committee, shareholders’ committee, general body meetings, means of communication, and so on.
- **Certification** CEO or MD or Manager (in their absence a Whole Time Director) and CFO shall certify to the Board that the financial statements present a true and fair view of the company’s affairs; that to the best of their knowledge and belief no transactions entered into

by the company are fraudulent, illegal, or violative of the company's code of conduct; that they accept responsibility for establishing and maintaining internal control systems of the company; and that they have indicated to the auditors and audit committee significant changes in internal control, significant changes in accounting policies, and significant frauds of which they have become aware.

The provisions of Clause 49 closely parallel those of Sarbanes–Oxley (SOX) Act of the U.S., and in some areas are even stricter than those of SOX. The introduction of Clause 49 was positively greeted by the market. A study by Bernard Black and Vikramaditya Khanna found that the stock prices of larger companies, who first adopted Clause 49, appreciated by 4 percent more during a two-day “event-window” (and 7 percent more over a 5-day period”) compared to smaller companies, that were not required to implement the reforms.

Although well-conceived regulatory measures are helpful, it must be recognised that ultimately good corporate governance has to be in the DNA of the promoter.

### **Sarbanes Oxley Act of 2002**

Sarbanes Oxley Act of 2002 in the U.S. was triggered by a series of frauds in companies like Enron, Worldcom, and Tyco. This act seeks to protect investors and check corporate and accounting frauds by a number of reforms meant to:

- Enhance the quality of financial disclosures.
- Establish independence of auditors.
- Require CEOs to certify the financial statements.
- Bar top executives from selling stocks during black out periods.

## 35.5 ■ REFORMING CORPORATE GOVERNANCE

Given the deficiencies characterising corporate governance, there is a pressing need for reform. Some ways and means of reforming corporate governance in practice are now discussed.

**Strengthen the Hands of Institutional Investors** Individual investors are not likely to be active because of the “free rider” problem. Institutional investors with a reasonable stake will have a greater incentive to play a more active role and they can contribute immensely to improvement in corporate governance.

**Separate Management from Control** According to Eugene Fama and Michael Jensen the various decisions of a business may be grouped under management functions and control functions as follows:

<i>Management</i>	<i>Control</i>
Initiation	Ratification
Implementation	Monitoring

The function of management must vest with the chief executive officer and his team and the function of control with the board of directors. Such a separation of control and management helps in mitigating the agency problem. Hence it is advisable to separate the offices of the chairman and the chief executive officer.

**Expand the Role of Non-executive Directors** Non-executive directors can bring varied expertise, rich experience, and a certain degree of objectivity in monitoring corporate behaviour. Their role needs to be expanded to improve the quality of corporate governance.

**Limit the Size of the Board** Lipton and Loesch have done an excellent analysis of the functioning of boards. Their research supports the hypothesis that as the size of the board increases, it becomes less effective because the advantages of wider participation are outweighed by the problems of coordination. Hence, it is advisable to ordinarily limit the size of boards to seven to ten or so. Any board which has more than a dozen directors tends to become unwieldy and inefficient.

**Ensure that the Board Is Informationally Well-equipped** The board of directors should receive information about the performance of the

company in all important areas. The board should be well informed of long-term plans, operating plans and budgets, quarterly divisional results, competitive developments in various product market segments, performance of the company and its competitors in the capital market, and so on.

**Link Managerial Compensation to Performance** Agency problems arise because of lack of alignment of the interests of shareholders and management. To make these interests more congruent, a significant portion of managerial compensation should be linked to the value created by management. Further, the rewards to the managers may be based on relative performance, rather than absolute performance.

**Enhance Contestability** If the incumbent management underperforms consistently, there should be a real possibility of dislodging it through the market for corporate control.

## **35.6 ■ 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, chauffeur 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 Cost** 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.

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 for 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.

**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 over-all 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. More about them in the next section.

## **35.7 ■ EMPLOYEE STOCK OPTION PLAN**

Most major companies across the globe link part of their executive compensation to the performance of stock price. Generally, this compensation is in three forms: stock options, restricted shares (shares that must be retained for several years), or performance shares (shares given provided the company achieves some target). In India, stock options which were virtually unheard of till the late 1990s are gaining popularity and a lot of attention. Companies like Infosys, TCS, Reliance Communications, Suzlon Energy, HDFC Bank, Cairn India, Axis Bank, and DLF have granted ESOPs to their executives. ESOPs are used to retain key employees in talent-driven businesses like IT and banking. This trend is expected to gather momentum because it is generally believed that stock options align closely the interest of managers with those of shareholders. After all, the value of a stock option depends mainly on the share price which is the dominant component of shareholders' total return.

## **SEBI Guidelines on Employee Stock Option Scheme (ESOS)**

A company whose shares are listed on a recognised stock exchange has to abide by the SEBI guidelines on ESOS. The key guidelines are as follows:

**Eligibility** An employee shall be eligible to participate in the ESOS of the company, provided (a) he is not a promoter or (b) he is not a director who directly holds more than 10 percent of the outstanding equity shares.

**Compensation Committee** No ESOS shall be offered unless the company constitutes a Compensation Committee, which shall be a committee of the board of directors consisting of a majority of independent directors, for advice and superintendence of the ESOS.

**Shareholder Approval** No ESOS can be offered to employees of a company unless the shareholders of the company approve ESOS by passing a special resolution.

**Pricing** A company granting option to its employees pursuant to an ESOS will have the freedom to determine the exercise price subject to conforming to the accounting policies specified in these guidelines.

**Lock-in Period and Rights of the Optionholder** There shall be a minimum period of one year between the grant of options and vesting of options. The company shall have the freedom to specify the lock-in period for the shares issued pursuant to the exercise of option. The employee shall not have any rights as a shareholder till shares are issued on exercise of option.

**Accounting Treatment** The accounting value of options may be determined either by the Black Scholes model or as the difference between the market price (when options are granted) and the exercise price. The accounting value of options should be written off as employee cost uniformly over the vesting period, which is the cooling period beginning on the grant date and ending on the date when employees can actually pay up the money and take shares. In order to avoid an accounting charge, most companies in India set the exercise price near the current market price. For example, at Infosys the pricing formula is “not less than 90 percent of the fair market value as on the date of grant.” At WIPRO, it is the fair market value and at HDFC Bank it is the current market price on the working day immediately preceding the date of grant of options.

For example, the fair value of the stock options granted by Mahindra & Mahindra under its 2010 scheme was calculated using Black-Scholes option pricing formula and the following assumptions were made in this regard: risk-free interest rate, 8.34%; expected life, 3.25 years; expected volatility, 41.96%; expected dividends, 1.82%; and the price of the underlying share in the market at the time of the option grant, ₹ 676.05.

## Limitations of Stock Option Plans

While stock compensation has some merits, it has its own limitations. First, the payoff from stock compensation depends on the absolute change in the stock price and not on the relative change vis-a-vis the sector or the market. Second, the rate of return from a stock depends not on the absolute performance of a company but on its performance relative to investor expectations. Third, stock compensation plans may prod managers to suppress bad news or manipulate earnings to boost stock prices. Fourth, stock options can induce excessive risk taking, as options offer an upside and have no downside.

## SUMMARY

- The essence of **agency problem** is that self-interested managers may squander corporate resources over uneconomic, value-destroying projects and activities.
- The forces leading to divergence between the goals of managers and shareholders have been referred to as **institutional imperative** by Warren Buffett.
- **Internal monitoring, incentive compensation contracts, the market for corporate control and the managerial labour market** are the important devices for containing agency costs.
- **Corporate governance** is concerned mainly with the agency problem that arises from the separation of finance and management (or, in popular terms, ownership and control).
- Corporate governance system in the Indian private sector may be characterised as the entrenched system, whereas corporate governance system in the Indian public sector may be characterised as the transient system.
- *Inter alia*, reform of corporate governance calls for strengthening the hands of institutional investors, expanding the role of non-executive directors, linking managerial compensation to performance, and enhancing contestability.
- A well-developed executive compensation plan, *inter alia*, calls for choosing the right performance metrics, lengthening the decision making horizon of the executives, and judiciously incentivising executives.

## QUESTIONS

1. Describe the unseen force that Warren Buffett refers to as the 'institutional imperative'.

2. What are the consequences of divergence between the interests of managers and shareholders according to Gordon Donaldson.
3. Discuss the internal and external devices for containing agency costs.
4. Describe the distinctive features of corporate governance in the Indian private sector.
5. Describe the salient features of corporate governance in the Indian public sector.
6. According to Eugene Fama and Michael Jensen what are the four components of decision making in a firm?
7. Suggest ways and means of reforming corporate governance in practice.
8. Describe the key legal provisions with respect to corporate boards in India.
9. What are the key elements of SEBI code on corporate governance?
10. Discuss the guidelines relevant for designing an incentive compensation plan.
11. What are the key SEBI guidelines on Employee Stock Option Scheme?

## PRACTICAL ASSIGNMENT

Based on the annual reports of your chosen company for the last two years, comment on its corporate governance philosophy and practices.

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- <sup>1</sup> Gordon Donaldson, "Financial Goals: Management vs. Stockholders," *Harvard Business Review*, May-June 1963.
  - <sup>2</sup> Andrei Shleifer and Robert W. Vishny "A Survey of Corporate Governance," *The Journal of Finance*, June 1997.

## Performance Measurement and Balanced Scorecard

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Explain the comprehensive value metrics framework.
- ✓ Discuss the salient features of balanced scorecard.
- ✓ Describe the Balridge Award, the European Business Excellence Model, and the Tata Business Excellence Model.

The performance measurement system of a firm has a strong influence on the behaviour of its people. As Robert W Hall says: "Performance measurement is the basis of every system in a company: cost systems, planning systems, capital budgeting systems, personnel assignments, promotions, reorganisations, budget allocations –the mechanisms, built up over years, by which everything runs." In a similar vein, Robert Kaplan and David Norton argue: "An organisation's measurement system strongly affects the behaviour of people both inside and outside the organisation. If companies are to survive and prosper in information age competition, they must use measurement and management systems derived from their strategies and capabilities."

More than 70 percent of those who responded to an Economist Intelligence Unit - KPMG survey said that they were dissatisfied with their company's performance measurement system. Some of the problems with the performance measurement systems are as follows:

- An excessive focus on operational and financial measures most of which are tactical and historical.
- A tendency to measure wrong or irrelevant things, just because they are easy to measure.
- Lack of proper alignment of measures either with each other or the strategy of the firm.

In an interesting 1991 HBR paper titled “The Performance Measurement Manifesto,” R.G. Eccles argued that “within the next five years, every company will have to redesign how it measures its business performance”. The heightened interest in business performance measurement since the early 1990s suggests that he made an important point.

## **36.1 ■ RATIONALE FOR THE CURRENT FOCUS ON BUSINESS PERFORMANCE MEASUREMENT**

Business performance measurement is receiving a lot of attention today due to a variety of reasons. The important ones seem to be as follows:

**Heightened Competition** Global competition has become a fact of life. In the wake of increased competition, firms are emphasising quality, productivity, cost, innovation, flexibility, and customisation. Improvement initiatives such as total quality management, world class manufacturing, total productivity management, and total cost management are gaining currency. All these tools and techniques rely on performance measurement.

**Growing Empowerment** Many organisations have realised the benefits of empowering people down the line. Empowerment works well when the top management spells out clearly what it expects from people at various levels. For this purpose, well-defined performance measures are required.

**Quality Awards** To recognise outstanding performance and motivate companies to excel, a number of national and international awards have been established. Notable among them are the Balridge Award (U.S.), the European Business Excellence Model (Europe), and the Deming Prize (Japan and Asia).

Each of these awards requires a comprehensive self-assessment by the companies who wish to be considered for these awards. As more and more companies are applying for these awards, the interest in business performance measurement is growing.

**Expanding Organisational Roles** Professional bodies like the Institute of Chartered Accountants in England and Wales (ICAEW), the Chartered Institute of Management Accounting (CIMA), the Institute of Chartered Accountants of India (ICAI), and the Institute of Cost Accountants of India are prodding their members to participate actively in developing balanced performance measurement systems. They are arguing that the role of the management accountant is to provide comprehensive information to run the business, and not just to prepare information required for external reporting.

**Greater External Demands** Organisations today have to satisfy various external demands. One such demand comes from the regulatory authorities. In the wake of deregulation of sectors such as telecommunications, power, airlines, and insurance, regulatory authorities have been set up. The regulatory authorities demand certain performance standards from the firms falling under their jurisdiction. This has implications for business performance measurement.

Financial community is another group which is exerting pressure on firms to disclose information about different dimensions of performance and thereby influencing performance measurement. A survey conducted by the Financial Executives Research Foundation found that "investors, analysts, and other users of financial reports would find value in more extensive disclosure of the company's market and competitive position, management goals and objectives, and business segment data".

**Power of Information Technology** Information technology has had a significant effect on performance measurement. Not only has information technology made it easier to capture and analyse data, but it has also provided new ways of performance monitoring.

## 36.2 ■ COMPREHENSIVE VALUE METRICS FRAMEWORK

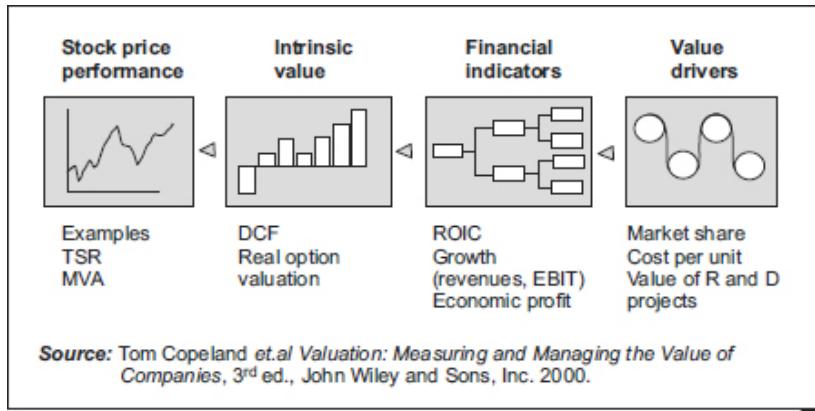
A number of performance measures have been developed: total shareholder return (TSR), market value added (MVA), discounted cash flow (DCF), economic value added (EVA<sup>TM</sup>), economic profit, cash flow return on investment (CFROI), cash value added (CVA), return on invested capital (ROIC), return on assets (ROA), earnings before interest taxes depreciation and amortisation (EBITDA), cash flow, earnings per share (EPS), and so on.

The debate over which metric to use is often misplaced because different metrics serve different purposes. For example, economic profit and DCF are not alternatives. While economic profit is a measure of short-term financial performance, DCF captures financial performance over time into a single number.

Of course, some metrics are better than others. Economic measures (such as economic profit) are superior to accounting-based measures (such as earnings per share) for the following reasons. First, empirical evidence suggests that share prices are driven by cash flow, not accounting profit. Second, you can understand the tradeoff between short-term and long-term more easily with the help of economic measures. Third, economic measures throw more light on the sources of value.

The various value metrics and their linkages are shown in the comprehensive value metrics framework shown in [Exhibit 36.1](#). At the left end of the exhibit are measures like TSR and MVA which reflect shareholder value creation. As these are the final output measures, managers use them for *setting long term value creation targets* and not for decision making.

## Exhibit 36.1 | Comprehensive Value Metrics Framework



The next link in the framework is the **intrinsic value** (DCF and option value), which is supposed to eventually drive stock price performance. Managers evaluate alternative strategies and opportunities and value the business units or the entire firm in terms of intrinsic value.

While a useful tool for evaluating strategies and investment opportunities, intrinsic value (DCF value) cannot be employed for evaluating historical performance, as it reflects projections. However, DCF value can be translated into financial indicators (like return on invested capital, growth, and economic profit) which can be measured on a current basis and which represent the third link in the value metrics framework. The targets for operating managers can be set in terms of these short-term financial indicators.

Since the short-term financial indicators may signal value creation somewhat belatedly, we have to go further and identify the value drivers, the last link in the value metrics framework. **Value drivers** are the operating and strategic measures like market share, employee productivity, new product introductions, and so on. A judicious selection of value drivers helps in identifying value creation opportunities, puts a proper focus on leading indicators, and ensures that long-term value creation is not sacrificed at the altar of short-term financial results.

## **Stock Market Performance: The Expectations Treadmill**

Total shareholder return (TSR) is regarded by many financial analysts as the best way to measure overall performance. While TSR has its merits, it has two serious limitations.

First, TSR is influenced by factors other than management performance. Empirical evidence suggests that market and sector movements account for more than 40 percent of the returns during any one to three-year period. Hence, if managerial performance is evaluated solely on the basis of TSR, managers will be partially rewarded or penalised for factors outside their control – this can, of course, be mitigated by using TSR relative to a market or stock index. Yet, the standard employee stock option scheme is based on TSR only.

Second, in the short run, share prices are driven more by the difference between actual performance and expected performance and the changes in market expectation, and less by the level of performance *per se*. It is the surprise element that produces higher or lower TSR. Hence, companies that consistently perform well, in line with market expectations, do not deliver superior TSR. The market expected them to do well and the expectation was already embedded in the stock price.

This problem can be understood by the analogy of a treadmill. The market expectation of future performance, factored in the stock price, is represented by the speed of the treadmill. If managers beat market expectation, they raise the expectation further. Put differently, they accelerate the treadmill and thereby deliver superior returns. But how long can any management outperform market expectation (accelerate the treadmill) and produce superior returns? As Copeland *et. al* put it: “For outstanding companies, the treadmill is moving faster than for anyone else. It is difficult for management to deliver at the expected level without faltering. Accelerating the treadmill will be hard. Continuing to accelerate the treadmill will eventually become impossible.”

This explains why outstanding managers often produce ordinary returns in the short run. If their incentive compensation is based on TSR, they may be inadequately rewarded. On the other hand, in the case of companies from which the market expectation is low, TSR-linked measures may over-compensate managers.

### 36.3 ■ NON-FINANCIAL MEASURES

Performance measurement sometimes relies heavily on financial measures. An excessive emphasis on financial measures in a business is like an obsession with the score card while playing cricket (or any other game). The score in a game, like financial results in a business, reflects the outcome of past performance. While it is important to know the score it must be recognised that the success in a game or business calls for paying considerable attention to the steps required for competing effectively in the game or the marketplace. Just as a cricket player must focus on batting, bowling, and fielding, a company must concentrate on activities like product development, manufacturing, marketing, and customer service. Well-conceived performance measures in these areas are essential for monitoring improvements required for maintaining competitive edge.

As financial measures like ROIC and growth are lagging indicators, companies concerned with long-term value creation use a variety of non-financial measures which are leading indicators of value. A representative list is given below:

- Customer satisfaction index
- Customer returns
- Market share
- New product introduction
- On-time delivery
- Manufacturing cycle time
- Defects percentage
- Throughput
- Employee productivity index
- Patents obtained

For most businesses 3 to 6 leading indicators capture the bulk of their long-term value creation potential. While identifying them is not easy, the process of doing so is very illuminating. As Alfred Rappaport put it: "It takes more than an impressive knowledge of customers, products, suppliers, and technology for managers to understand the sources and value of their businesses. The process of identifying leading indicators is challenging, revealing, and rewarding."

## Pros and Cons of Non-financial Measures

Non-financial measures offer the following advantages:

- Non-financial measures are directly traceable to key success factors like customer satisfaction, market leadership, manufacturing excellence, quality and technological competence.
- Non-financial measures are actionable. A major problem about a standard cost system is that it is not often easy to determine the cause and cure of unfavourable variances. In contrast, non-financial measures are actionable at the plant level.
- Non-financial measures may predict better the future cash flows of the firm. For example, the long-term performance of a firm may be substantially influenced by its ability to improve product quality.

While non-financial measures are useful, there are certain problems associated with them:

- It is difficult to assign rupee value to improvements in non-financial measures.
- Non-financial measures may conflict with each other. In the absence of a theoretical framework, it is difficult to make proper tradeoffs.
- Managers may resort to gaming<sup>1</sup>. There are opportunities for managers to optimise their performance at the expense of others.

Due to the above deficiencies, the very purpose of non-financial performance measurement gets defeated. As Christopher Ittner and David Larker observed: “When such things happen, a company’s financial and non-financial performance diverge – an ironic outcome, since the original reason for tracking non-financial performance was to fill out the picture provided by traditional accounting picture. And yet, it is surprising that non-financial measures would be equally, if not more, susceptible to manipulation as financial accounting?”

## **36.4 ■ BALANCED SCORECARD**

Most companies have a performance measurement system that includes financial measures as well as non-financial measures. Financial measures are used primarily by senior managers to monitor the performance of the firm as a whole and its business units or divisions; non-financial measures are employed mainly by operating managers to control short-term operations. Till recently, not much effort was made to combine financial and non-financial measures in an integrated measurement framework. The balanced scorecard approach pioneered by Robert Kaplan, David Norton<sup>2</sup> and others seeks to develop an integrated performance measurement system.

## Distinctive Features

The proponents of the balanced scorecard approach claim that it has the following distinctive features:

1. The balanced scorecard is strategy driven. It is a mechanism for implementing the strategy of a business unit into a comprehensive system of performance measurement and management. As Robert Kaplan and David Norton say: "The balanced scorecard is more than a tactical or an operational measurement system. Innovative companies are using the scorecard as a strategic management system to manage their strategy over the long run. They are using the measurement focus of the scorecard to accomplish critical management processes."
2. The balanced scorecard covers four important perspectives in a business viz., financial, customer, internal business, and learning and growth. The key issues relating to these perspectives are as follows:

<i>Perspective</i>	<i>Key Issue</i>
Financial	Is the company attractive to shareholders?
Customer	Does the company provide value to its customers?
Internal business	What must the company excel at?
Innovation and learning	Is the company improving and innovating continually?

Robert Kaplan and David Norton believe that these four perspectives are fairly robust for a wide range of businesses. [Exhibit 36.2](#) shows the structure of a balanced scorecard.

3. The balanced scorecard represents a linked series of objectives and measures. The linkages capture cause effect relationships obtaining in a business. As Robert Kaplan and David Norton say: "The multiple measures on a properly constructed balanced scorecard should consist of a series of objectives and measures that are both consistent and mutually reinforcing. The linkages should incorporate both cause and effect relationships and mixtures of outcome measures and performance drivers." [Exhibit 36.3](#) shows how the important measures under the four perspectives are linked in a cause–effect relationship.

## **Pros and Cons of Balanced Scorecard**

The proponents of balanced scorecard believe that it is a very useful tool for the following reasons:

- It focuses managerial attention on a handful of measures that are critical to a company's substantial success.
- It pulls together in a relatively simple management report the key elements of the competitive agenda of a company.
- It guards a company against sub-optimisation, as the managers are forced to look at all the measures together.

The balanced scorecard seems to have caught the fancy of the business and consulting world. Why? The reasons appear to be:

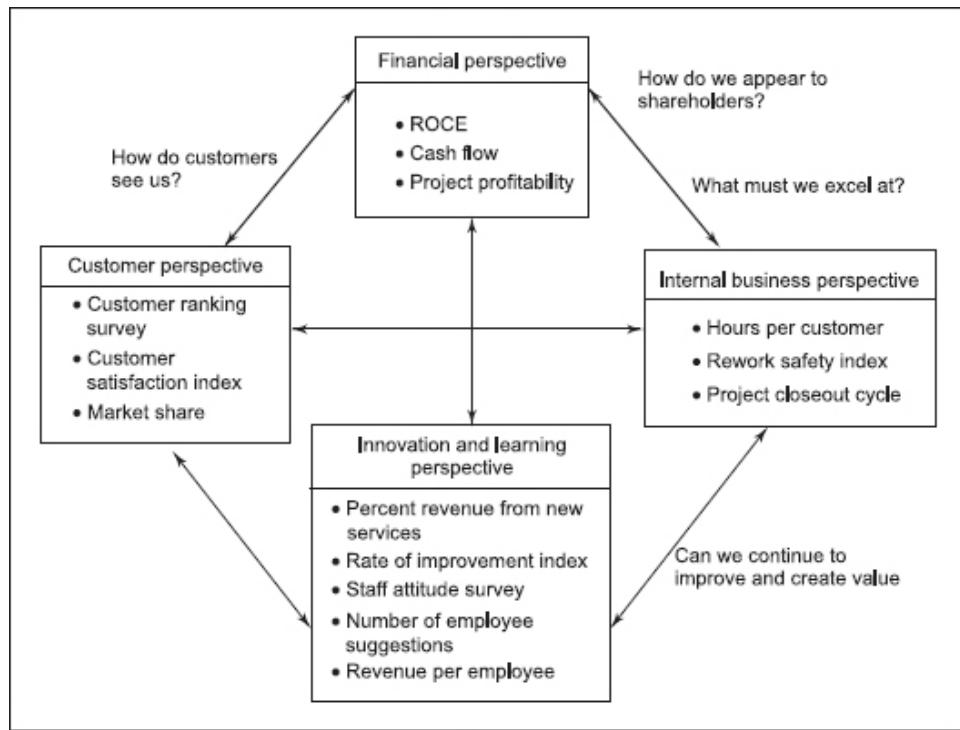
- It is an idea whose time has arrived. Dissatisfaction with traditional measurement systems combined with the need to cope with an increasingly complex world has created a great market opportunity.
- It has been well packaged and astutely marketed.
- It is simple in appearance but has potential depth. Managers can immediately understand it and can explore the concept in greater detail.

The balanced scorecard approach appears to be a definite improvement in performance measurement. However, the following problems, unless they are appropriately tackled, can impair the usefulness of the balanced scorecard.

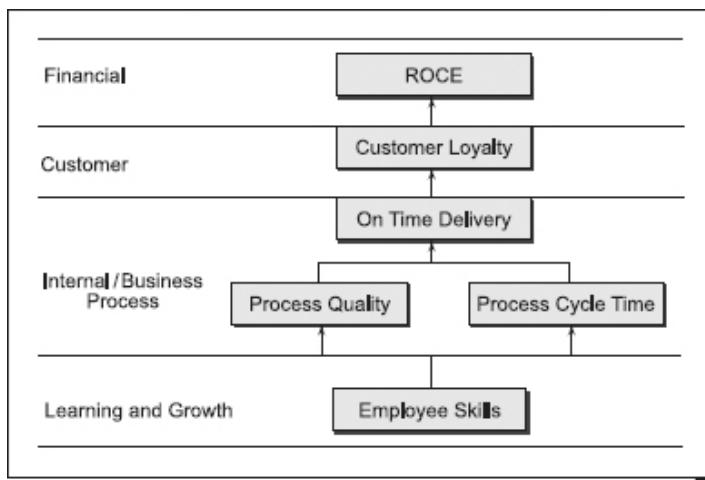
- There may be a poor correlation between non-financial measures and financial outcomes. Establishing reliable cause-effect relationships is very difficult.



## Exhibit 36.2 | Rockwater's Balanced Scorecard



## Exhibit 36.3 | Key Measures and Cause-Effect Relationships



- Managers are likely to be fixated on financial results, partly because they are well versed with measures of financial performance and partly because they are under pressure to deliver results. As Anthony and Govindarajan say: “Shareholders are vocal and the Board of Directors often applies pressure on stakeholders’ behalf. This

pressure often overwhelms the long term, uncertain payback of non-financial measures.”

- Measurement overload is a distinct possibility. If the number of measures, non-financial and financial, included in the balanced scorecard is large, managers may suffer from measurement overload. Trying to do too many things at the same time, they may lose focus.
- It is difficult to establish tradeoffs. Most balanced scorecards, for understandable reasons, do not assign weights to different measures. This leads to difficulty in specifying trade-offs between financial and non-financial measures.
- The supplier perspective has been ignored. In these days of outsourcing and growing business interdependencies, specially in manufacturing, the supplier perspective is important. Indeed many organisations have modified the balanced scorecard to include supplier perspective.

### **Parta System**

The ‘parta’ system is widely used in Birla companies as a performance measurement and control system. Its salient features are as follows:

- The ‘parta’ represents the commitment of the unit in charge to the chairman of the company or the group. It is arrived at after taking into account various factors like manufacturing capacity, operational efficiency, consumption norms, market situation, supply of materials, and labour productivity.
- The performance of the unit in-charge is monitored on a daily basis by the group chairman on key variables like quantity produced, value of production, sales, material consumption, fuel efficiency, material cost, variable conversion cost, contribution, fixed costs, profit, and cash flow.
- The rewards to the unit in-charge are linked to the extent to which the ‘parta’ commitment is fulfilled.

An indigenously developed system of responsibility accounting, the parta system is eloquently supported and defended by Birlas. This is evident from the following observations:

Siddharth Birla : “Essentially, it emphasises the speed of reporting, even sacrificing some accuracy in the process. So there is a mental pressure on the manager to perform daily. It is a very short reaction time.”

Sudarshan Birla : “The parta system is not a static or hide-bound system. It is adapted to the changing needs and we have found that the basic principles work very well.”

## **36.5 ■ PERFORMANCE EXCELLENCE AWARDS**

To recognise and stimulate performance excellence a number of awards have been instituted all-over the world.

The most well-known self-assessment frameworks used internationally are the Balridge Award (U.S.), the European Business Excellence Model (Europe), and the Deming Prize (Japan and Asia). In India, the business house of Tata has evolved the Tata Business Excellence Model for the companies in the Tata group.

A brief description of the Balridge Award, the European Business Excellence Model, and the Tata Business Excellence Model follows.

## **Balridge Award**

Instituted in 1987, the Balridge Award *inter alia* seeks to stimulate American companies to improve quality and productivity for the pride and recognition while obtaining a competitive edge through increased profits.

Balridge Awards are given annually to companies that have achieved the highest levels of performance excellence. The criteria for judging performance consist of seven categories as shown in [Exhibit 36.4](#).

## The European Business Excellence Model

Launched by the European Foundation for Quality Management (EFQM) in 1992, the European Business Excellence Model is the European version of the Baldrige Award.

The European Business Excellence Model consists of two separate sections, viz., **results** and **enablers**. Companies are marked out of 1000 and the weightages assigned to various categories of criteria are as shown in [Exhibit 36.5](#).

## Tata Business Excellence Model

Patterned after the Balridge Award, the Tata Business Excellence Model, adopted by the business house of Tata in India, evaluates the performance of Tata companies along seven criteria. The criteria and the points assigned to them are as follows:

Categories and Items	Point Value
<b>1. Leadership</b>	<b>125</b>
1.1 Senior Leadership	75
1.2 Governance and Societal Responsibilities	50
<b>2. Strategic Planning</b>	<b>85</b>
2.1 Strategy Development	45
2.2 Strategic Implementation	40
<b>3. Customer Focus</b>	<b>85</b>
3.1 Voice of the Customer	40
3.2 Customer Engagement	45
<b>4. Measurement, Analysis, and Knowledge Management</b>	<b>85</b>
4.1 Measurement, Analysis, and Improvement of Organisation Performance	40
4.2 Knowledge Management, Information, and Information Technology	45
<b>5. Workforce Focus</b>	<b>85</b>
5.1 Workforce Environment	40
5.2 Workforce Engagement	45
<b>6. Operation Focus</b>	<b>85</b>
6.1 Work Processes	45
6.2 Operational Effectiveness	40
<b>7. Results</b>	<b>450</b>
7.1 Product and Process Results	120
7.2 Customer-focused Results	85
7.3 Workforce-focused Results	85
7.4 Leadership and Governance Results	80
7.5 Financial and Market Results	80

**TOTAL POINTS** **1000**

**Exhibit 36.4 Balridge Award: Factors for Judging Performance**

1. **Leadership** The company's leadership system, values, expectations and public responsibilities.
2. **Strategic planning** The effectiveness of strategic and business planning and deployment of plans, with a strong focus on customer and operational performance requirements.
3. **Customer and market focus** How the company determines customer and market requirements and expectations, enhances relationships with customers, and determines their satisfaction.
4. **Information and analysis** The effectiveness of information collection and analysis to support customer-driven performance excellence and marketplace success.
5. **Human resource focus** The success of efforts to realise the full potential of the workforce to create a high-performance organisation.
6. **Process management** The effectiveness of systems and processes for assuring the quality of products and services.
7. **Business results** Performance results, trends and comparison with competitors in key business areas: customer satisfaction; financial and marketplace; human resources; suppliers and partners; and operations.

Source: National Institute of Standards Technology home page ([www.NIST.quality.gov](http://www.NIST.quality.gov)).

**Exhibit 36.5 The European Business Excellence Model**



**SUMMARY**

- The **performance measurement system** of a firm has a strong influence on the behaviour of its people.
- A number of performance measures have been developed: total shareholder return (TSR), market value added (MVA), discounted cash flow (DCF), economic value added (EVA), economic profit, cash flow return on investment (CFROI), cash value added (CVA), return on invested capital (ROIC), return on assets (ROA), return on equity (ROE), earnings before interest taxes depreciation and amortisation (EBITDA), cash flow, earnings per share (EPS), and so on.
- **Economic measures** (such as economic profit) are superior to accounting-based measures (such as EPS).
- As financial measures like TSR or EVA are **lagging** indicators, companies concerned with long-term value creation use a variety of non-financial measures, such as customer satisfaction index, which are **leading** indicators of value.
- The **balanced scorecard** approach seeks to develop an integrated performance system.
- The balanced scorecard covers four important perspectives in the business viz., financial, customer, internal business, and learning and growth.
- The Balridge Award (U.S.), the European Business Excellence Model (Europe), and the Deming Prize (Japan and Asia) are the most well-known international awards recognising excellence.
- Patterned after the Balridge Award, the Tata Business Excellence Model, adopted by the business house of Tata in India, evaluates the performance of Tata companies along seven criteria.

## QUESTIONS

1. Why is business performance measurement receiving a lot of attention?
2. What are the commonly employed measures of financial and non-financial performance?
3. Describe the distinctive features of balanced scorecard.
4. What are the pros and cons of balanced scorecard?
5. What are the salient features of 'parta' system?
6. Describe the Balridge Award, the European Business Excellence Model, and the Tata Business Excellence Model.

<sup>1</sup> This, of course, is true of all measurement system.

<sup>2</sup> R.S. Kaplan and D.P. Norton, *The Balanced Scorecard*, HBS Press, Boston, Massachusetts, 1996.

## PART-X

### Special Topics

**37**

International Financial Management

**38**

Financial Management in Sick Units

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Financial Management in Companies with  
Special Characteristics

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The State of Our Knowledge

## International Financial Management<sup>1</sup>

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe the present system of exchange rates.
- ✓ Understand why companies “go global”.
- ✓ Explain various exchange rates.
- ✓ Discuss the theories of international parity relationships.
- ✓ Evaluate an overseas investment proposal.
- ✓ Discuss the various sources of foreign currency finance for Indian firms.
- ✓ Explain different types of foreign exchange exposure and the ways of managing them.

So far we were concerned mainly with the financial aspects of doing business domestically. Many firms in India, however, raise finances in foreign markets, export goods and services, import goods and services, and even invest abroad. The international involvement of Indian firms is increasing and this trend is expected to continue as India forges stronger linkages with the world economy.

The basic principles of financial management are the same whether a firm is a domestic firm or an international firm—a firm that has significant foreign operations is called an international firm or a multinational firm. However, international firms must consider several financial factors that do not directly have a bearing on purely domestic firms. These include currency denominations, diverse tax and legal systems, varying accounting standards, language differences, disparate cultures and values, barriers to trade and financial flows, and political risk.

The field of international finance has witnessed explosive growth and dynamic changes in recent decades. This has been stimulated by several

forces: (a) The change in the international monetary system from a fairly predictable system of exchange rates to a flexible and volatile system of exchange rates. (b) Emergence of new institutions and markets and a greater need for international financial intermediation. (c) A greater integration of the global financial system.

## 37.1 ■ WORLD MONETARY SYSTEM

In order to understand the present world monetary system, it is helpful to look at the developments during the last few decades. From the end of the Second World War until February 1973, an adjustable peg exchange rate system, administered by the International Monetary Fund, prevailed. Under this system, the U.S. dollar which was linked to gold (\$35 per ounce) served as the base currency. Other currencies were expressed in terms of the dollar and, through this standard, exchange rates between currencies were established. A special feature of this system was that close control was exercised over the exchange rates between various currencies and the dollar—a fluctuation of only  $\pm$  one percent was allowed around the fixed exchange rate.

What mechanism was used to hold fluctuations within the one percent limit? Central banks of various countries participated actively in the exchange market to limit fluctuation. For example, when the rupee would fall vis-à-vis other currencies, due to forces of demand and supply in the international money and capital markets, the Reserve Bank of India would step in to buy rupees and offer gold or foreign currencies in exchange to buoy the rupee rate. When the rupee rate tended to rise, the Reserve Bank of India would sell rupees.

What happened when the central bank of a country found it extremely difficult to maintain the exchange rate within limits? If a country experienced continued difficulty in preventing the fall of its exchange rate below the lower limit, it could, with the approval of the International Monetary Fund, devalue<sup>2</sup> its currency. India, for example, devalued its currency in 1966 in a bid to cope with its balance of payments problem. A country enjoying continued favourable balance of payments situation would find it difficult to prevent its exchange rate from rising above the upper limit. Such a country would be allowed, again with the approval of the International Monetary Fund, to revalue its currency. West Germany, for example, was allowed to revalue its currency in 1969.

### The Euro and the European Monetary Union

January 1, 1999 was a momentous day in the field of international finance when 11 out of 15 European Union (EU) countries adopted a common currency called the euro, giving up their monetary independence to foster economic integration. On the

positive side, a common currency reduces transaction costs and eliminates exchange rate risk. On the negative side, a common currency takes away a nation's monetary and exchange rate policy independence.

## **Present System of Floating Exchange Rates**

In 1971 the U.S. dollar was delinked with gold. Put differently, it was allowed to “float”. This brought about a dramatic change in the international monetary system. The system of fixed exchange rates, where devaluations and revaluations occurred only very rarely, gave way to a system of floating exchange rates.

In a truly floating exchange rate regime, the relative prices of currencies are decided entirely by the market forces of demand and supply. There is no attempt by the authorities to influence exchange rate movements or to target the exchange rate. Such an idealised free float probably does not exist. Governments of almost all countries regard exchange rate as an important macro-economic variable and attempt to influence its movements either through direct intervention in the exchange markets or through a mix of fiscal and monetary policies. Such floating is called *managed or dirty float*.

Unlike the Bretton Woods era, there are few if any rules governing exchange rate regimes adopted by various countries. Some countries allow their currencies to float with varying degrees and modes of intervention, some tie their currencies with a major convertible currency, and some tie it to a known basket of currencies. The general prescription is that a country must not manipulate its exchange rate to the detriment of international trade and payments.

The exchange rate regime of the Indian rupee has evolved over time moving in the direction of less rigid exchange controls and current account convertibility.

The exchange rate of the rupee is managed by the RBI. More specifically, during the last several years, the RBI has been intervening heavily in the market to hold the rupee-dollar rate within tight bounds while rupee rates with other currencies fluctuate as the U.S. dollar fluctuates against them.

These changes in the exchange rate regime have been accompanied by a series of measures relaxing exchange control as well as significant liberalisation of foreign trade.

## **Agencies that Facilitate International Flows**

Several agencies have been established since the early 1940s to promote international trade and financial transactions. The more important ones are described below briefly:

**International Monetary Fund** The Bretton Woods conference of the United Nations in July 1944 was called to develop a structured international monetary system. As a result, the International Monetary Fund (IMF) was set up. The major objectives of IMF, as spelt out in its charter, are to promote cooperation among countries on international monetary issues, promote stability in exchange rates, provide temporary assistance to member countries to correct imbalances in international payments, promote free mobility of capital across countries, and promote free trade.

**International Bank for Reconstruction and Development (IBRD)** Also called as the World Bank, IBRD was formed in 1944 with the primary objective of giving loans to countries for the purpose of economic development. The World Bank has a profit-orientation and hence its loans are given at market rates to governments (and their agencies) that are expected to repay them. The World Bank raises its funds through borrowings in various currencies and countries.

**World Trade Organisation (WTO)** The Uruguay Round of trade negotiations that led to the GATT (General Agreement on Trade and Tariffs) accord in 1993 led to the formation of WTO. WTO is a forum for trade negotiations and settlement of disputes related to the GATT accord.

**International Financial Corporation (IFC)** Established in 1956, IFC seeks to promote private enterprises. IFC gives loans as well as participates in equity. IFC typically provides 10 to 15 percent of the funds required for the private enterprise projects, thus acting as a catalyst.

**International Development Association (IDA)** Established in 1960, IDA seeks to promote country development. IDA offers loans at subsidised rates of interest to poor countries that cannot qualify for World Bank loans.

**Bank for International Settlements (BIS)** The BIS facilitates cooperation among countries with respect to international transactions and assists countries experiencing financial crisis. It is sometimes referred to as central banks' central bank.

**Regional Development Agencies** In addition to the above agencies which have a global scope, there are several agencies that have a more regional character. *Inter alia*, these include the Asian Development Bank, the African Development Bank, the Inter-American Development Bank, and the New Development Bank.

### Globalisation of the World Economy: Recent Trends

The following trends have contributed to the process of globalisation.

- The 1980s and 1990s witnessed a *rapid integration of international capital and financial markets*, the impetus for which came from the deregulation of the foreign exchange and capital markets by the governments of major countries.
- The *advent of the euro* at the beginning of 1999 heralded a new era, which may possibly lead to a bipolar international monetary system.
- There was rapid expansion of international trade from 1950. This is being pushed further at the global level (by WTO) and the regional level (by EU, NAFTA and others).
- Economic integration and globalisation that started in 1980s gathered momentum in 1990s, thanks to massive *privatisation* initiatives.

## 37.2 ■ MULTINATIONAL CORPORATIONS (MNCs)

A multinational, or global, corporation is a firm that operates in an integrated fashion in a number of countries. Companies “go global” for various reasons.

**Trade Barriers** Confronted with restrictions to export its products to foreign markets, a firm may set up production facilities in foreign countries to circumvent trade barriers.

**Imperfect Labour Markets** Due to immigration barriers, labour mobility is limited. So firms locate their plants or facilities in countries that offer labour cost advantage.

**Intangible Assets** Companies often possess special intangible assets like superior R&D capabilities, marketing savvy, brand equity, and managerial talent. So they invest in foreign countries to leverage these competitive advantages.

**Vertical Integration** Companies invest in countries to enjoy the benefits of vertical integration. While the majority of vertical foreign direct investments are *backward* to secure supplies of raw materials (oil, mineral deposits, and forest produce), some are *forward* as they involve an industry using the MNC’s outputs.

**Product Life Cycle** According to Raymond Vernon, it is advantageous for a firm to set up production base in foreign countries when the product has reached the stage of maturity.

**Diversification** By geographically diversifying their production base and markets, firms can reduce the risk of adverse economic developments in a single country.

**Shareholder Diversification** If there are restrictions to cross-border portfolio diversification, firms can provide their shareholders the benefits of indirect diversification by investing in foreign countries.

### **37.3 ■ FOREIGN EXCHANGE MARKETS AND RATES**

The foreign exchange market is the market where one country's currency is traded for another's. It is the largest financial market in the world. The daily turnover in this market in 2016 was estimated to be above \$5 trillion. Most of the trading, however, is confined to a few currencies: the U.S dollar (\$), the Japanese Yen (¥), the Euro (€), the British pound sterling (£), the Swiss franc (SF) and the Chinese remnimbi (¥).

## **International Foreign Exchange Market**

The important features of the international foreign exchange market, which has grown very rapidly in recent years, are as follows:

- The key participants are: (a) importers who need foreign currencies, to pay for their imports, (b) exporters who want to convert their foreign currency receipts into domestic currency, (c) traders who “make a market” in foreign currencies, (d) foreign exchange brokers who bring together buyers and sellers, (e) speculators who try to profit from exchange rate movements, and (f) portfolio managers who buy and sell foreign securities.
- The foreign exchange market is essentially an ‘over the counter’ market. This means that there is no central location where traders get together and trade—some derivative contracts based on forex rates, however, are traded on exchanges. Rather, market participants are located in major commercial banks, investment banks, and multinational corporations around the world. They communicate through telephones, telexes, Reuter monitors, computer terminals, and other telecommunication devices.
- The implications of an OTC market, as distinct from an exchange, are: (a) There is lesser price transparency, although modern information and transportation systems have improved the situation. (b) There is risk of counterparty default. (c) Trades can be customised in terms of currency pairs, amounts, and maturities. (d) There can be differences in the exchange rates for the same currency pair, for different counterparts.
- Extending from Tokyo and Sydney in the East to New York and San Francisco in the West, the international foreign exchange market spans almost all the time zones. It is virtually a 24-hour market.
- Speculative transactions account for more than 95 percent of the turnover on the foreign exchange market. Irrespective of how one looks at speculation, it cannot be gainsaid that if the turnover is not large, the foreign exchange market would be patchy and discontinuous.

## **Foreign Exchange Market in India**

The foreign exchange market in India is very small. Its important features are as follows:

- The key participants in this market are the Reserve Bank of India, banks, and business undertakings.
- The Indian foreign exchange market is a managed market in which the Reserve Bank of India plays a key role in setting the day-to-day rates.
- Business undertakings in India can participate in the foreign exchange market in India only to the extent that they need cover for exchange exposure arising from a merchant transaction or a foreign currency borrowing. This means they cannot resort to speculative transactions.
- The present exchange control regulations permit banks to have a net overbought or oversold position in a foreign currency subject to limits notified by the RBI from time to time in its Exchange Control circulars.

## Exchange Rates

An exchange rate represents the price of one currency expressed in terms of another. There are two ways in which the exchange rate is quoted. In a **direct quote**, the exchange rate for a foreign currency is quoted in terms of the number of units of local currency that are equal to a unit of the foreign currency. For example, when we say that the exchange rate of a dollar is ₹ 70 we have a direct quote for the dollar. In an **indirect quote**, the exchange rate for a foreign currency is expressed in terms of the number of units of foreign currency that are equal to a unit of the local currency. For example when we say that \$0.01429 is equal to ₹ 1 we have an indirect quote for the dollar.

Till August 1993, the interbank foreign exchange market in India used the system of indirect quotes. Since then, it has adopted direct quotes so that exchange rates are now quoted as number of rupees per unit (or per 100 units in some cases) of foreign currency.

Before proceeding further, let us note that the International Standards Organisation has developed three letter codes for all currencies that are used by the SWIFT network which effects inter-bank fund transfers. The codes for selected currencies are given below:

USD	:	US Dollar
AUD	:	Australian Dollar
GBP	:	British Pound
CAD	:	Canadian Dollar
INR	:	Indian Rupee
JPY	:	Japanese Yen
SGD	:	Singapore Dollar
CHF	:	Swiss Franc
AED	:	UAE Dirham
EUR	:	Euroland Euro

## The Spot Market

The spot market is the market for almost the immediate purchase or sale of foreign exchange. Typically, the settlement is done in two business days after the transaction date.

**Spot Rate Quotations** To understand spot rate quotations, we will use the ACI (Association Cambiste International) conventions, which are followed in the inter-bank market. These conventions are as follows:

- A pair of currencies is denoted by the 3-letter SWIFT codes for the currencies separated by an oblique or a hyphen.

Examples: GBP/CHF : Great Britain Pound–Swiss Franc  
USD/INR : US Dollar–Indian Rupee

- In a pair, the first currency is the ‘base’ currency and the second currency is the ‘quoted’ currency.
- The exchange rate quotation reflects the number of units of the quoted currency per unit of the base currency. Thus a GBP/INR quotation reflects the number of Indian rupees per British pound.

A quotation consists of two prices separated by a hyphen or slash. The first price is the *bid price*; this is the price at which the dealer is willing to buy the base currency. The second price is the *ask price*; this is the price at which the dealer is willing to sell. An illustrative quotation is given below:

USD/INR Spot : 70.5000/70.5400

This quotation means that the dealer will buy one US dollar for ₹ 70.5000 and will sell one US dollar for ₹ 70.5400.

The *bid–ask spread*—the difference between bid and ask prices—reflects the breadth, depth, and volatility of the currency market. Typically, the bid–ask spread which is ₹ 0.04 here represents the transaction cost. The spread is normally expressed in percentage terms as follows:

$$\text{Percent spread} = \frac{\text{Ask price} - \text{Bid price}}{\text{Bid price}} \times 100$$

For example, the percentage spread for the dollar quote ₹ 70.5000 – 70.5400 works out to 0.088 percent.

$$\text{Percent spread} = \frac{70.5400 - 70.5000}{70.5000} \times 100 = 0.057 \text{ percent}$$

**Cross-Exchange Rate Quotations** To develop the concept of a cross-rate, let us for the time being ignore the transaction cost. Given the

exchange rate between currencies A and B and currencies B and C, you can derive the exchange rate between currencies A and C. In general,

$$S(A/C) = S(A/B) \times S(B/C)$$

Note that  $S(A/C)$  represents the spot rate (say, the average of the bid and ask prices) between currencies A and C, and so on. To illustrate, consider the following rates:

$$S(\text{INR/USD}) = 0.0143$$

$$S(\text{USD/CHF}) = 1.0114$$

Given the above rates you can calculate the exchange rate between INR and CHF.

$$\begin{aligned} S(\text{INR/CHF}) &= S(\text{INR/USD}) \times S(\text{USD/CHF}) \\ &= 0.011 \times 1.04314 = 0.0145 \end{aligned}$$

Most commonly, cross-rate calculations are done to establish the exchange rates between two currencies that are quoted against the US dollar but are not quoted against each other.

## The Forward Market

In the foreign exchange market, forward transactions are also possible in which the rate is fixed today but the settlement is at some specified date in the future. Such rates are called **forward rates**. Banks normally quote forward rates for maturities in whole calendar months—such as 1, 2, 3, and 6 months—but will tailor a forward deal to suit the customer's requirements.

For commercial customers banks usually give an outright quotation in the same way as they give for a spot transaction. Thus a quote like

USD/INR 3 – Month Forward: 70.5220/70.6210

means that the bank (dealer) will buy one US dollar for ₹ 70.5220 or sell one US dollar for ₹ 70.6210 for a delivery to be made after 3 months.

In the interbank market, however, forward quotes are given as a pair of “swap points” to be added to or subtracted from the spot quotation. A typical swap quotation is as follows:

USD/INR Spot : 70.5010/70.5020

1 month swap : 12/9

The swap quotation is expressed in such a way that the last digit coincides with the same place as the last digit of the spot price. Thus in the USD/INR quote given above, the number “12/9” means INR 0.0012/INR 0.0009.

**Conversion of Swap Rate into Outright Rate** You can convert a swap rate into an outright rate by adding the premium to, or subtracting the discount from, the spot rate. The swap rates do not carry plus or minus signs but you can easily determine whether the forward rate is at a premium or discount using the following rule.

*If the forward bid in points is less (more) than the offer rate in points, the forward rate is at a premium (discount). So add (subtract) the points to the respective spot rate to get the outright quote.*

Let us apply this rule to the USD/INR example given above. In that example the bid rate in points (12) is more than the offer rate in points (9). So the forward rate is at a discount in relation to the spot rate. Hence we subtract the points from the respective spot quotation to get the outright forward quotation. Thus, the outright forward quotation is:

USD/INR One Month Forward:  $(65.5010 - 0.0012)/(65.5020 - 0.0009)$  or 65.4998/65.5011

**Forward Premiums and Discounts** Consider the following spot and forward quotes:

USD/INR Spot : 70.5020/70.5120

USD/INR 1-month forward : 70.5420/70.5620

The US dollar is costlier in the forward market than in the spot market. Put differently, it is at a *forward premium* in relation to the Indian rupee.

With two-way quotations, you cannot quantify the premium or discount in a unique way. One way to quantify the annual percentage premium or discount is as follows:

$$\frac{\text{Forward (USD/INR)}_{\text{mid}} - \text{Spot (USD/INR)}_{\text{mid}}}{\text{Spot (USD/INR)}_{\text{mid}}} \times 12 \times 100$$

In this formula, the mid rate is simply the arithmetic average of the bid and ask rates. Note that multiplication by 12 converts the monthly premium (or discount) to annual premium (or discount) and multiplication by 100 translates it into percentage terms.

Applying this formula to the USD/INR spot and forward quotes given above, we get:

$$\frac{70.5520 - 70.5070}{70.5070} \times 12 \times 100 = 0.766 \text{ percent}$$

This means that the annual forward premium on US dollar in relation to Indian rupee is 0.766 percent.

## Illustrative Exchange Rates

Exhibit 37.1 shows illustrative exchange rates. To understand the numbers given in Exhibit 37.1, note the following:

- A *spot rate* is the rate applicable to a transaction in which settlement is done in two business days after the date of transaction. A *forward rate* is a rate that is fixed today but the settlement takes place at some specified date in future. Banks normally quote forward rates for maturities in whole calendar months—such as 1, 2, 3 and 6 months—but will tailor a forward deal to suit the customer's requirements.
- A TT (telegraphic transfer) buying rate is the rate applied by a bank for purchase of foreign currency, where it is already in receipt of cover funds (i.e., corresponding funds). A TT selling rate is the rate applied to all clean (i.e., not involving handling of documents) remittances of foreign currencies outside India.
- A forex dealer (such as a bank) offers a two-ways quotation. If a bank quotes ₹ 70.09/₹ 70.21 per US dollar, it means that the bank is willing to buy a US dollar for ₹ 70.09 and sell a US dollar for ₹ 70.21. The buying rate is called the 'bid rate' and the selling rate the 'offer rate'. In Exhibit 37.1 bid rates are shown under the EXPORT columns and ask rates are shown under the IMPORT columns.

### Exhibit 37.1 Exchange Rates

Indicative on Monday January 21, 2019									
IMPORT					EXPORT				
Spot	1 month	3 months	6 months	Currency	Spot	1 month	3 months	6 months	
0.8798	0.8773	0.8729	0.8661	Euro	0.8796	0.8797	0.8772	0.873	
0.777	0.7758	0.7735	0.77	Pound Sterling	0.7767	0.7769	0.7757	0.7735	
109.6021	109.3101	108.7809	107.9615	Japanese Yen*	109.6246	109.5939	109.3076	108.7971	
0.9978	0.9946	0.9892	0.9803	Swiss Franc	0.9978	0.9976	0.9946	0.9893	
1.3596	1.3585	1.3565	1.353	Singapore Dollar	1.3599	1.3595	1.3588	1.357	
71.34	71.62	72.10	72.82	Indian Rupees	71.2450	71.51	71.99	72.72	

\* 100 units  
Source : State Bank of India, Chennai (as reproduced in Business Line dated 22-I-2019)

## **Futures and Options in Foreign Currencies**

Instead of using the forward market, you can use the futures market. Currency futures contracts are standardised currency forward contracts. Such contracts are standardised in terms of the size of the contract and delivery dates and exist only for major currencies. They trade on organised futures exchanges.

Both forward contracts and futures contracts impose a definite obligation on you to take (or give) delivery of the currency contracted. By contrast a currency option contract gives you the right, without imposing the obligation, to sell (put) or buy (call) the foreign currency at a predetermined price and maturity date. You can buy a tailor made currency option contract from a bank or a standardised currency option contract on an options exchange. Of course, in either case you have to pay a non-refundable premium to enjoy the option.

Finally, you can enter into an agreement with a bank to buy foreign currency in future at the prevailing spot rate but subject to certain price limits. If the spot price in future happens to be above the upper limit, you buy at the upper limit; on the other hand, if the spot price in future is below the lower limit you buy at the lower limit.

## 37.4 ■ INTERNATIONAL PARITY RELATIONSHIPS

To develop a consistent international financial policy, you need to understand the relationship between interest rates, inflation rates, and exchange rates. For this purpose the following theories are discussed:

- Covered interest arbitrage and interest rate parity
- Purchasing power parity
- Expectations theory and forward exchange rates
- Fisher effect and international Fisher effect

## Covered Interest Arbitrage and Interest Rate Parity

There is a close link between the interest rates in two countries and the forward rate premium or discount. To understand this relationship let us consider the case of a US investor, Richard Hope, who has \$1.5 million to invest. He finds that the interest rate on 90-day certificates of deposit in the US is 2 percent for 90 days, whereas the interest rate on 90-day certificates of deposit in UK is 3 percent for 90 days. The spot rate of the British pound is \$1.50/£ and the 90-day forward rate is also \$1.50/£. Richard Hope will find it profitable to:

- Convert \$1.5 million into £1.0 million at the current spot rate of \$1.50/£.
- Buy a 90-day certificate of deposit at a British bank yielding 3 percent for 90 days.
- Sell £1.03 million forward (original £1.0 million plus £0.03 million of interest on the 90-day certificate of deposit) at the forward rate of \$1.50/£.

This strategy will give him \$1.545 million 90 days hence. This compares favourably with \$1.530 million (\$1.5 million plus interest at 2 percent) that he would receive from investing in a 90-day certificate of deposit in the US. Put differently he earns an additional return of \$15,000 without incurring any extra risk by resorting to covered interest arbitrage transaction.

Obviously such opportunities for earning risk-free additional returns cannot persist for long. The demand by American investors for British pounds will push the spot price of the pound beyond \$1.50. Simultaneously, as American investors sell pounds forward to cover their positions, the forward rate of the pound will fall below \$1.50. Moreover, as funds leave the US for Great Britain, the reduced supply of funds in the US will tend to raise the US interest rates. On the other hand, the increased supply of funds in Great Britain will tend to depress the British interest rates.

The combined effect of such transactions and market pressures will result in an equilibrium relationship called interest rate parity (IRP) which precludes covered interest arbitrage transactions. When IRP exists, the difference between the forward rate and the spot rate is just enough to offset the difference between the interest rates in the two currencies. The IRP condition implies that the home interest rate must be higher (lower) than the foreign interest rate by an amount equal to the forward discount (premium) on the home currency. Formally, IRP is stated as follows:

$$\frac{F}{S_o} = \frac{1+r_h}{1+r_f} \quad (37.1)$$

where  $F$  is the direct quote forward rate,  $S_o$  is the direct quote spot rate,  $r_h$  is the home (or domestic) interest rate,  $r_f$  is the foreign interest rate.

**Example** The 90-day interest rate is 1.25 percent in the US and 2.00 percent in the UK, and the current spot exchange rate is \$1.50/£. What will be the 90-day forward rate?

$$\frac{F}{\$1.50} = \frac{(1+0.0125)}{(1+0.020)} \quad F = 1.4890$$

In this case the US dollar appreciates in value relative to the British pound. Explain why this happens.

## Purchasing Power Parity

If there are no costs or other barriers associated with the movement of goods or services across countries, the price of each product should be the same in each country, after making appropriate currency conversions. It is called the law of one price in economics. It implies that the exchange rate between the currencies of two countries will be equal to the ratio of the price indexes in these countries. In its absolute version this relationship is called purchasing power parity.

In reality, of course, the purchasing power parity does not hold because of the costs of moving goods and services and the presence of various barriers. For example, the *Economist* magazine regularly reports the price of Big Mac hamburgers in various countries converted into US dollars. In 1995, a Big Mac cost \$2.32 in the United States, \$1.05 in China, \$3.48 in Germany, \$4.65 in Japan, \$5.20 in Switzerland, \$2.80 in United Kingdom, and \$1.82 in Australia. Since it is not possible to buy Big Macs in Australia and ship them for sale to Switzerland, the law of one price does not hold for Big Macs. However, for goods like gold and crude oil that can be easily moved and stored, one may not find major deviations from the law of one price.

A less restrictive form of PPP is called the relative purchasing power parity. It says that the difference in the rates of inflation between two countries will be offset by a change in the exchange rate. For example, if the expected inflation rate is 6 percent in India and 2 percent in the US, then the Indian rupee will depreciate relative to the US dollar at a rate of approximately 4 percent. More precisely, the relative PPP is expressed as follows:

$$\frac{S_1^e}{S_o} = \frac{1+i_h}{1+i_f} \quad (37.2)$$

where  $S_1^e$  is the expected spot rate a year from now,  $S_o$  is the current spot rate,  $i_h$  is the expected inflation rate in home country, and  $i_f$  is the expected inflation rate in foreign country.

**Example** The current spot rate for the U.S. dollar is ₹ 70. The expected inflation rate is 6 percent in India and 2 percent in the U.S. What is the expected spot rate of dollar a year hence?

$$\frac{S_1^e}{70.0} = \frac{1+0.06}{1+0.02} \quad S_1^e = ₹ 72.75$$

The market forces that lead to the relative PPP work as follows. If a country's inflation rate is higher than that of another, its goods and services will become relatively more expensive, thereby making its exports less price-competitive and its imports more price-competitive. This will lead to a deficit in its balance of trade account and put a downward pressure on its exchange rate. The opposite will happen to a country with a lower inflation rate. Its exports will become more price-competitive and its imports less price-competitive. This will lead to a surplus in its balance of trade account and put an upward pressure on its exchange rate.

## Expectations Theory and Forward Exchange Rates

If foreign exchange markets are efficient, the forward rate equals the expected future spot rate.

$$F_1 = S_1^e \quad (37.3)$$

For example, if the market participants expect the one-year future spot rate ( $S_1^e$ ) for the US dollar to be ₹ 65.00, then the one year forward rate ( $F_1$ ) will also be ₹ 65.00. If  $F_1$  were lower than  $S_1^e$ , market participants would buy dollars forward, thereby pushing  $F_1$  upward till it equals  $S_1^e$ . On the other hand, if  $F_1$  were higher than  $S_1^e$ , market participants would sell dollars forward, thereby pushing  $F_1$  downward till it equals  $S_1^e$ .

If the forward rate is equal to the expected future spot rate, we can say that the forward rate is an unbiased estimate of the future spot rate. Does it mean that the forward rate will always equal the actual future spot rate? No, it does not mean that. Rather, it means that the forward rate on average equals the future spot rate and does not systematically overshoot or undershoot the future spot rate.

Empirical evidence suggests that if the risks of currency markets are ignored, the forward rate is an unbiased estimate of the expected future spot rate. However, there is some evidence that when the forward rate implies a large change from the current spot rate, the forward rate tends to overshoot the future spot rate.

The expectations theory has two important implications for financial managers. First, financial managers should not spend money to buy exchange rate forecasts since unbiased forecasts are freely available in the currency market. Second, forward contracts are a cost-effective way of hedging foreign currency risk.

## Fisher Effect and the International Fisher Effect

According to the Fisher effect, the nominal interest rate is equal to the real interest rate plus an adjustment for inflation:

$$(1 + \text{Nominal interest rate}) = (1 + \text{Real interest rate}) (1 + \text{Inflation rate})$$

For example, if the real interest rate is 6 percent and the inflation rate is 5 percent, the nominal interest rate will be:

$$(1 + 0.06) (1 + 0.05) - 1 = 0.113 \text{ or } 11.3 \text{ percent}$$

The generalised version of the Fisher effect says that if risk is held constant the real returns are equalised across countries due to arbitrage operation.

If expected real returns are higher in one country, than in another, capital will flow from the country where the expected real returns are lower to the country where the expected real returns are higher. This will continue till the expected real returns are equalised across countries. This implies that in equilibrium the nominal interest differential will be equal to the expected inflation differential. In symbols,

$$\frac{1+r_h}{1+r_f} = \frac{1+i_h}{1+i_f} \quad (37.4)$$

where  $r_h$  is the home interest rate in nominal terms,  $r_f$  is the foreign interest rate in nominal terms,  $i_h$  the expected inflation rate in home country, and  $i_f$  is the expected inflation rate in foreign country.

If we combine purchasing power parity with generalised Fisher effect, the result is the International Fisher effect.

$$\text{Purchasing power parity : } \frac{S_1^e}{S_o} = \frac{1+i_h}{1+i_f}$$

$$\text{Generalised Fisher effect : } \frac{1+r_h}{1+r_f} = \frac{1+i_h}{1+i_f}$$

$$\text{International Fisher effect : } \frac{S_1^e}{S_o} = \frac{1+r_h}{1+r_f}$$

**Example** If the one-year US nominal interest rate is 2 percent, the one-year Indian nominal interest rate is 8 percent, and the current spot exchange rate,  $S_o$ , is ₹ 70/\$ then the expected spot rate in one year will be:

$$\frac{S_1}{₹ 70} = \frac{(1+0.08)}{(1+0.02)}$$

$$S_1 = ₹ 74.12$$

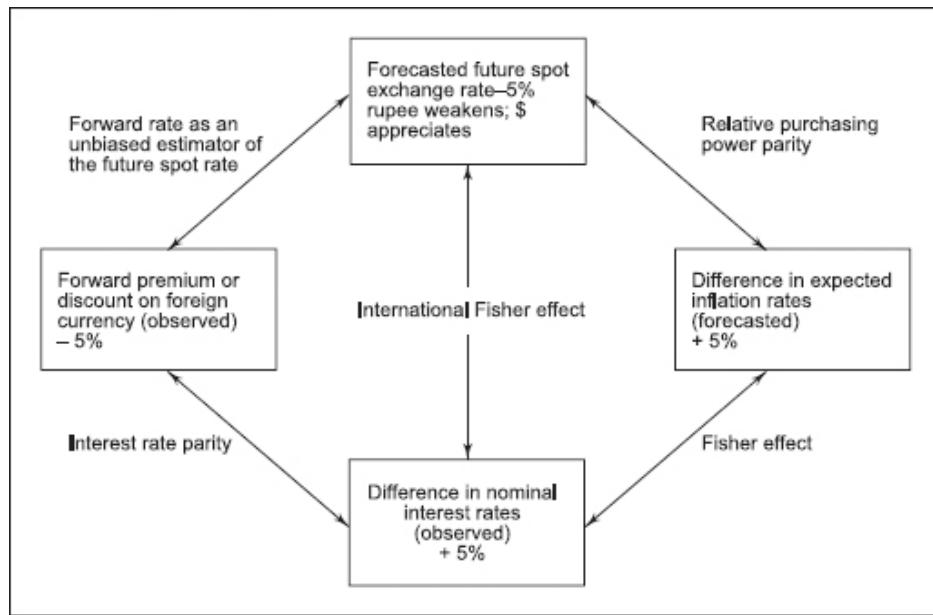
## An Integrated Picture of International Parity Relationships

[Exhibit 37.2](#) provides an integrated picture of international parity relationships. The calculations in this exhibit assume that the Indian nominal rate of interest is 8 percent, the US nominal rate of interest is 3 percent, and the time horizon is 1 year.

The lower box shows the observed difference in nominal interest rates as 5 percent. This implies, according to the Fisher effect, that the difference in the expected inflation rate is 5 percent. The 5 percent expected inflation differential means that the one-year forecasted spot rate will fall by 5 percent relative to the US dollar. This is the implication of the purchasing power parity relationship.

The 5 percent interest rate differential also means that the rupee will sell at a 5 percent discount relative to the US dollar in the one-year forward market. This reflects the interest rate parity relationships. Since the forward rate is an unbiased estimator of future spot rate, the one year future spot rate of exchange is expected to change such that the rupee will decline by 5 percent relative to the US dollar.

### Exhibit 37.2 An Integrated Picture of International Parity Relationships



Finally, the international Fisher effect implies that if the one-year nominal interest rate is 5 percent higher in India than in the US, the one year

expected future spot rate of exchange will be less by 5 percent relative to the current spot rate.

### **Key Implications of the International Parity Relationships**

The key implications of the international parity relationships are:

1. Forward rates can be used to adjust for exchange risk in contract pricing.
2. The expectations theory suggests that it makes sense to protect against exchange risk.
3. The interest rate parity theory suggests that hedging can be done either by selling forward or by borrowing foreign currency and selling spot.
4. The cost of forward cover is the difference between the forward rate and the expected spot rate and not the forward rate and today's spot rate, as some people mistakenly think.

## Exchange Rate Forecasting

Exchange rate forecasts are an important input for many decisions in corporate finance. Decisions relating to cross-border acquisitions and investments, choice of currency for borrowing and investment of short-term surpluses, hedging of foreign exchange exposure, speculation in currencies, pricing of products and services sold abroad, choice of invoicing currency, and so on all require some exchange rate forecasts.

A treasurer may depend on in-house forecasting expertise or seek advice from an outside service. In either case, the forecasting methodology and the forecasts themselves need to be evaluated.

There are two broad categories of forecasting models: structural economic models and pure forecasting models. **Structural economic models** show how the exchange rate is determined by factors such as the purchasing power parity or the monetarist model. **Pure forecasting models** eschew all fundamentals and seek to discover patterns in past exchange rate movements which can be extrapolated to the future. Pure forecasting models include time series models and technical or chartist methods. Time series models such as the ARIMA (Auto-Regressive Integrated Moving Average) model estimate the parameters of the underlying stochastic process and use the estimated equation for forecasting. Technical or chartist methods are less formal in nature, relying on visual patterns in plots of past exchange rates. *Euromoney* surveys suggest that technical analysis is very popular among professional currency forecasters, particularly for short-term forecasting. For long-term forecasting, market participants seem to believe in some kind of “reversion to an equilibrium exchange rate,” the equilibrium exchange rate being determined by some fundamental relation such as the purchasing power parity theory. There seems to be a considerable dispersion in the forecasts of market participants and the dispersion increases as the forecasting horizon becomes longer.

Recent developments in modeling and forecasting financial time series have applied mathematical models imported from biological and physical sciences, chaos theory, and neural networks.

## 37.5 ■ INTERNATIONAL CAPITAL BUDGETING

India Pharma Limited, an India-based multinational company, is evaluating an overseas investment proposal. India Pharma's exports of pharmaceuticals products have increased to such an extent that it is considering a project to build a plant in the US. The project will entail an initial outlay of \$100 million and is expected to generate the following cash flows over its four year life.

Year	Cash flow (in million)
1	\$ 30
2	\$ 40
3	\$ 50
4	\$ 60

The current spot exchange rate is ₹ 70 per US dollar, the risk-free rate in India is 8 percent and the risk-free rate in the US is 3 percent—these are rates observed in the financial markets.

India Pharma's required rupee return on a project of this kind is 15 percent. Should India Pharma undertake this project? The answer, of course, depends on the NPV of the project. How is the NPV of such a project calculated?

There are two basic ways of doing this:

### *Home Currency Approach*

- Convert all the dollar cash flows into rupees (use forecasted exchange rates)
- Calculate the NPV in rupees (using the rupee discount rate)

### *Foreign Currency Approach*

- Calculate the NPV in dollars (use the dollar discount rate)
- Convert the dollar NPV into rupees (use the spot exchange rate)

## Home Currency Approach

To apply the home currency approach we have to come up with the forecasted exchange rates. Based on the parity relationships discussed earlier, the expected spot exchange rate at time  $t$  is:

$$S_t^e = S_o \left( \frac{1+r_h}{1+r_f} \right)^t \quad (37.5)$$

where  $S_t^e$  is the expected spot exchange rate at time  $t$ ,  $S_o$  is the current spot exchange rate,  $r_h$  is the nominal risk free interest rate in home currency, and  $r_f$  is the nominal risk-free interest rate in foreign currency.

In our example,  $S_o = ₹ 70$ ,  $r_h = 8$  percent, and  $r_f = 3$  percent. Hence the forecasted spot exchange rate are as follows:

Year	Forecasted spot exchange rate
1	₹ 70 $(1.08/1.03)^1 = ₹ 73.40$
2	₹ 70 $(1.08/1.03)^2 = ₹ 76.96$
3	₹ 70 $(1.08/1.03)^3 = ₹ 80.70$
4	₹ 70 $(1.08/1.03)^4 = ₹ 84.61$

Using these forecasted spot exchange rates along with the current spot rate of ₹ 65, we can convert the dollar cash flows into rupees as follows:

Year	Cash flow in dollar (million)	(1)	(2)	(3)
		Expected exchange rate	Cash flow in rupees (million)	$(1) \times (2)$
0	100	₹ 70.00	-₹ 7000	
1	30	73.40	2202.0	
2	40	76.96	3078.4	
3	50	80.70	4035.0	
4	60	84.61	5076.6	

Given a rupee discount rate of 15 percent, the NPV in rupees is:

$$\begin{aligned} \text{NPV} &= -7000 + \frac{2202.0}{(1.15)} + \frac{3078.4}{(1.15)^2} + \frac{4035.0}{(1.15)^3} + \frac{5076.6}{(1.15)^4} \\ &= ₹ 2798 \text{ million} \end{aligned}$$

## Foreign Currency Approach

To apply the foreign currency approach we have to come up with a risk-adjusted dollar discount rate corresponding to the risk-adjusted rupee discount rate of 15 percent. To do this we have to first find the risk-premium implicit in 15 percent:

$$(1 + \text{Risk free rupee rate}) (1 + \text{Risk premium}) = (1 + \text{Risk-adjusted rupee rate})$$
$$(1 + 0.08) (1 + \text{Risk premium}) = (1 + 0.15)$$

Hence

$$(1 + \text{Risk premium}) = \frac{(1.15)}{(1.08)} = 1.0648$$

Applying the above risk premium to the risk free dollar rate of 2 percent, we find that the risk-adjusted dollar rate is:

$$(1 + \text{Risk adjusted dollar rate}) = (1.03) (1.0648) = 1.0967$$

Given the dollar cash flows, the NPV in dollars works out to:

$$\begin{aligned} \text{NPV} &= -100 + \frac{30}{1.0967} + \frac{40}{(1.0967)^2} + \frac{50}{(1.0967)^3} + \frac{60}{(1.0967)^4} \\ &= \$ 39.98 \text{ million} \end{aligned}$$

Since the spot exchange rate is ₹ 70 per dollar, the rupee NPV of the project is:

$$\text{NPV} = 39.98 \times ₹ 70 = ₹ 2798 \text{ million}$$

Expectedly, this is the same as the rupee NPV we obtained earlier using the home currency approach. Notice that in the above analysis the exchange rate forecast was based on a standard parity relationship. Alternatively, you can use forward rates. The basic idea is that you separate the investment decision from the decision to assume currency risk.

## **Other Considerations**

In the above discussion three considerations, which may matter in the real world, have been left out: unremitted cash flows, risk-premium on foreign investment, and political risk. A word about them is in order.

**Unremitted Cash Flows** In our previous example, we assumed that the post-tax cash flows from the foreign investments could be freely remitted to the parent firm. In reality, there may be substantial differences between the cash flows generated by a foreign project and the amount that can be remitted to the parent firm because many governments put restrictions on remittances. Funds that cannot be currently remitted are referred to as blocked funds.

**Risk-Premium on Foreign Investment** In our discussion so far we assumed that the risk-premium on the foreign investment will be the same as the risk-premium on a similar domestic investment.

Foreign investments generally involve higher risk which arises from factors like change in currency value, discriminatory treatment of a foreign company, and threat of expropriation. Risk stemming from fluctuations in exchange rate looms constantly on the horizon of foreign investment. In addition, a foreign investment is subject to discriminatory treatment and selective control in various forms, motivated mainly by political considerations. Finally, the threat of expropriation without adequate compensation may exist, particularly in countries where radical nationalistic sentiments are strong.

In view of the higher risk associated with foreign investment, a firm contemplating foreign investment would naturally expect a higher rate of return. Put differently, the discount rate applicable to foreign investment will be higher than the discount rate applicable to domestic investment.

A higher-than normal required rate of return by multinational corporations is often viewed unfavourably by the critics of multinational companies. They hurl accusations of ‘profiteering’ even when the multinational company may simply be following the reasonable financial practice of asking for a rate of return commensurate with the risks characterising the project.

Can there be situations where the demand for higher returns by a multinational company can be unreasonable? Yes, when the multinational company invests in several different economies and enjoys the benefit of

risk reduction arising from portfolio diversification. In such a case, it may be possible to reduce the overall risk of the firm's portfolio of investments even while accepting a project which individually is highly risky. Of course, this depends on the existence of low or negative correlations between the project under consideration and the other projects within the firm's portfolio of investments.

**Political Risk** Businesses everywhere face the risk of unexpected actions by governments. But foreign companies seem more vulnerable to such political risk.

To mitigate political risk, a firm may resort to the following devices: (a) Enter into a joint venture with a local company. (b) Ensure that some critical inputs, like technological knowhow, are provided by the parent company so that the foreign subsidiary would, on its own, be of very little value. (c) Borrow from local banks and financial institutions. (d) Raise a portion of financing from the World Bank (or one of its affiliates) and incorporate a **cross-default** clause. This means that a default to any creditor, automatically means a default to the World Bank—very few governments have the courage to default on a World Bank loan.

## **37.6 ■ FINANCING FOREIGN OPERATIONS**

A foreign affiliate, like any other business operation, requires: (i) long-term funds and (ii) short-term and intermediate funds.

## **Long-term Financing**

The key issues with respect to the long-term financing of a foreign affiliate are:

- What should be the stake of the parent company in the equity capital of its foreign affiliate?
- What should be the optimal capital structure of the foreign affiliate?
- What should be the sources of long-term funds for the foreign affiliate?

**Parent Company's Stake in Equity** The parent company may hold the entire equity in its foreign affiliate or offer a portion of it to local investors and create a joint venture. It is often advantageous to set up a joint venture with local equity participation as it widens the scope of investment activity, generates certain tax advantages, strengthens the partnership between the firm and its host country, and lessens the risk of expropriation. Some countries insist on local equity participation—this is put as a pre-condition for granting permission to establish operations.

**Optimal Capital Structure** Given the presence of taxes, agency costs, and financial distress costs, the multinational company, as a whole, does have an optimal capital structure. But does each affiliate of the multinational company have its 'own' optimal capital structure? If we ignore some real-world imperfections, the capital structure of the affiliate is irrelevant as long as the overall capital structure of the multinational company as a whole is unchanged and the multinational company guarantees the borrowings of the affiliate.

**Sources of Long-term Funds** Apart from equity capital, which is typically provided by the parent company and the local investors, the foreign affiliate requires long-term debt funds also. These are generally obtained from local banking institutions and international financing institutions. Sometimes, they may be raised by issuing debt securities in the capital market of the host country. Finally, where the firm has a respectable stature, it may even consider a eurobond issue. (A eurobond is issued in the international market for long-term debt called the eurobond market. Though a eurobond may be denominated in any currency, the issuer would try to choose a currency which is fairly stable and actively traded. The most popular denomination for eurobonds appears to be the US dollar).

## **Short term and Intermediate Financing**

The foreign affiliate typically taps local sources for its short-term financing needs. Short term financing is obtained by way of an overdraft arrangement (which is a line of credit) provided by local banks. Likewise, intermediate-term loans can also be obtained from local banks. Of course, these loans usually require collateral and impose certain restrictions on the borrower's investment policy, dividend policy, debt-equity ratio, and so on.

The foreign affiliate may also borrow in the *eurocurrency* market which is the international market for short-term capital. In this market, borrowings and lendings are usually for a six-month period. However, loans are typically renewable at revised rates of interest. The eurocurrency market is virtually free from the governmental regulations of individual countries. Indeed, its emergence and phenomenal growth has occurred largely because it has remained beyond such regulations.

## **37.7 ■ INTERNATIONAL FINANCIAL MARKETS**

From mid 1940s through the 1960s, the US financial market dominated the world financial market. With the growing financial clout of other countries from 1970s onward, the relative importance of the US financial market has declined significantly. Given this situation, it behooves on corporate managers (and investors as well) to understand international markets.

## **International Money Market**

The eurocurrency market is the core of the international money market—note that euro here has nothing to do with Euro which is the currency of the Euroland. A eurocurrency is a time deposit of money in an international bank outside the country of the currency. For example, a eurodollar deposit is a dollar deposit in a bank outside the United States. Likewise, a euroyen deposit is a yen deposit in a bank outside Japan. How do eurocurrency deposits arise? This may be explained with an example. Suppose an American oil company buys oil from a Sheik in the middle east and pays \$10 million drawn on the Chase Manhattan bank and the Sheik deposits the cheque in his account with a Swiss bank. The dollar deposit, placed outside the United States, the country of the dollar currency, is a eurodollar deposit. The Swiss bank can use this deposit for granting eurodollar loans. The prefix euro is somewhat misleading because the bank in which the deposit is made does not have to be located in Europe. Hence many now refer to it as the offshore market and not the eurocurrency market. Historically, London has been the major eurocurrency financial centre.

The eurocurrency market is an external banking system. It runs parallel to the domestic banking system of the country that issued the currency. It operates at the interbank and/or wholesale level. It has grown phenomenally because it is virtually free from the regulations of individual countries. The monetary authority of the country where the deposit is made does not bother about deposits or loans in foreign currencies as they do not affect the domestic money supply, which is its primary concern. Likewise, the monetary authority of the home country is not concerned because the transaction occurs outside its boundaries. Indeed, the emergence and phenomenal growth of the eurocurrency (offshore) market has occurred largely because it has remained beyond such regulations.

**Eurocurrency Loans** The main features of eurocurrency loans, which represent the principal form of external commercial borrowings for Indian firms, are as follows.

**Syndication** Eurocurrency loans are often syndicated loans, wherein a group of lenders, particularly banks, participate jointly in the process of lending under a single loan agreement. The syndicate of lenders is represented by the lead bank. The borrower is required to pay a syndication fee, which is a front-end payment usually ranging between 1/2 percent and

2 percent to the lead bank. This represents the management fees payable to the lead bank, participation fee to the other banks, and other charges.

**Floating Rate** The rate of interest on eurocurrency loans is a floating rate. It is usually linked to LIBOR (London Inter Bank Offer Rate) the interest rate at which leading banks in London lend funds to each other, or SIBOR (Singapore Inter Bank Offer Rate). The spread over the LIBOR or SIBOR rate is mainly a function of the credit worthiness of the borrower, the size of the loan, and the prevailing market conditions. For example, in May 2003, Indian Railway Finance Corporation raised \$75 million through a 5-year bullet maturity syndicated term loan facility at a coupon of 70 basis points over LIBOR. While the rate is determined at the beginning of each interest period, the interest is payable at the end of each period.

**Interest Period** The interest period may be 3, 6, 9, or 12 months in duration. It is largely left to the option of the borrower.

**Currency Option** The borrower often enjoys the multi-currency option which enables it to denominate the interest and principal in the new currency opted for. This option is exerciseable at the end of each interest period.

**Repayment and Prepayment** The eurocurrency loans are repayable in installments, which are typically equal, or in the form of balloon repayment, as agreed to by the parties. The borrower may prepay the loan after giving due notice to the lead bank. When prepayment is done, some premium is payable. The lender may also reserve the right to recall the outstanding loan under certain circumstances.

In recent years, the government has adopted a very cautious approach to external commercial borrowings. Borrowings of maturities less than three years are more or less ruled out and the government controls the access to syndicated loan markets by a queue system within the overall annual ceiling on total borrowing specified by the government. Certain sectors such as power projects are given preference over others in accessing the loan markets.

**Approvals for External Commercial Borrowings** Subject to certain terms and conditions, the Government of India permits Indian firms to resort to external commercial borrowings for the import of plant and machinery. Corporates are allowed to raise funds upto certain limits from the global markets through the automatic route. Companies wanting to raise

more than that have to get an approval of the MOF. The key steps involved in raising such borrowings are as follows:

1. Secure the permission of the Capital Goods Committee/Projects Approval Board
2. Obtain an offer from a bank
3. Get the approval of the Department of Economic Affairs (DEA), Ministry of Finance, for the offer
4. Arrange for the documentation of the loan
5. Secure the approval of the Reserve Bank of India
6. Deposit the loan document with the DEA
7. Draw the loan.

## International Bond Markets

An **international bond** is a bond sold outside the country of the borrower. There are two major types of international bonds: eurobonds and foreign bonds. A **Eurobond** is an international bond denominated in a currency not native to the country where it is issued. Eurobonds are named after the currency in which they are denominated. For example, Eurodollar and Euroyen bonds are denominated in American dollars and Japanese yen respectively. A number of Indian companies have issued dollar denominated convertible bonds, called foreign currency convertible bonds (FCCBs), in London and other financial centres. Some examples: Sterling Biotech Limited issued US \$175 million, 0.50 percent convertible bonds due 2010 and Jaiprakash Associates Limited issued 165 million, 0.50 percent convertible bond due 2013. Convertible bonds make sense for companies that want to contain their interest cost during bad times and to do so they are willing to issue shares at a discount over their market price during good times. On the other side of the market, they appeal to investors who are looking at the upside potential of equity (that they can get on conversion) while containing their downside risk (as they can continue with the straight bond).

Eurobonds appeal to issuers because they are subject to fewer regulations and lighter disclosure requirements. In general, governments are less strict in regulating securities denominated in foreign currencies because the investors in these bonds are generally more sophisticated. As a result, the total transaction costs for eurobonds are lower.

Eurobonds appeal to investors for the following reasons: (a) They are generally issued as bearer bonds rather than registered bonds. Investors who seek anonymity, for reasons of privacy or tax avoidance, prefer eurobonds. (b) Most governments do not withhold taxes on interest paid on eurobonds.

**Foreign bonds** are issued by a foreign borrower but denominated in the currency of the country where the issue is made. For example, a British firm may issue dollar denominated bonds in the US capital market or a German firm may issue yen-denominated bonds in the Japanese capital market. A foreign issuer has to satisfy all regulations applicable to domestic firms. In addition, it may be required to fulfill certain special obligations applicable to foreign issuers.

Since the US capital market is the largest national capital market, complemented by a very active derivatives market, foreign companies

routinely issue bonds in the US. The most prestigious funding option in the US market is a public issue of *Yankee Bonds* (dollar denominated bonds issued in the US capital market by foreign borrowers). A public issue of Yankee bonds has to comply with stringent listing requirements of the SEC in the US. Yankee bonds can also be offered on a private placement basis to QIBs (qualified institutional buyers) under what is popularly known as rule 144. Such bonds do not have to comply with the stringent listing requirements under the Securities Act, 1933. Reliance Industries Limited was the first Indian company to issue Yankee bonds in the US.

**Other Markets** Besides the US domestic debt market, Indian companies can tap the domestic debt markets of other countries such as Japan and UK, issuing instruments such as *Samurai Bonds* (publicly issued bonds in the Japanese market), *Shibosai Bonds* (privately issued bonds in the Japanese market), *Bulldog Bonds* (UK market), and Rembrant Bonds (Dutch market).

## **International Equity Markets**

With the globalisation of financial markets, a company domiciled in one country can issue equity shares in multiple markets or the capital market of a single foreign country.

The principal mechanism used by Indian firms to raise finance in international equity markets is the Depository Receipts mechanism. In the depository receipts mechanism the shares issued by a firm are held by a depository, usually a large international bank, which receives dividends, reports, etc., and issues claims against these shares. These claims are called depository receipts with each receipt being a claim on a specified number of shares. The underlying shares are called **depository shares**. The depository receipts are denominated in a convertible currency—usually US dollars. The depository receipts may be listed and traded on major stock exchanges. This way the issuing firm avoids listing fees and onerous disclosure and reporting requirements which would be obligatory if it were to be directly listed on the stock exchange.

Global Depository Receipts (GDRs), which can be used to tap multiple markets with a single instrument, have been the most popular instrument used by Indian firms. Holders of depository receipts can convert them into the underlying shares by surrendering the depository receipts to the depository. In the case of GDRs issued by Indian companies, the reverse conversion i.e. from shares to GDRs is permitted only to a limited extent.

A company planning a GDR issue must obtain the approval from the Ministry of Finance as well as FIPB (Foreign Investment Promotion Board) since GDR issues are deemed to be foreign direct investment. The government periodically issues guidelines regulating GDR issues. These guidelines set out the criteria a potential issuer must satisfy and the permissible uses of the funds raised. The custodian is required to be an Indian institution.

In addition to GDRs, Indian companies have also been raising funds in the US equity market by issuing American Depository Receipts (ADRs). ADRs represent claims on a specific number of shares. The principal difference between the two is that the GDRs are issued in the euromarket whereas ADRs are issued in the US domestic capital market.

Infosys raised money by way of American Depository Shares (ADS) which are the same as ADRs. On the need for the ADS, Narayana Murthy said: “The IT business is dependent on international clients. We have to get

clients outside India. The CFOs and CEOs have to see our name. Once listed overseas, they will feel comfortable. This way we would build our brand equity. This (ADS and listing overseas) is a part of the management strategy.”

## **Other Sources of Foreign Currency Finance**

Besides raising international finance through eurocurrency loans, international bonds, and international equities, Indian firms can raise foreign currency finance by way of foreign currency term loans from financial institutions and export credit schemes.

### **Foreign Currency Term Loans from Financial Institutions**

Financial institutions provide foreign currency term loans for meeting the foreign currency expenditures towards import of plant, machinery, and equipment and also towards payment of foreign technical know how fees. The periodical liability for interest and principal remains in the currency/currencies of the loans and is translated into rupees at the then prevailing rate of exchange for making payments to the financial institution.

**Export Credit Schemes** Export credit agencies have been established by the governments of major industrialised countries for financing exports of capital goods and related technical services. These agencies follow certain consensus guidelines for supporting exports under a convention known as the Berne Union. As per these guidelines, the interest rate applicable for export credits to Indian companies for various maturities are regulated. Two kinds of export credit are provided: buyer's credit and supplier's credit.

**Buyer's Credit** Under this arrangement, credit is provided directly to the Indian buyer for purchase of capital goods and/or technical services from the overseas exporter. The buyer's credit facility operates as follows:

- The overseas exporter and the Indian buyer negotiate a contract.
- An application for the buyer's credit facility is made to the export credit agency of the exporter's country along with relevant details (like the types of goods/services to be exported, approximate value of the contract, terms of payments, schedule of projected shipment of goods or provision of services, percentage of financing required, etc).
- The buyer's credit facility is approved by the export credit agency of the exporter's country.
- A loan agreement delineating the terms and conditions of the buyer's credit is negotiated between the overseas exporter's bank, the Indian borrower, and, where applicable, the Indian guarantor.

**Supplier's Credit** This is a credit provided to the overseas exporters so that they can make available medium-term finance to Indian importers. The supplier's credit facility operates as follows:

- The overseas exporter notifies his bank and the export credit agency of a potential export order of an Indian buyer who requires medium term finance.
- The export credit agency communicates to the bank its willingness to provide the facility.
- The terms of the facility are incorporated in the contract between the overseas exporter and the Indian buyer.

### Cross-Border Listing of Stocks

Cross-border listing of stocks is quite common for major corporations around the world. In recent years, several companies from India (Infosys, Wipro, Reliance Industries, Tata Motors, Dr. Reddy's Laboratories, and so on) have listed their stocks on foreign stock exchanges.

Cross-border listing expands a company's potential investor base (which generally raises the stock price and lowers the cost of capital), improves the liquidity of its stock, enhances the visibility of its name and its products and services abroad, enables it to use its stocks to pay for overseas acquisitions, and improves its corporate governance and transparency.

As against these potential benefits, cross-border listing entails costs for meeting the disclosure and listing requirements, renders the company vulnerable to takeover by foreign investors, and perhaps heightens the volatility of the stock.

## **37.8 ■ FINANCING AND INSURING EXPORTS**

Commercial banks and EXIM bank provide export finance and Export Credit Guarantee Corporation provides insurance to exporters.

## **Commercial Bank Finance**

Commercial banks, the major source of export finance in India, provide finance before shipment of goods (pre-shipment finance) as well as after shipment of goods (post-shipment finance).

- *Pre-shipment Finance* The pre-shipment finance, typically is in the form of packing credit facility. Packing credit is bank advance provided to an exporter for the purpose of buying/manufacturing/packing/shipping goods to foreign buyers. An exporter with a firm export order placed with him by a foreign buyer or with an irrevocable letter of credit opened in his favour can approach a bank for packing credit. Packing credit, a short-term credit, is normally required to be liquidated within 180 days by negotiation of export bills or receipt of proceeds from exports. Packing credit could be either secured by way of hypothecation or pledge of goods or be unsecured. In the latter case it is called a clean packing credit.
- *Post-shipment Finance* The finance provided after the shipment may be in the following forms: (i) purchase/discounting of documentary export bills and (ii) advance against export bills sent for collection. A commercial bank may purchase export bills payable at sight or discount usance bills covering confirmed sales and supported by relevant documents like the bill of lading, post-parcel receipts, etc. Or, a commercial bank may provide finance by way of advance against export bills forwarded through it for collection.

## EXIM Bank Finance

The EXIM Bank provides finance to exporters in several ways:

- Direct financing of exporters
- Financing of export of technology and consultancy services
- Pre-shipment credit
- Overseas buyer's credit
- Refinance of export credit
- Export bill discounting

**Forfaiting<sup>3</sup>** In recent years forfaiting has emerged as a popular method of financing export receivables. Basically forfaiting refers to non-recourse discounting of medium term (1 year to 5 years) export receivables. In a forfaiting transaction, the exporter surrenders, without recourse to him, his rights to claim for payment of goods delivered to an importer, in return for immediate cash payment from the forfaiter. As a result, the exporter is able to convert a credit sale into a cash sale with no recourse to him. Under this arrangement the export receivables are usually guaranteed by the importer's bank (referred to as the 'avalling' bank).

The exporter is required to pay a fee to the forfaiter for the forfaiting transaction. The fee has three components:

- **Commitment Fee:** This represents the fee payable to the forfaiter for securing its commitment to execute a specific forfaiting transaction at a firm discount rate within a specific time.
- **Discount Fee:** This reflects the interest cost payable by the exporter for the entire period of credit. This fee is based on the relevant market rate of interest as reflected by the prevailing LIBOR for the credit period and currency involved, plus a premium for the country risk and credit risk assumed by the forfaiter. This fee is deducted from the amount paid to the exporter against the discounted promissory notes or bills of exchange.
- **Documentation Fee:** This covers expenses involved in documentation and legal work.

In the Indian context the Exim Bank acts as a facilitator for facilitating the forfaiting transaction and charges a service fee for this purpose. Also, the RBI requires the fee levied by the forfaiter to be charged to the overseas buyer. Put differently, the exporter must finalise the export contract in a manner, which ensures that the amount received in foreign exchange by the

exporter, after payment of the forfakter's fee, is equivalent to the price which he would obtain if goods were sold on cash payment terms.

From the exporter's standpoint the key advantages of forfaiting are as follows:

- It provides finance upto 100 percent of the export value as compared to 80–85 percent financing available from conventional export credit schemes.
- It obviates the need for export credit insurance.
- It provides fixed rate finance. The exporter is protected from the interest and exchange rate risks arising from deferred export credit.
- It relieves the exporter of credit administration and collection problems.
- It does not impact the exporter's borrowing limits from banks. Thus forfaiting serves as an additional source of finance.

## **Insuring Exports**

The Export Credit Guarantee Corporation (ECGC, hereafter), a Government of India undertaking, provides insurance to Indian exporters of goods and services, against the risk of non-payment for exports. Under the ECGC credit insurance policy, the exporter is assured that ECGC will pay if the overseas buyer fails to pay for the goods and services exported. ECGC, bearing the main brunt or risk, pays the exporter 90 percent of his loss on account of commercial and political risks.

Under the Comprehensive Risks Policy, popularly referred to as the standard policy of ECGC, the exporter is covered for both political and commercial risks. The exporter may, however, insure himself against political risks alone, if he so desires. Insurance cover is provided from the date of shipment. Where goods are manufactured in accordance with buyer's specifications and which cannot be easily sold to others, insurance cover may be provided from the date of contract. In addition to the standard policy, ECGC offers a variety of other policies and schemes.

## 37.9 ■ DOCUMENTS IN INTERNATIONAL TRADE

In comparison with domestic trade, international trade presents certain special problems: (i) Sellers in international trade are not able to assess the creditworthiness of their buyers as reliably and thoroughly as sellers in domestic trade. (ii) Transportation of goods is slower and less certain and communication less efficient and more time-consuming. (iii) Legal settlement processes are complicated, tardy, and expensive. In order to cope with these problems, international trade relies considerably on three major documents/instruments: trade draft, bill of lading, and letter of credit.

**Trade Draft** The international trade draft, also referred to as a bill of exchange, is a written order by the exporter (the drawer) asking the importer (the drawee) to pay a specified amount of money at a certain time. The draft may be a sight draft (which is payable on presentation) or a time draft (which is payable a certain number of days after presentation).

The important features of the draft are: (i) It is an unconditional written order signed by the drawer. (ii) It specifies the exact amount of money to be paid and the time when it is payable. (iii) Once the drawee (or his banker) accepts the draft, he acknowledges his obligation. The draft then becomes a trade acceptance. If it is accepted by the banker, it becomes a banker's acceptance. In this case the bank assumes responsibility for payment.

Banker's acceptances are generally marketable. So the drawer (the exporter) can sell it before its due date. If the interest rate in the banker's acceptance market is 15 percent, the drawer can sell a 90-day banker's acceptance at a discount of 3.75 percent ( $15 \times 90/360$ ) to an investor. For example, a 90-day banker's acceptance of ₹ 100,000 can be sold for ₹ 96,250. The investor on presenting the acceptance to the accepting bank after 90 days would get ₹ 100,000.

**Bill of Lading** A bill of lading is a document of shipping employed when the exporter transports goods to the importer. It serves several functions: (i) It is a document of title to goods. (ii) It is a receipt given by the transportation company acknowledging their commitment to deliver the goods to a specified party at a certain destination.

The bill of lading is released to the importer only when the payment is made (when the bill of lading is accompanied by a sight draft) or when

obligation is accepted (when the bill of lading is accompanied by a time draft).

**Letter of Credit** A letter of credit is issued by a bank on behalf of the importer. As per this document, the bank agrees to honour the draft drawn on the importer provided certain conditions are satisfied. Through the letter of credit arrangement, the credit of the importer is substituted by the credit of bank. Hence it virtually eliminates the risk of the exporter when he sells to an unknown importer in a foreign country. This arrangement is further reinforced if the letter of credit is confirmed by a bank in the exporter's country. The following example illustrates this point:

- An Indian importer wishing to buy goods from an American exporter approaches Bank of India for a letter of credit.
- Bank of India issues a letter of credit whereby it agrees to honour a draft drawn on the importer.
- The American exporter, not very familiar with Bank of India, gets confirmation of the letter of credit by J P Morgan Chase.
- The American exporter ships the goods, draws a draft in conformity with the letter of credit arrangement, and presents the same to J P Morgan Chase.
- J P Morgan Chase pays the American exporter the designated amount and forwards the draft and other documents to Bank of India.
- After affirming that as per the documents received, the goods have been shipped strictly in accordance with the terms set out in the letter of credit, Bank of India pays the draft amount to J P Morgan Chase and, in turn, collects the same from the Indian importer.

## **37.10 ■ ACCOUNTING FOR FOREIGN EXCHANGE TRANSACTIONS**

An enterprise may have transactions in foreign currencies or it may have foreign operations. In order to include foreign currency transactions and foreign operations (branches and subsidiaries) in the financial statements of an enterprise, transactions must be expressed in the enterprise's reporting currency and the financial statements of foreign operations must be translated into the enterprise's functional currency.

The key issues in accounting for foreign currency transactions and foreign operations are:

- Which exchange rate should be used?
- How should the effect of changes in exchange rates be recognised in the financial statements?

Ind AS 21 addresses these issues.

## **Foreign Currency Transactions**

A foreign currency transaction is a transaction, which is denominated in or requires a foreign currency, such as purchase or sale of goods and borrowing or lending of funds in a foreign currency.

A foreign currency transaction should be recorded, on initial recognition in the functional currency, by applying to the foreign currency amount the spot exchange rate between the reporting currency and the foreign currency at the date of the transaction.

At each balance sheet date: (a) foreign currency monetary items should be reported using the closing rate; (b) non-monetary items which are carried in terms of historical cost denominated in a foreign currency should be reported using the exchange rate at the date of the transaction; and (c) non-monetary items which are carried at fair value or other similar valuation denominated in a foreign currency should be reported using the exchange rates that existed when the values were determined.

Cash, receivables, and payables are examples of monetary items. Fixed assets, inventories, and investments in equity shares are examples of non-monetary items.

Exchange differences arising on the settlement of monetary items or on translating an enterprise's monetary items at rates different from those at which they were initially recorded during the period, or reported in previous financial statements, should be recognised as income or as expenses in the period in which they arise.

The Income Tax Act requires that foreign currency liabilities are "marked to market" at the exchange rate prevailing on the date of casting the balance sheet. If the foreign currency liability increases (decreases) on account of such revaluation the value of the fixed asset, which is financed by the foreign currency borrowing, is correspondingly increased (decreased). Depreciation is admissible on such revalued assets.

## **Financial Statements of Foreign Operations**

Indian accounting standards require consolidation of the accounts of foreign subsidiaries or branches with those of the parent firm in India. The method used for translating foreign currency statements depends on the nature of relationship between the parent and the foreign operations. From this point of view, foreign operations are classified into two categories.

*Integral Foreign Operations:* An integral operation carries out business as if it is an extension of the operations of the parent. For example, the foreign operation may just sell goods imported from the parent and remit the proceeds of the same to its parent.

*Independent Foreign Operations:* An independent or non-integral foreign operation is run independently, as if it is a separate enterprise. It is also referred to as a foreign entity.

In respect of integral foreign operations, monetary assets and liabilities are translated at the exchange rate prevailing at the date of the balance sheet. Non-monetary items are translated at the historical rate. The items in the statement of profit and loss are translated at the average exchange rate during the period. The differences arising out of the translation are recognised in the profit and loss account.

In translating the financial statements of a non-integral foreign operation for incorporation in its financial statements, the reporting enterprise should use the following procedures: (a) the assets and liabilities, both monetary and non-monetary, of the non-integral foreign operation should be translated at the closing rate; (b) income and expense items of the non-integral foreign operation should be translated at exchange rates at the dates of the transactions; and (c) all resulting exchange differences should be accumulated in a foreign currency translation reserve until the disposal of the net investment.

## 37.11 ■ FOREIGN EXCHANGE EXPOSURE

With the advent of floating exchange rates in 1973, fluctuations in exchange rate have created foreign exposure. Firms which have cross-border transactions (such as exports, imports, foreign investment, foreign borrowings, and lendings) have a direct exposure, and firms which have no cross-border transaction are likely to have indirect exposure as their customers, suppliers, and competitors may be exposed.

Foreign exchange exposure can be classified into three broad categories:

- Transaction exposure
- Operating exposure
- Translation exposure

Of these, the first and the second are called ‘cash flow exposure’ or ‘economic exposure’ and the third is called ‘accounting exposure.’

Accountants and financial economists consider exchange rate risk very differently. Accountants are interested in measuring the effect of exchange rate changes on current income and the book value of assets and liabilities on the balance sheet. Economists are primarily concerned with the impact of exchange rate changes on future cash flows and the resulting effect on the value of the firm.

## **Transaction Exposure**

Transaction exposure stems from transactions that give rise to known, contractually determined future foreign-currency denominated cash inflows or outflows. Cross-border trade, borrowings and lendings in foreign currencies, and the local purchases and sales of foreign subsidiaries are examples of such transactions. If exchange rates change between now and when these transactions settle, the value of the associated foreign currency cash flows changes resulting in currency gains and losses. For example, if an Indian exporter has a receivable of \$100,000 due three months hence, and if in the meanwhile the dollar depreciates relative to the rupee, a cash loss occurs. In the case of a payable, the outcome is of an opposite kind: depreciation of the dollar relative to the rupee results in a gain, whereas an appreciation of the dollar relative to the rupee results in a loss.

In the books of accounts, the foreign currency amount is expressed in the reporting currency by applying the exchange rate prevailing on the transaction date. If an item is settled during the current account period, it is revalued at the rate prevailing on the settlement day. This may result in loss or gain.

When a forward exchange contract is entered into as a hedge, the premium or discount arising at the inception of the contract should be amortised as expense or income over the life of the contract.

## **Operating Exposure**

Operating exposure, like transaction exposure, involves an actual or potential gain or loss. While the latter is specific to a transaction, the former, much broader in nature, relates to an entire investment. The essence of operating exposure is that exchange rate changes significantly alter the costs of a firm's inputs and the prices of its outputs and thereby influence its competitive position substantially. Here are some examples:

- Volkswagen had a highly successful export market for its 'Beetle' model in the U.S. before 1970. With the breakdown of the Brettonwood system of fixed exchange rates, the Deutschemark appreciated significantly against the dollar. Since Volkswagen's expenses were mainly in Deutschemark and its revenues in dollars, it raised the dollar price of the cars in the U.S. However, in a highly price-sensitive U.S. market, such an action caused a sharp decrease in sales volume – from 600,000 vehicles in 1968 to 200,000 in 1976. (Incidentally, Volkswagen's 1973 losses were the highest, as of that year, suffered by any company anywhere in the world).
- In the wake of the East Asian crisis in 1997, currencies of several East Asian countries fell sharply. This made exports from these countries very competitive in advanced markets. As a consequence, gems and jewellery exports from India suffered competitive disadvantage vis-à-vis their rivals from South East Asia.

## Translation Exposure

From the accountant's point of view, the risk of changes in exchange rates is called *translation exposure*, which reflects the effect of these changes on the current statement of profit and loss and the balance sheet. In translating foreign currency denominated items to domestic currency, two issues arise:

- Should financial statement items that are in a foreign currency be translated at the current exchange rate or the historical exchange rate (the rate prevailing at the time of the transaction)?
- Should the profit or loss that arises from exchange rate adjustment be regarded as a profit or loss in the current period or postponed?

Translation exposure, also called accounting exposure, stems from the need to convert the financial statements of foreign operations from foreign currencies to domestic currency for purposes of reporting and consolidation. If there is a change in exchange rate since the previous reporting period, the translation or restatement of foreign-currency denominated assets, and liabilities, revenues, and expenses will result in foreign exchange gains or losses, and may have some tax implications.

Translation exposures are concerned only with the effect on the reported profit and balance sheet values. Do investors view these translation changes as having a bearing on firm value or believe that translation risk will average out across time and companies? Although the evidence is somewhat mixed, most studies seem to suggest that the earnings impact of translation does not have any significant bearing on stock prices of firms. Perhaps investors believe that translation risk can be diversified and hence do not expect a premium for it.

## 37.12 ■ MANAGEMENT OF FOREIGN EXCHANGE EXPOSURE

### Management of Transaction Exposure

Transaction exposure arises mainly on account of imports, exports, and foreign currency borrowings. To cope with transaction exposure the firm can use financial contracts and operational techniques.

<i>Financial Contracts</i>	<i>Operational Techniques</i>
■ Forward market hedge	■ Choice of invoice currency
■ Money market hedge	■ Leading and lagging
■ Swaps	■ Netting and offsetting
■ Options	

## Financial Contracts

**Forward Market Hedge** In a forward market hedge, a net liability (asset) position is covered by an asset (liability) in the forward market. To illustrate the mechanism of the forward market hedge, consider the case of an Indian firm, which has a liability of \$100,000 payable in 60 days to an American supplier on account of credit purchases. The firm may employ the following steps to cover its liability position:

- Step 1** Enter into a forward contract to purchase \$100,000 in 60 days from a foreign exchange dealer. The 60-day forward contract rate is, say, ₹ 71.00 per dollar.
- Step 2** On the sixtieth day pay the dealer ₹ 7,100,000 ( $\$100,000 \times ₹ 71$ ), collect \$ 100,000, and pay the same to the American supplier.

By using such a mechanism, the Indian firm can eliminate the exchange risk in dollars because of its asset position in the forward dollars. To cover a net asset position in the foreign currency a reverse process has to be followed. To illustrate this process, consider an Indian firm which is expecting a payment of \$100,000 due in 60 days, on account of a credit sale, from an American customer. The firm can take the following steps to cover its asset position.

- Step 1** Enter into a forward contract with a foreign exchange dealer to sell \$100,000 in 60 days. The 60 day forward rate is, say, ₹ 70.80.
- Step 2** On the sixtieth day collect \$100,000 from the American customer, deliver the same to the dealer, and collect ₹ 7,080,000.

The forward market hedge is a relatively simple and convenient arrangement. It merely involves getting a forward quotation from a foreign exchange dealer and advising him to do the needful. Of course, the dealer will charge a commission for performing the transaction.

The RBI now permits companies to book forward contracts in third currencies. Thus, for instance an importer with a payable in yen can buy yen forward against the U S dollar and leave the dollar exposure uncovered. Similarly, an exporter with a dollar receivable can sell it forward against the British pound and leave the British pound position open. Effectively, it allows exporters and importers to speculate on exchange rates.

The RBI has also permitted cross currency options to be sold by banks in India. In a cross currency call option, the option buyer acquires the right,

without the obligation, to buy a foreign currency against another foreign currency at a specified price on a specified date. In a put option, the option buyer acquires the right, without the obligation, to sell a foreign currency against another foreign currency at a specified price on a specified date.

In the foreign exchange market in India, a forward contract for a maturity period exceeding six months is not ordinarily possible because in the interbank market, quotations beyond six months are not available. So, an Indian firm which has a foreign currency borrowing payable over an extended period of time, will have to go for a '**rollover**' contract, if it wants a forward cover. Essentially this means that the borrower buys forward the entire amount to be covered for a date which synchronises with the next installment date. Come that date, the borrower uses a portion of the forward contract to meet the installment amount and rolls over the balance of the contract to the next installment date—this means he sells the balance in the spot market and buys it in the forward market. This is continued till the last installment is paid.

Under the rollover contract, the basic rate of exchange is fixed. However, each rollover may result in some cost (or gain) depending on (the) a premium (or discount) at the time of each rollover.

Indian exchange regulations permit banks to undertake currency trading within approved limits. The regulations also allow non-bank entities in India:

- To transact in the forward or options market only to hedge a commercial exposure—actual or, within limits, anticipated – and to cancel and rebook forward contracts and unwind option contracts.
- To book a hedge in a currency other than the currency in which it has an actual exposure. For example, a pound payable can be “hedged” by buying pounds against euros. Paradoxically this is not a hedge at all. The pound exposure against rupees remains unhedged, and an additional speculative exposure, namely long pound/short euro, has been added.

**Option Forwards** A variant of the forward contract is an **option forward** in which the exchange rate between the currencies is fixed when the contract is entered into but the delivery date is not fixed. In this contract, one of the parties (typically the corporate customer) enjoys the option to give or take delivery on any day between two fixed dates. For example, Alpha Corporation enters into an option forward with National Bank under which it agrees to sell forward \$1 million at ₹ 70.50 per dollar, to be delivered on any day between the 91st day and the 120th day from the time

the contract is entered into. In this case, the period 91–120 days is the **option period** during which Alpha Corporation has to give delivery. Option forwards make sense when the exact timing of a foreign currency inflow or outflow is not known, though the amount is known.

**Financial Swaps** A financial swap basically involves an exchange of one set of financial obligations with another. Widely used internationally, financial swaps have in recent years attracted the attention of firms in India. The two most important financial swaps are the interest rate swap and the currency swap. These are described in [Chapter 40](#).

## **Operational Techniques**

**Choice of Invoice Currency** A firm can shift, share, or diversify exchange risk by its choice of the currency of invoice. For example, Bharat Forge may invoice its supplies to a British customer in dollars rather than pound sterling.

**Leading and Lagging** Sometimes, exposures can be managed by altering the timing of foreign currency flows through leading and lagging. **Leading** involves advancing and **lagging** involves delaying. The general rule is to lead payables and lag receivables in ‘strong’ currencies. By the same token, lead receivables and lag payables in “weak currencies.”

**Netting and Offsetting** If a firm has receivables and payables in different currencies, it can net out its exposure in each currency. Suppose an Indian firm has exports of \$100,000 to the US and imports of \$120,000 from the US. It can use its receivables of \$100,000 and hedge only the net US dollars payable. If the timings of the flows are not matched, it can lead or lag one or both of them to achieve a match.

## Some Suggestions

While managing its foreign exchange exposure, a firm must bear in mind the following suggestions:

- **Be Selective** Foreign exchange risk is like a double-edged sword. While it can entail losses, it can also produce gains. Hence it may not be necessary or desirable to eliminate all foreign exchange rate risk. Further, even when the exchange rate risk is sought to be eliminated, the cost of doing so must be borne in mind. On balance, it appears that while it may be desirable to eliminate a portion of the exchange rate risk, it may not be worthwhile to eliminate the whole of it. Put differently, the firm must be selective.
- **Seek More than One Quotation** Exchange rates tend to differ across banks depending on their currency positions and other factors. Hence a firm must seek quotations from at least two banks before concluding a deal with any one of them. (It may be noted that banks generally quote indicative rates in the morning and firm rates only at the time of business.).
- **Choose a Proper Mix of Currencies and Interest Rates** The currency mix as well as the interest rate mix are important. In general, it is advisable to go for a mix of currencies rather than a single currency. (Companies which had exposure only to the US dollar in the early 1980s and to the Japanese yen in the late 1980s suffered grievously). It seems to make sense for an Indian firm to structure its foreign currency liability in such a way that about one half of it is in the US dollars and the rest in other currencies. In addition to choosing the currency mix, the borrower has to decide about the interest rate mix (the mix between fixed and floating interest rates). Interest rate forecasting, in general, is an uncertain and unreliable exercise, particularly over a period of 5 to 7 years. Thanks to the availability of financial swaps, the borrower can choose the desired liability structure, in terms of currencies as well as interest rates.
- **Establish Rapport with the Banker** The treasurer of a firm may not be able to manage its foreign exchange risks efficiently without the help of the corporate dealer in his bank, who has a good understanding of the firm's foreign exchange risk exposure. So, it is essential for the firm's treasurer to establish a good rapport with the

corporate dealer in the bank and to disclose to him the positions he wants to cover on a continuing basis. Without such rapport and confidence, the firm may not benefit fully from the expertise, resources, and facilities of the banks.

- ***Act Swiftly*** Given the volatility of the foreign exchange market, prompt action is required. So, the corporate treasurer must be expeditious in his decision making. Further, to facilitate swift action, he may give standing instructions to the corporate dealer in his bank for covering certain exposures or meeting various contingencies.

## **Management of Operating Exposure**

Transaction exposure is short-term in nature and well-identified. Operating exposure, on the other hand, is long-term in nature and can scarcely be identified with precision. So, the instruments of financial hedging (forwards, options, and so on) which are helpful in hedging short-term, well-identified transaction exposure are not of much help in hedging operating exposure.

Managing operating exposure calls for designing the firm's marketing, production, and financing strategy to protect the firm's earning power in the wake of exchange rate fluctuations. The important levers for managing operating exposure are briefly described below.

**Product Strategy** A firm may introduce new products and expand its product line after its home currency depreciates. Conversely, after its home currency appreciates, a firm may re-orient its product line so that it caters to market segments which are more quality-conscious and less price-sensitive.

**Pricing Strategy** When faced with currency volatility, should a firm emphasise market share or profit margin? Economies of scale and price elasticity of demand are the key factors that drive the pricing strategy. If significant economies of scale exist or price elasticity of demand is high, it makes sense to hold prices down, expand demand, and lower unit cost of production. If economies of scale are insignificant or if price elasticity of demand is low, it may be profitable to charge higher prices.

**Plant Location** A firm may locate its production to countries whose currencies have depreciated in real terms to lessen the adverse impact of exchange rate variation.

**Sourcing** A firm may source its inputs in countries where it sells its products to achieve a better match between currency footprints of revenues and costs. Multinational giants such as Toyota, Honda, GM, and IBM manage their operating exposure through a better matching of currency footprints.

**Product Cycle** In a world of volatile exchange rates, a firm can get a competitive edge by reducing the time it takes to bring new products to market. A shorter product cycle compresses the adjustment period following a significant exchange rate change.

**Liability Structure** Suppose an Indian firm derives a good portion of its revenues from exports to the US. It would do well to hold a portion of its

liabilities denominated in the US dollar. This way it can achieve a certain match between its earnings and debt servicing burden.

## **Exposure Management in Practice**

Several surveys have been done to study corporate foreign exchange exposure management in practice in various countries and industries. Although detailed findings vary, there are broad commonalities in these surveys. The principal findings are summarised below:

1. Very few companies do a quantitative assessment of how unanticipated changes in exchange rate impact on the value of the firm.
2. Many firms seem to believe that their exposure to exchange rate risk is not very serious.
3. Firms that engage in systematically assessing and managing their foreign exchange exposure seem to focus primarily on transaction exposure extending upto a year. Here too, firms seem to prefer to deal with exposures individually and not collectively.
4. For managing operating exposure, firms use mechanisms such as locating and sourcing of inputs in different currency areas, upgrading products to cater to less price-elastic market segments, resorting to borrowing in local currencies through foreign subsidiaries, and indexing wages to the exchange rate.

## **37.13 ■ MULTINATIONAL WORKING CAPITAL MANAGEMENT**

### **Cash Management**

Like a purely domestic company, a multinational company seeks to maximise net float by speeding up collections and slowing down disbursements, shift cash rapidly from cash-surplus to cash-deficit parts of the business, and maximise the post-tax, risk-adjusted rate of return on temporary cash surpluses. Because of longer distances and mail delays, multinational companies rely more on devices such as lockbox systems and electronic funds transfer.

Although multinational companies and domestic companies have the same objectives and follow similar procedures, cash management in multinational companies is far more complex. First, foreign governments may impose restrictions on transfers of funds into and out of the country. Second, while domestic companies generally invest surplus funds in their own markets, multinational companies participate in investment opportunities around the world, using the services of one or more global concentration banks, situated in places like London, New York, Tokyo, Singapore, or Zurich.

## **Credit Management**

Credit management in a multinational company is similar but more challenging than that in a domestic company. First, it may be more difficult to evaluate the credit-worthiness of overseas customers than domestic customers. Second, apart from the risk of default, the multinational company has to bother about the change in exchange rate during the receivable collection period. It can hedge the exchange rate risk, but this entails a cost. Third, granting credit is generally more important for multinational companies than for purely domestic companies.

## Inventory Management

As with other aspects of financial management, inventory management in a multinational company is similar but more complex than that in a domestic company. The key issues in inventory management relate to the choice of physical location of inventories and the level of inventories that have to be maintained at these locations. This choice is more difficult for a multinational company than for a domestic company. For example, where should a company like Exxon Mobil, which has refineries and marketing centres around the world, keep its stocks of crude oil and refined products? It can keep its stocks in a few strategic spots from where they can be shipped as per needs. While this strategy may minimise the total investment in inventories, it may lead to delays in serving the needs of users. These two considerations have to be carefully balanced.

Apart from this, the inventory policy of a multinational company has to take into account the exchange rate fluctuations, the possibility of import or export quotas or tariffs in different countries, property taxes on assets imposed by some countries, and the threat of expropriation in certain countries.

Taking into account various factors, multinational companies may examine the possibility of at-sea storage. Companies that deal in a bulk commodity such as oil, chemical, or grain that has to be stored in some type of a tank can hold them in loaded tankers that are kept at sea or anchored at some strategic ports. This enhances flexibility with respect to shipping them to areas where needs are greater or prices higher, minimises the property tax problem, and eliminates the risk of expropriation.

## SUMMARY

- An exchange rate represents the price of one currency expressed in terms of another. A **spot rate** refers to the rate applicable to transactions in which settlement (i.e. delivery) is made in two business days after the date of transaction. A **forward rate** applies to a transaction in which the rate is fixed today but the settlement is at some specified date in the future.
- The **interest rate parity** says that the difference between the forward rate and the spot rate is just enough to offset the difference between the interest rates in the two currencies. The **relative purchasing power parity** says that the difference in the rates of inflation between two countries will be offset by a change in the exchange rate. The **expectations theory** says that if foreign

exchange markets are efficient, the forward rate equals the expected future spot rate. The **international fisher effect** says that the nominal interest differential will be equal to the expected inflation differential.

- There are two basic ways of evaluating an international capital budgeting proposal: the **home currency approach** and the **foreign currency approach**.
- The main features of **eurocurrency loans**, which represent the principal form of external commercial borrowings, are: syndication, floating rate, and currency options.
- **Euroissues** are issues which are made in the euromarket (a market which falls outside the regulatory purview of national regulatory authorities). The two principal mechanisms used by Indian companies are the **Global Depository Receipts (GDRs)** and the **Euroconvertible Issues**. The former represents indirect equity investment while the latter is debt with an option to convert it into equity.
- Apart from euroissues which are made in the euromarket, Indian firms can also issue bonds and equities in the domestic capital market of a foreign country.
- Commercial banks, the major source of export finance in India, provide finance before shipment of goods (pre-shipment finance) as well as after shipment of goods (post-shipment finance).
- The Export Import Bank of India provides export and import finance through a variety of schemes.
- The Export Credit Guarantee Corporation of India (ECGC) provides insurance to Indian exporters of goods and services, against the risk of non-payment for exports.
- International trade relies considerably on three major documents/instruments: **trade draft, bill of lading, and letter of credit**.
- Foreign exchange exposure may be classified into three broad categories: **transaction exposure, translation exposure, and operating exposure**.
- To cope with foreign exchange exposures the following devices are available: forward market hedge, rollover contracts, financial swaps, and money market hedge.
- In a forward market hedge, the most common device for managing foreign exchange exposure, the net liability (asset) position is covered by an asset (liability) in the forward market.

## QUESTIONS

1. What forces have brought about a rapid change in the field of international financial management?
2. Describe the present system of floating exchange rates.
3. What are the salient features of the international foreign exchange market?
4. What are the salient features of the foreign exchange market in India?

5. Discuss the interest rate parity theory.
6. What is the argument of the relative purchasing power parity theory?
7. Discuss the expectations theory.
8. What is Fisher effect? International Fisher effect?
9. Present an integrated picture of international parity relationships.
10. Discuss the difference between the home currency approach and the foreign currency approach to capital budgeting.
11. Should the risk premium on foreign investment be different from that on domestic investment?
12. What are the ways of financing foreign projects?
13. Discuss the buyer's credit scheme.
14. Explain the supplier's credit scheme.
15. Discuss the principal features of eurocurrency loans.
16. Explain the mechanics of issuing GDRs.
17. Describe the forms in which pre-shipment and post-shipment finance are provided.
18. What types of export insurance does Export Credit Guarantee Corporation provide?
19. Discuss the schemes of assistance of EXIM Bank.
20. State the special problems of international trade vis-à-vis domestic trade.
21. Describe the major documents/instruments used in international trade.
22. Explain how forfaiting works.
23. Describe the three types of foreign exchange exposure.
24. What factors influence translation gains/losses? How?
25. What is a money market hedge? Illustrate how it may be employed.
26. What is a forward market hedge? Illustrate how it may be employed.
27. What are the operational techniques for managing transaction risks?
28. Discuss the important levers for managing operating exposure.

## SOLVED PROBLEMS

- 37.1 The spot rate of the US dollar is ₹ 70.00/USD and the three month forward rate is ₹ 70.80/USD. What is the annualised premium?

*Solution*

The annualised premium is:

$$\frac{\text{Forward rate} - \text{Spot rate}}{\text{Spot rate}} \times \frac{12}{\text{Forward contract length in months}}$$

$$\frac{70.80 - 70.00}{70.00} \times \frac{12}{3} = 4.57\%$$

- 37.2 The 90-day interest rate is 1.75 percent in the US and 1.25 percent in the UK and the current spot exchange rate is \$1.5/£. What will be the 90-day forward rate?

*Solution*

$$\frac{\text{Forward rate}}{\text{Spot rate}} = \frac{1 + \text{Domestic interest rate}}{1 + \text{Foreign interest rate}}$$

$$\frac{F}{\$1.50} = \frac{1 + .0175}{1 + .0125}$$

$$F = \$1.5074$$

- 37.3 The current spot rate for the US dollar is ₹ 70. The expected inflation rate is 4 percent in India and 1.5 percent in the US. What is the expected spot rate of the US dollar a year hence?

*Solution*

$$\frac{\text{Expected spot rate a year from now}}{\text{Current spot rate}} = \frac{1 + \text{expected inflation in home country}}{1 + \text{expected inflation in foreign country}}$$

$$\frac{\text{Expected spot rate a year from now}}{\₹ 70} = \frac{1.04}{1.015}$$

So,

$$\text{Expected spot rate of the US dollar a year hence} = ₹ 63 \times \frac{1.04}{1.015} = ₹ 71.72$$

- 37.4 One-year US nominal interest rate is 3 percent, one-year Indian nominal interest rate is 8 percent. The current spot rate  $S_0$  is ₹ 70. What is the expected spot rate one year hence?

*Solution*

$$\frac{S_1^e}{S_0} = \frac{1 + r_h}{1 + r_f}$$

$$\frac{S_1^e}{70.00} = \frac{1.08}{1.03}$$

$$S_1^e = ₹ 73.92$$

- 37.5 Bharati International, an India-based multinational company, is evaluating an overseas investment proposal. Bharati International's exports of generic drugs to have increased to such an extent that it is considering a project to build a plant in the UK. The project will entail an initial outlay of £50 and is expected to generate the following cash flows over its four year life.

Year	Cash flow (in million)
1	£ 20
2	£ 30
3	£ 20
4	£ 10

The current spot exchange rate is ₹ 98 per British Pound (£), the risk-free rate in India is 7 percent and the risk-free rate in UK is 3 percent.

Bharati International's required rupee return on a project of this kind is 20 percent. What is the NPV of the project? Use the home currency approach.

*Solution*

$S_0 = ₹ 98$ ,  $r_h = 7$  percent, and  $r_f = 3$  percent. Hence the forecasted spot exchange rates are:

Year	Forecasted spot exchange rate
1	₹ 98 $(1.07/1.03)^1 = ₹ 101.81$
2	₹ 98 $(1.07/1.03)^2 = ₹ 105.76$
3	₹ 98 $(1.07/1.03)^3 = ₹ 109.87$
4	₹ 98 $(1.07/1.03)^4 = ₹ 114.13$

Using these forecasted spot exchange rates along with the current spot exchange rate of ₹ 98, we can convert the pound cash flows into rupees.

Year	Cash flow in pounds (million)	Expected exchange rate	Cash flow in rupees (million)
0	-50	₹ 98	-4900
1	20	101.81	2036.2
2	30	105.76	3172.8
3	20	109.87	2197.4
4	10	114.13	1141.3

Given a rupee discount rate of 20 percent, the NPV in rupees is:

$$\begin{aligned} \text{NPV} &= -4900 + \frac{2036.2}{(1.20)} + \frac{3172.8}{(1.20)^2} + \frac{2197.4}{(1.20)^3} + \frac{1141.3}{(1.20)^4} \\ &= ₹ 822.2 \text{ million} \end{aligned}$$

37.6 Consider the following rates:

$$\begin{aligned} S(\text{INR/USD}) &= 0.0137 \\ S(\text{USD/GBP}) &= 0.8850 \end{aligned}$$

What is the exchange rate between INR and GBP?

*Solution*

$$\begin{aligned} S(\text{INR/GBP}) &= S(\text{INR/USD}) \times S(\text{USD/GBP}) \\ &= 0.0137 \times 0.8850 = 0.0121 \end{aligned}$$

37.7 A bank gives the following quotation

USD/INR Spot : 70.5015/70.5020

1 month swap : 10/14

What is the outright forward quotation?

*Solution*

Since the bid rate in points (10) is less than the offer rate in points (14), the forward rate is at a premium in relation to the spot rate. Hence we add points to the respective spot quotation to get the outright forward quotation.

USD/INR One month Forward : 70.5025/70.5034

## PROBLEMS

**37.1 Forward Premium** If the spot rate of the US dollar is ₹ 70.00 and the three month forward rate is ₹ 70.50, what is the annualised forward premium?

**37.2 Forward Exchange Rate** As the investment manager of RBI's foreign resources, you have \$100 million to invest. You are considering deposits in the US or UK. The US interest rate on 1-year deposit of this size is 2 percent. The current spot rate is 1.320 dollars per sterling pound. The rate of interest on a 1-year deposit of this size in UK is 1.6 percent. What forward exchange rate will make you indifferent between investing in the US and depositing in the UK?

**37.3 Implications of Exchange Rates** The exchange rate between US dollar and yen is as follows:

Spot	118 yen/dollar
30-day futures	112 yen/dollar
90-day futures	108 yen/dollar
180-day futures	103 yen/dollar

Required:

- What is the annual percentage premium of the dollar on the yen?
- What is the most likely spot rate 6 months hence?
- If the interest on 6-month deposit in the US is 0.8 percent (for 6 months), what is it likely to be in Japan?

**37.4 NPV of Foreign Project** Videsh Ventures, a Mumbai-based company, is considering a project to be set up in the US. The project will entail an initial outlay of \$200 million and is expected to generate the following cash flow over its five year life:

Year	1	2	3	4	5
Cash flow (in million)	\$50	\$70	\$90	\$105	\$80

The current spot exchange rate is ₹ 70 per US dollar, the risk-free rate in India is 7 percent and the risk-free rate in the US is 1.5 percent.

Videsh Venture's required rupee return on a project of this kind is 18 percent.

Calculate the NPV of the project using the home currency approach.

**37.5 Forward Rate** The 90-day interest rate is 0.55 percent in the US and 0.4 percent in UK and the current spot exchange rate is \$1.32/£. What will be the 90-day forward rate?

**37.6 Expected Spot Rate** The current spot rate for the British pound is ₹ 96. The inflation rate is 6 percent in India and 2 percent in UK. What is the expected spot rate of British pound a year hence?

**37.7 Forward Rate** Suppose India and United States produce only one good, steel. Suppose the price of steel in India is ₹ 28,000 and in the US it is \$720.

- (a) According to the law of one price, what should the \$: Rupee spot exchange rate be?
- (b) Suppose the price of steel over the next year is expected to rise is ₹ 36,000 in India and \$800 in the US. What should the one year \$: Rupee forward rate be?

**37.8 Expected Spot Rate** The inflation rate in UK is expected to be 2 percent per year, and the inflation rate in Japan is expected to be 0.7 percent per year. If the current spot rate is 144 yen/£ what will be the expected spot rate in 2 years?

**37.9 Money Market Hedge** An American firm has a liability of £100,000 on account of purchases from a British supplier, which is payable after 90 days. The 90-day money market rates in the US and UK are 1.5 percent for lending and 0.8 percent for borrowing. What steps should the American firm take to do a money market hedge?

**37.10 Money Market Hedge** In the previous problem assume that the American firm has a receivable of £100,000 on account of sales to a British customer, which is due in 90 days. What steps should the American firm do to do a money market hedge?

**37.11 Issuing Foreign Bonds** R. Sehgal, the finance manager of Thermoplastics Inc. in New York has found that the interest rate in Switzerland is 1 percent below the interest rate in the US. He is urging the board of directors of his firms to issue foreign bonds in Switzerland. Evaluate his position.

**37.12 Exchange Rate** Consider the following rates:

$$S(\text{INR}/\text{USD}) = 0.0141$$

$$S(\text{USD}/\text{GBP}) = 0.7692$$

What is the exchange rate between INR and GBP?

**37.13 Forward Quotation** A bank gives the following quotation

USD/INR Spot 70.3535/70.3542

1 month swap : 11/8

What is the forward quotation?

**37.14 Forward Discount** Consider the following spot and forward quotes:

USD/INR Spot : 71.3424/71.3435

USD/INR 1 – month forward : 71.8050/71.8060

What is the annual percentage of discount, if mid-rates are used?

## MINICASE

It was an eventful day for Amman Engineering Company, a small machinery manufacturer in Coimbatore, when their owner, Shakthivel brought an export order for \$ 50,000 from Indonesia for supply of machines by the end of six months. He had even succeeded in getting a demand draft for \$ 10,000 by way of interest free advance from them. As the buyer was very quality conscious, they had insisted that one critical component of the machinery should be of a particular German make. He has now called you, their bright young finance manager, to discuss the matter in some detail. Being very cautious by nature he was very particular on getting full forward cover from their bank on all forex exposures. He has asked you to gather all the needed information and advise him to the best of your knowledge, on the following in the next hour or so:

- (a) How many rupees would the bank pay on the demand draft?
- (b) What premium/discount on the dollar would be indicated by the 6 month forward rate that would be obtained by the bank?
- (c) How fair or otherwise would be the forward buying rate given by the bank as compared to the rate indicated by the prevailing market interest rates?
- (d) If the estimated price of the component to be imported were to be Euro 7,000 payable at the end of the third month, what would be the rupee cost of the import?
- (e) What would be the overall estimated profit margin from this export?

Using the following information answer the queries along with calculations.

*Rates obtained from the bank:*

USD/INR Spot : 71.62/71.65

3 months swap points in : 132/133

paise

6 months swap points in : 230/235

paise

EUR/USD spot : 1.1288/1.1290

3 months swap points : 35/32

(1 point = 1/10000 Euro)

TT buying rate in INR for USD: 71.19 TT selling rate in INR for USD: 73.98

USD Sight/Demand bills discounting charges: 1 percent (all inclusive)

Forward contract booking charges: Nil

*Information gathered from the production department:*

Estimated net cost of sales of the goods ready for export at the end of six months, excepting the imported cost of the German component: ₹ 12,63,000

*Rates ascertained from the market:*

Risk-free interest rate: in India 7.65% p.a., in the US 2.60% p.a.

- 
- 1 The author gratefully acknowledges the help provided by Dr. P.G. Apte in writing this chapter.
  - 2 If the currency of a country is devalued, the exports of that country become cheaper to foreign buyers and hence more competitive in international markets. This tends to push up its exports. On the other hand, its imports become dearer. This tends to depress imports. The combined effect normally leads to improvement in the balance of payments positions.
  - 3 This section has been contributed by Dr. K. Sriram.

## Online Resources

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter37/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter37/index.html)

- Additional Self-Test Problems
- Chapters Excel
- Answer Key
- Additional Solved Problems
- Excel on Solved Problems



## Financial Management in Sick Units

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Understand the causes and symptoms of sickness.
- ✓ Explain the use of financial ratios in predicting sickness.
- ✓ Describe the key elements of a revival programme.
- ✓ Discuss the mechanisms for debt restructuring in India.

Business sickness in India, as elsewhere, is a problem. Tens of thousands of crores of bank funds and institutional resources are locked up in sick units, large, medium, and small. These outstandings are in addition to unpaid arrears of excise duty, sales tax, provident fund, wages, power bills, and so on. The incidence of sickness, quite understandably, has been a cause of considerable concern to the government, financial institutions, and banks.

So far we have discussed issues faced by successful, growing enterprises. However, many firms face financial distress and some of them may eventually be forced into bankruptcy.

Forewarned is forearmed. So, every firm must be alert to impending difficulties so that it can take remedial measures in time. Should a firm encounter financial distress, its managers must find ways and means of warding off financial collapse. The ability of a firm to deal with financial sickness often spells the difference between recovery and liquidation.

As sickness leads to acute financial embarrassment, the financial manager has a special interest in getting a forewarning of sickness. Moreover, he has an onerous responsibility in steering a sick unit toward recovery.

## 38.1 ■ DEFINITION OF SICKNESS

There are two ways of looking at insolvency. Stock-based insolvency occurs when the firm has a negative net worth implying that its assets are less than its debt. Flow-based insolvency occurs when the operating cash flows of the firm are not enough to meet its obligations. Some of the definitions of sickness, as used in India by various agencies, are given below.

The Reserve Bank of India defines a sick unit as ‘One which has incurred cash losses for one year and, in the judgement of the financing bank, is likely to incur cash losses for the current as well as the following year and/or there is an imbalance in the unit’s financial structure, that is, current ratio is less than 1:1 and debt/equity ratio (total outside liabilities as a ratio of net worth) is worsening.’<sup>1</sup>

For micro and small enterprises (MSEs), RBI has a modified definition: “An MSE is considered sick when any of the borrowing account of the enterprise remains NPA (non performing account) for three months or more or there is erosion in the net worth due to accumulated losses to the extent of 50 percent of its net worth.”

Under section 253 of the Companies Act, 2013, a company is assessed to be sick on a demand by the secured creditors of a company representing 50 percent or more of its outstanding amount of debt under the following circumstances:

- The company has failed to pay the debt within a period of 30 days of the service of the notice of demand.
- The company has failed to secure or compound the debt to the reasonable satisfaction of the creditors.

*A business firm may be regarded as sick if (i) it faces financial embarrassment (arising out of its inability to honour its obligations as and when they mature), and (ii) its viability is seriously threatened by adverse factors.*

### Five Stages in Corporate Decline

In his book on corporate failures, ***How the Mighty Fall***, management guru Jim Collins identifies five stages in corporate decline.

**Stage one: Hubris** Firms attribute their success to their superior qualities and become dogmatic about their practices.

**Stage two: Undisciplined Pursuit of More** Firms overreach and grow to a scale or move into industries where the factors that contributed to their original success do not apply.

**Stage three: Denial of Risk and Peril** Despite warning sign, the bosses, comforted by strong headline performance, convince themselves that everything is fine.

**Stage four: Grasping for Salvation** In the face of mounting problems, the firms grasp for salvation. Instead of returning to fundamentals that made them great, they gamble on a new CEO, radically change strategy, make a so-called transformational acquisition, or rely on some other silver bullet.

**Stage five: Irrelevance or Death** If the company remains in stage four for long, it is likely to spiral down to stage five where it becomes irrelevant or dies. However, many still-great-firms like IBM and Nucor Steel have bounced back even after reaching stage four.

## 38.2 ■ CAUSES OF SICKNESS

A firm remains healthy if it (i) operates in a reasonably favourable environment, and (ii) has a fairly efficient management. When these conditions are not satisfied, the firm is likely to become sick. Hence sickness may be caused by:

- Unfavourable external environment
- Managerial deficiencies

**Unfavourable External Environment** The firm may be affected by one or more of the following external factors over which it may hardly have any control.

- Shortage of key inputs like power and basic raw materials.
- Changes in governmental policies with respect to taxes, licensing, export duties, reservation, etc.
- Emergence of large capacity leading to intense competition.
- Development of new technology.
- Sudden decline in orders from the government.
- Shifts in consumer preferences.
- Natural calamities.
- Adverse international developments.
- Reduced lending by financial institutions.

**Managerial Deficiencies** Management can be deficient in many ways. An attempt has been made below to classify managerial deficiencies function-wise. These shortcomings, singly or in combination, can induce sickness.

<i>Production</i>	<i>Marketing</i>
■ Improper location	■ Inaccurate demand projection
■ Wrong technology	■ Improper product-mix
■ Uneconomic plant size	■ Wrong product positioning
■ Unsuitable plant and machinery	■ Irrational price structure
■ Inadequate emphasis on R & D	■ Inadequate sales promotion

- Poor quality control
- Poor maintenance

#### *Finance*

- Wrong capital structure
- Bad investment decisions
- Weak management control
- Inadequate MIS
- Poor working capital management
- Strained relations with investors

- High distribution costs
- Poor customer service

#### *Human Resources*

- Ineffective leadership
- Inadequate human resources
- Overstaffing
- Poor organisation design
- Insufficient training
- Irrational compensation

**RBI Study on Causes of Sickness** A study conducted by the Reserve Bank of India, on the causes of industrial sickness, concluded as follows:

“A broad generalisation regarding important causes of industrial sickness emerges. It is observed that the factor most often responsible for industrial sickness can be defined as ‘management’. This may take the form of poor production management, poor labour management, poor resources management, lack of professionalism, dissensions within the management, or even dishonest management.”

### **38.3 ■ SYMPTOMS OF SICKNESS**

Sickness does not occur overnight, but develops gradually over time. A firm which is becoming sick shows symptoms which indicate that trouble lies ahead of it. Some of the common symptoms are:

- Delay or default in payment to suppliers.
- Irregularity in the bank account.
- Delay or default in payment to banks and financial institutions.
- Non-submission of information to banks and financial institutions.
- Frequent requests to banks and financial institutions for additional credit.
- Decline in capacity utilisation.
- Poor maintenance of plant and machinery.
- Low turnover of assets.
- Accumulation of inventories.
- Inability to take trade discount.
- Excessive turnover of personnel.
- Extension of accounting period.
- Reliance on ‘creative accounting’ which seeks to present a better financial picture than what it really is.
- Decline in the price of equity shares and debentures.

## 38.4 ■ PREDICTION OF SICKNESS

While the above symptoms suggest that the unit is in difficulty and may become potentially sick, it is not easy to reach a definitive conclusion about impending sickness on the basis of these symptoms. Can sickness then be predicted more reliably by some other means? Considerable amount of empirical research done in the last few decades suggests that financial ratios can be used for predicting industrial sickness with greater reliability. This research, in general, involves two types of analysis: univariate analysis and multivariate analysis.

**Univariate Analysis** In univariate analysis, an attempt is made to predict sickness on the basis of single financial ratios. A path breaking attempt to predict corporate failure, employing univariate analysis, was made by William H. Beaver in 1966<sup>2</sup>. He defined failure as the inability of a firm to meet its financial obligations as they mature. He compared the financial ratios of a sample of 79 firms that failed with the financial ratios of a sample of 79 non-failed firms for the same period of time—for each failed firm, a non-failed firm operating in the same industry and of comparable size was selected. For both the samples, Beaver examined a period of five years prior to the point of failure for the failed firms and conducted three types of analysis to determine the predictive power of financial ratios: (i) a comparison of mean values, (ii) a dichotomous classification analysis, and (iii) an analysis of likelihood ratios. His analysis suggested that many of the ratios employed by him showed the power to signal an impending failure. The ratios of failed firms differed significantly from those of the non-failed firms. Further, they deteriorated sharply during the five years prior to failure.

L.C. Gupta<sup>3</sup>, in a study done with Indian data, attempted to distinguish sick and non-sick companies on the basis of financial ratios. His major focus was on a sample of 41 textile companies of which 20 were sick and 21 non-sick to test the predictive power of 63 financial ratios. He employed the criterion of 'percentage classification error' to judge the predictive power of financial ratios. The computation of 'percentage classification error' may be illustrated by an example. Suppose we have a mixed sample of 4 sick (S) and 4 non-sick (N) firms with their ROI (for a given year) arranged in an ascending order as follows:

-5	-2	3	4		6	8	10	12
S	S	(N)	S	↑	N	N	(S)	N

Inspecting the above configuration, we choose a cut-off point, where the arrow is shown, to separate the sick group from the non-sick group—to the left of the cut-off point lies the sick group, to the right of the cut-off point lies the non-sick group. The cut-off point is chosen in such a way that the number of misclassifications is minimised. It may be noted that almost invariably there will be some misclassifications. In the above example, there are two misclassifications (shown in parenthesis) out of 8 items. This means that the ‘percentage classification error’ is 25 percent (2/8).

The ratio which showed the least ‘percentage classification error’ at the earliest possible time was deemed to have the highest predictive power. The relative predictive power of different financial ratios was determined for each year for the period 1962–64.

L.C. Gupta’s study revealed that the two ratios of about equal merit were: (i) EBDIT/Sales, and (ii) OCF/Sales (EBDIT stands for earnings before depreciation interest and taxes. OCF stands for operating cash flow which is equal to profit after the tax plus depreciation).

**Multivariate Analysis** Univariate analysis examines financial ratios individually but does not assess the joint predictive power of various combinations of ratios. Multivariate analysis, on the other hand, seeks to predict industrial sickness using a methodology that considers the combined influence of several variables (financial ratios in our context). The multivariate technique commonly used in predicting business failure or sickness is the technique of multiple discriminant analysis. This is a statistical technique which helps in classifying an observation into one of the several pre-specified groups (classes) on the basis of certain characteristics of the observation. It essentially involves estimating a function which discriminates best between the groups. The discriminant function is usually a linear one:

$$Z = a_1X_1 + a_2X_2 + \dots + a_nX_n \quad (38.1)$$

where  $Z$  is the discriminant index,  $X_i$ s are independent variables ( $i = 1, \dots, n$ ), and  $a_i$ s are coefficients of independent variables  $i$  ( $i = 1, \dots, n$ ).

The use of multiple discriminant analysis for predicting business failure may be illustrated by a classic study conducted by E.I. Altman<sup>4</sup>. He studied a sample of 33 bankrupt firms along with a paired sample of 33 non-bankrupt firms. He examined 22 financial ratios with a view to selecting the 5 which jointly possessed the maximal power to predict bankruptcy. The

discriminant function which discriminated best between the bankrupt and non-bankrupt firms is:

$$Z = 3.3 \frac{\text{EBIT}}{\text{Total assets}} + 1.2 \frac{\text{Net working capital}}{\text{Total assets}} + 1.0 \frac{\text{Sales}}{\text{Total assets}} + 0.6 \frac{\text{Market value of equity}}{\text{Book value of equity}} \\ + 1.4 \frac{\text{Accumulated retained earnings}}{\text{Total assets}} \quad (38.2)$$

where  $Z$  is an index of bankruptcy.

A  $Z$  score less than 2.675 implies that the firm has a 95 percent chance of becoming bankrupt within one year. However, Altman's analysis shows that the area between 1.81 and 2.99 may be regarded as a gray area. Thus  $Z \leq 1.81$  predicts bankruptcy and  $Z \geq 2.99$  non-bankruptcy.

Altman's original  $Z$  score model was developed for listed firms and manufacturing firms. He revised his model for unlisted firms and non-manufacturing firms. The revised model is:

$$Z = 6.56 \frac{\text{Net working capital}}{\text{Total assets}} + 3.25 \frac{\text{Accumulated retained earnings}}{\text{Total assets}} \\ + 1.05 \frac{\text{EBIT}}{\text{Total assets}} + 6.72 \frac{\text{Book value of equity}}{\text{Total liabilities}} \quad (38.3)$$

According to his analysis:

- $Z < 1.23$  indicates a bankruptcy prediction
- $1.23 < Z < 2.90$  indicates a gray area
- $Z > 2.90$  indicates no bankruptcy

In a comprehensive study done with Indian data S.S. Srivastava and Y.A. Yadav<sup>5</sup> developed a multiple discriminant analysis model for predicting industrial sickness. From a long list of 36 financial ratios, they selected the following four financial ratios:

- $V_9$  = earnings before interest and taxes/total tangible assets
- $V_{25}$  = current assets/current liabilities
- $V_{31}$  = net sales/total tangible assets
- $V_{35}$  = defensive assets/total operating expenditure

The discriminant function which appeared to discriminate best between the sick and the non-sick companies was defined as:

$$Y = 19.8927V_9 + 0.0047V_{25} + 0.7141V_{31} + 0.4860V_{35} \quad (38.4)$$

The cut-off value of the discriminant score was determined as 1.425. The predictive accuracy of the discriminant model is given below:

<i>Years Prior to Sickness</i>	<i>Number of Companies</i>	<i>Number Correctly Classified</i>	<i>Number Misclassified</i>	<i>Percentage of Correct Classification</i>
1	78	74	4	95
2	78	68	10	87
3	76	65	11	86
4	72	59	13	82
5	63	50	13	79
6	51	40	11	78

Morgan Stanley periodically (annually) evaluates companies in India using Altman's Z-score method which aggregates five different financial ratios of a company to estimate the risk of extreme financial stress. It considers a Z-score of more than 3.0 a sign of financial health.

**A Critique of Bankruptcy Prediction Models** Though various bankruptcy prediction models appear to possess some predictive value, it is very difficult to generalise about corporate failure for the following reasons:

1. We do not have a well-defined theory of corporate failure to guide empirical work. In the absence of such a theory, empirical research involves a great deal of experimentation with different variables (Altman, for example, examined 22 ratios), different models (univariate and multivariate), and various statistical techniques (regression analysis, discriminant analysis, and so on). As Baruch Lev says: "As expected, results of such unguided research efforts are often inconsistent, and impossible to generalise. It seems, therefore, that the main research effort should be directed toward the construction of a testable theory of corporate failure."<sup>6</sup>
2. Empirical studies are statistically flawed because they are retrospective in nature. As Johnson argues: "Altman demonstrated that failed and nonfailed firms have dissimilar ratios, not that ratios have predictive power. But the crucial problem is to make an inference in the reverse direction, i.e., from ratios to failures. It must be demonstrated that stratified samples of ratios' values can imply failure and non-failure."<sup>7</sup>

Notwithstanding the above criticisms, well-specified multivariate models that incorporate accounting as well as non-accounting variables are helpful in providing timely warning. Hence they are useful to lenders, investors, managers, and regulators. Of course, they are helpful to the financial manager who would like to initiate corrective measures to avert potential failure.

## 38.5 ■ REVIVAL OF A SICK UNIT

When an industrial unit is identified as sick, a viability study should be conducted to assess whether the unit can be revived/rehabilitated within a reasonable period. If the viability study suggests that the unit can be rehabilitated, a suitable plan for rehabilitation must be formulated. If the viability study indicates that the unit is “better dead than alive”, steps must be taken to liquidate it expeditiously.

**Viability Study** A reasonably comprehensive assessment of the various aspects of the working of a unit, a viability study should cover the following:

- Market
- Operations
- Finance
- Human resources
- Environment

The viability study may suggest one of the following:

- (a) The unit can be revived by adopting one or more of the following measures: debt restructuring, infusion of funds, correction of functional deficiencies, granting of special reliefs and concessions by the government, replacement of existing management because of its incompetence and/or dishonesty.
- (b) The unit is not potentially viable—this essentially implies that the benefits expected from remedial measures are less than the cost of such remedial measures.

**Revival Programme** A revival programme usually involves the following:

**Settlement with Creditors** A sick unit is normally in straitened financial circumstances and is not able to honour its commitments to its creditors (financial institutions, debenture holders, commercial banks, suppliers, and governmental authorities). To alleviate its financial distress, a settlement scheme has to be worked out which may involve one or more of the following: rescheduling of principal and interest payment; waiver of interest; reduction of interest; conversion of debt into equity; payment of arrears in installments.

*Provision of Additional Capital* Typically, a revival programme entails provision of additional capital. This may be required for modernisation and repair of plant and machinery, for purchase of balancing equipment, for sustaining a new marketing drive, and for enhanced working capital needed to support a higher level of operations. The additional capital has to be provided on concessional terms, at least for the initial years, so that the financial burden on the unit is not high.

*Divestment and Disposal* The revival programme may involve divestment of unprofitable plants and operations and disposal of slow moving and obsolete stocks. The thrust of these actions should be to strengthen the liquidity of the unit and facilitate reallocation of resources for enhancing the profitability of the unit.

*Reformulation of Product-market Strategy* Many a business failures can be traced to an ill-conceived product-market strategy. For reviving a sick unit, its product-market strategy may have to be significantly reformulated to improve the prospects of its profitable recovery. This, of course, calls for a great deal of imagination and penetrating analysis.

*Modernisation of Plant & Machinery* In order to improve manufacturing efficiency, plant and machinery may have to be modernised, renovated, and repaired. This may be essential for attaining certain cost standards and quality norms for competing effectively in the market place.

*Reduction in Manpower* Generally, sick firms tend to be over-staffed. The revival programme must seek to reduce superfluous manpower. Remember an old managerial saw: "The leaner the organisation, the greater are its chances of survival." Often a 'golden handshake' involving paying significant retrenchment compensation is a better proposition than carrying redundant manpower on the payroll of the unit.

*Strict Control Over Costs* A profitable organisation can afford wastefulness and laxity in its expenditures. A tottering firm, seeking to regain its health and vigour, has to exercise strict control over its costs, particularly over its discretionary expenses. A zero-base review of all the discretionary expenses may be undertaken to eliminate programmes and activities which are a drain on the finances of the firm.

*Streamlining of Operations* Manufacturing, purchasing, and selling operations have to be meticulously examined so that they can be streamlined. Value engineering, standardisation, simplification, cost-benefit

analysis, and other approaches should be exploited fully to improve the efficiency of the operations.

*Improvement in Managerial Systems* The managerial systems in the unit must be strengthened. In this exercise, greater attention may have to be paid to the following:

- Environmental monitoring
- Organisational structure
- Responsibility accounting
- Management information system
- Budgetary control

*Workers' Participation* In general, workers' participation in management enhances employee commitment, motivation, and morale. Further, the suggestions offered by the workers result in improvements that lead to higher manufacturing efficiency and productivity. A sick organisation, which is being revived, can perhaps benefit even more from workers' participation in management. During the revival phase, the dedication, commitment, and support of workers is indispensable and meaningful workers' participation and involvement goes a long way in ensuring this.

*Change of Management* A change in management may be necessary where the present management is dishonest and/or incompetent. It has been observed that a new chief executive, who is competent, committed, and upright, can often bring about dramatic results. The classic example of this phenomenon was the dramatic turnaround of Chrysler Corporation under the stewardship of Lee Iacocca.

*Merger with a Healthy Company* If a sick firm cannot pull itself by its own bootstraps, the option of merger with a healthy firm must be seriously explored. The healthy firm can leverage its resources to revive the sick firm.

**Common Elements** Excluding the cases of Negotiated Settlement (NS) or One Time Settlement (OTS), the common elements of debt restructuring schemes are as follows:

*Interest Rate Relief* The contracted interest rate may be reduced if the borrower is not in a position to achieve cash break-even.

*Deferment of Past Interest Dues* The arrears of interest, upto the restructuring date, are deferred and a repayment schedule spread over a period of time worked out.

***Waiver of Penalties*** Penalties levied in the form of compound interest and liquidated damages for non-payment of dues on time are generally waived.

***Reschedulement of Loan Repayment*** The loan repayment schedule is reworked, after assessing the cash flow position.

***Reduction in the Loan Amount*** In a situation where the borrower cannot potentially service the loan, lenders may write off a portion of the loan.

***Conversion of Loan into Equity*** If the loan servicing burden is considered to be onerous, a portion of the loan may be converted into equity.

***Disposal of Assets*** The company may be asked to dispose some of its idle, redundant, or non-core assets to improve its liquidity.

***Limitation on Capital Expenditure*** The lenders may impose a ban on new capital expenditure or subject them to rigorous scrutiny.

**Tax and Accounting Treatment of Debt Restructuring** The following tax and accounting provisions apply to debt restructuring.

1. Interest and other charges payable on all borrowings from financial institutions and on term loans from banks are tax-deductible only if the same has been paid in the previous year. This means the interest overdue is not a tax-deductible expense. Hence, in a subsequent year when overdue interest is remitted or waived as part of debt restructuring, there will be no tax implication.
2. Interest on working capital facilities such as cash credit and overdraft is tax-deductible on an accrual basis, regardless of when it is paid. Hence, if such interest is subsequently remitted or waived as part of debt restructuring, it would be deemed as income of the relevant previous year and subjected to tax.
3. Waiver, partial or total, of principal amount, as a result of debt restructuring, has no tax implication for the borrower. Such a capital gain is not taxable under Section 45 of the Income Tax Act, as there is no transfer of a capital asset within the meaning of that section.
4. For purposes of accounting, companies have to follow the mercantile system of accounting and hence have to charge interest to the profit and loss account on an accrual basis. Hence, if interest is waived as part of debt restructuring, it is written back to the profit and loss account as a revenue profit.
5. If principal repayment is waived, as part of debt restructuring, it is treated as a remission of capital liability. Hence it is treated as a capital profit and credited to capital reserve. The credit may be made

through the profit and loss appropriation account, supported by a note explaining the credit.

**Debt Restructuring—The Arvind Mills Case** Arvind Mills Limited, the Ahmedabad-based denim manufacturer built a huge capacity during 1987–1997, substantially financed with debt, comprising domestic loans and eurocurrency bonds. The sharp decline in denim prices in 1998–1999 combined with a steep rise in the price of naptha, the feedstock for Arvind's captive power plant, caused financial distress. Arvind could not service its 85 domestic and international lenders who had a cumulative exposure of a staggering ₹ 2700 crore.

Jardine Fleming Singapore Securities, one of the lenders, headed the steering committee of lenders that drew up a debt restructuring plan, which was based on the 'Market Study and Due Diligence of Business Plan of Arvind' prepared by KSA Technopack. On the basis of future assessment, the plan provided for a write off of 40 percent of Arvind's debt commitment. Three banks dissented with this plan and petitioned before Gujarat High Court for foreclosure. The court, however, dismissed the petition and directed the dissenting banks to agree to the plan proposed by the steering committee. Finally, 40 percent of the debt was waived off and the repayment of the balance 60 percent was staggered with a reduction in the interest rate.

## **38.6 ■ INSOLVENCY AND BANKRUPTCY CODE OF INDIA**

After many decades of frustration with a completely broken bankruptcy process, India enacted a game-changing law in 2016 called The Insolvency and Bankruptcy Code, 2016 (IBC). The erstwhile legislative framework comprised of numerous laws. The IBC will override other existing laws on matters pertaining to Insolvency and Bankruptcy. The IBC ecosystem comprises of the Insolvency and Bankruptcy Board (IBB), Information Utilities (IUs), Insolvency Professionals Association (IPA), Insolvency Professionals (IPs), Committee of Creditors, and the National Company Law Tribunal (NCLT).

**Key Aspects of IBC** The key aspects of IBC are as follows:

- Consolidation of all existing insolvency related laws.
- Establishment of Insolvency and Bankruptcy Board (IBB) for the administration of IBC and creation of Information Utilities (IUs) as a depository of financial information.
- Empowerment of the National Company Law Tribunal (NCLT) as the adjudicating authority (AA) for corporate insolvency. It will entertain or dispose any insolvency application, approve/reject resolution plans, decide in respect of claims or matters of law/facts thereof.
- Introduction of qualified insolvency professionals (IP) as intermediaries to oversee the process. IPs would be enrolled with Insolvency Professional Agency (IPA) and regulated by IBB and IPA. Appointed by the creditors, the IP will override the powers of board of directors, conduct the resolution process, and act as liquidator/bankruptcy trustee.
- A paradigm shift from the existing ‘Debtor in Possession’ to a ‘Creditor in Control’ regime.
- Resolution of insolvencies in a strict time-bound manner—within 180 days, the evaluation and viability determination must be completed.
- A moratorium period of 180 days (extendable upto 270 days) for the company. Insolvency professionals to take over the management of the company.
- Clearly defined ‘order of priority’ or the waterfall mechanism. Government dues would be junior to most others.

- Investigation of antecedent transactions.

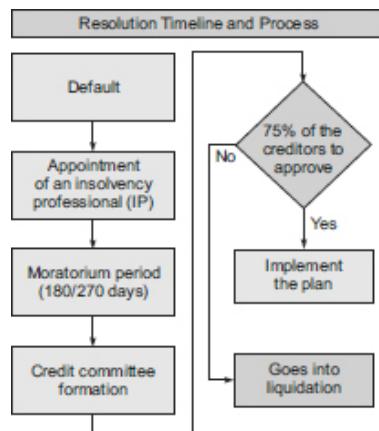
## Corporate Insolvency Resolution and Liquidation Process

The process on insolvency resolution and liquidation will be as follows:

*Application on Default* Any financial or operational creditor(s) can, on default of debt or interest payment, apply to NCLT for insolvency.

*Appointment of IP* If the application is accepted, NCLT will appoint an IP which will need the approval of the creditor committee. IP will take over the running of the company. From date of appointment of IP, the power of board of directors will be suspended and vested in the IP. IP shall have immunity from criminal prosecution and any other liability for anything done in good faith.

*Moratorium Period* NCLT will declare a moratorium period during which no action can be taken against the company or the assets of the company. The focus will be on running the Company on a going concern basis. A Resolution Plan would have to be prepared and approved by the Credit Committee.



*Credit Committee* A credit committee of creditors will be constituted. Related parties are to be excluded from this committee. Each creditor shall vote in accordance to voting share assigned. If 75 percent of creditors approve the resolution plan, the same needs to be implemented.

*Initiation of Liquidation* If 75 percent of creditors do not approve the resolution plan within the specified period, the IP will initiate the liquidation proceedings. The Debtor can also opt for voluntary liquidation by a special resolution in a General Meeting.

*Liquidation and Distribution of Assets* The IP may act as a liquidator and exercise all the powers of the Board of Directors. The liquidator shall form an estate of the assets and determine the value of the claims of creditors.

The order of priority for distribution of assets shall be as follows: insolvency related costs, secured creditors and workmen dues up to 24 months, salaries and dues of other employees up to 12 months, financial debts (unsecured creditors), government dues (up to 2 years), any remaining debts and dues, equity.

## 38.7 ■ TURNAROUND STORIES

A number of sick companies all over the world have been successfully turned around. They have been brought back to life with the help of intelligently crafted strategies, dynamic leadership, expedient initiatives, and sustained efforts. Here is a ‘peep’ into some of the Indian turnaround stories.

**E.I.D. Parry** E.I.D. Parry a 200-year old hoary company was tottering financially in the early 1980s. Though it had reasonably valuable assets and some good lines of business, it was mired into problems. It had an over-extended portfolio of businesses, it was over-staffed, it had no systems worth the name, and it lacked cost consciousness. Above all, its management was steeped in a dying British legacy of leisure and enjoyment.

Venkataraman, the then Union Minister of Industries (and later the President of India), advised the TI group to explore the possibility of acquiring an equity stake of about 10 percent in EID Parry from a commonwealth organisation and run the company. The TI group, sensing an opportunity, did that and successfully turned around the company.

The key ingredients of the strategy adopted by the TI group in reviving the company were as follows:

- The entire top management was virtually replaced to bring about a change in culture.
- Certain peripheral units were divested and valuable securities were encashed to augment the liquidity position of the firm.
- Proper systems were introduced to inject greater discipline in the organisation.
- Cost consciousness was continually drilled among the employees.
- The manpower was drastically reduced from 7800 to 3000.

**Andhra Pradesh Paper Mills** In the late 1980s, Andhra Pradesh Paper Mills was in straitened circumstances. Thanks to power cuts and other problems, its production was low and it was incurring losses of nearly ₹ 5 million every month in 1988.

Somanis, the controlling group, brought M.V.G. Rao who had a successful stint with Tamil Nadu Newsprint. Reputed for his turnaround

skills, M.V.G. Rao took a series of steps to rehabilitate the company. The key elements of the turnaround strategy were as follows:

- Accumulated inventories were disposed to generate ₹ 30 million.
- Two more diesel generators, each having a capacity of 1000 KVA, were purchased. This helped in raising production from 3,000 tonnes to 7,500 tonnes per month.
- Bamboo, an expensive raw material, was substantially replaced by hardwood, a cheaper raw material.
- A number of highly skilled employees were inducted from Tamil Nadu Newsprint project.
- The workers union was taken into confidence by open and plain speaking.

These actions paid off. Andhra Pradesh Paper Mills, regarded by many observers as a hopeless case, emerged from the shadows of bankruptcy. By 1990–91 the company was turned around.

**TVS Suzuki** TVS Suzuki started operations in 1987–88 on an optimistic note. However, its performance deteriorated in the following three years. While it still made profit (though substantially reduced) in 1988–89, it incurred losses in 1990–91. By early 1991 the situation was pretty bad because of intense competition in the marketplace. As its president Mohan Ram said: “We’re close to being considered a basket case, but we retained our vision of the future.”

Determined to fight competition and improve performance, the company took a series of steps. The important ones are described below:

- A six-month, week-by-week, cost reduction drive focussed on raw material cost, manpower cost, and non-value added expenditures (this led to a drop of 30 percent in operating costs).
- A massive exercise in value engineering undertaken in tandem with Suzuki (this resulted in a saving of ₹ 10 million per month).
- A product improvement strategy to introduce a new model every few years, to build a market share.
- A renewed marketing drive backed by a higher advertising outlay and a new marketing and vendor policy.

Thanks to these initiatives and the dynamic leadership of Venu Srinivasan, the company emerged as a healthy, vibrant organisation.

**Common Ingredients** A turnaround situation represents an unusual phase in the life history of a firm and requires a very different approach to management as compared to a normal situation.

According to Pradip Khandwalla, the key elements found commonly in turnarounds are:

- A change in the top management.
- A substantial involvement of top management in the day-to-day operations.
- An emphasis on projects that have a quick payoff.
- Opportunistic action, improvisation, crisis management, and short-term expediency.

## SUMMARY

- A firm may be regarded as sick if it is unable to honour its obligations and its validity is seriously threatened by adverse factors.
- Sickness is caused by unfavourable external environment or managerial deficiency, more so, the latter.
- Business sickness does not occur overnight but develops gradually over time. Empirical research suggests that financial ratios can be used for predicting business sickness.
- According to Pradip Khandwalla, the key elements found commonly in turnarounds are: a change in the top management, a substantial involvement of top management in the day-to-day operations, emphasis on projects that have a quick payoff, and opportunistic action.

## QUESTIONS

1. What are the causes of industrial sickness?
2. List the symptoms which might indicate that sickness lies ahead.
3. Discuss the use of univariate analysis for predicting industrial sickness.
4. Discuss briefly how multivariate analysis may be employed for predicting industrial sickness.
5. What aspects would be covered in the viability study?
6. What are the usual components of a revival programme?
7. Discuss the common ingredients of corporate turnarounds.

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<sup>1</sup> RBI Report on Trends and Progress of Banking in India, 1977-78.

<sup>2</sup> W.H. Beaver, "Financial Ratios as Predictors of Failures", *Empirical Research in Accounting: Selected Studies* 1966, Supplement to vol. 4, *Journal of Accounting Research*.

- <sup>3</sup> L.C. Gupta, *Financial Ratios as Forewarning Indicators of Sickness*, Bombay: ICICI, 1979.
- <sup>4</sup> E.I. Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *Journal of Finance*, vol. 23 (September 1968).
- <sup>5</sup> S.S. Srivastava and R.A. Yadav, *Management and Monitoring of Industrial Sickness*, New Delhi : Concept Publishing Company, 1986.
- <sup>6</sup> Baruch Lev, *Financial Statement Analysis: A New Approach*, Englewood Cliffs, N.J.: Prentice Hall, Inc., 1974.
- <sup>7</sup> C.J. Johnson, "Ratio Analysis and the Prediction of Firm Failure," *The Journal of Finance* (December 1970).

## Financial Management in Companies with Special Characteristics

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Discuss the features of financial management in public sector enterprises.
- ✓ Explain the important features of intangible assets or intangible-intensive firms.
- ✓ Understand the challenges of financial management in small and medium enterprises.

The principles and techniques of financial management, discussed at length in this book, have universal applicability. However, in applying them to any company, you have to bear in mind the special characteristics or features of the company.

This chapter discusses the important features and characteristics of three types of companies, namely public sector enterprises, intangible-intensive firms, and small and medium enterprises, and the implications of the same for financial management.

## **39.1 ■ FINANCIAL MANAGEMENT IN PUBLIC SECTOR ENTERPRISES**

Public sector was accorded a key place in India's industrial policy since 1948. Massive investments were made in scores of central public sector enterprises (PSEs) in a number of sectors such as oil and gas, power, metals, banking, insurance, transportation, mining, and so on. The list of prominent central PSEs includes names like ONGC, Indian Oil Corporation, BHEL, GAIL, NTPC, BSNL, SAIL, MMTC, SBI, LIC, Air India, and Coal India. If we take into account departmental enterprises like Indian Railways and Indian Post as well, the public sector had indeed occupied the "commanding heights" of the economy by 1990. From 1991 the thrust of the New Economic Policy has been to reduce the areas reserved exclusively for public sector, dilute government stake in the equity of PSEs, allow PSEs to raise money from the capital market, sell off or close down chronically loss making PSEs, and devolve full managerial and commercial autonomy to successful, profit making PSEs.

The distinctive features of financial management in public sector enterprises arise primarily from government ownership (substantial or total) and secondarily from the capital intensive nature of most public sector enterprises.

## **Capital Budgeting in Central PSEs**

A special feature of capital budgeting in public sector enterprises is that the boards of these enterprises are empowered to sanction capital expenditures within certain limits which, of course, are reviewed from time to time. Capital expenditures involving larger outlay have to be approved by the higher echelons in the government.

**Role of the Public Investment Board** The Public Investment Board (PIB), set up in 1972, presently plays a pivotal role in the appraisal and sanction of capital projects of public enterprises. The PIB is headed by the Secretary, Expenditure. Its other members are the Secretaries to the Planning Commission, Department of Economic Affairs, Prime Minister, Department of Public Enterprises, Ministry of Industrial Development, and the Administrative Ministry bringing up the investment proposal before the Board.

**Guidelines Provided by the Government** For almost 15 years since the commencement of the planned era, no guidelines or manuals were provided by the central government or the Planning Commission to public sector enterprises or their administrative ministries, for the preparation of feasibility reports and detailed project reports. In 1966, for the first time, the Planning Commission issued a *Manual on Feasibility Studies*. Among other things, this Manual: (a) suggested the use of various criteria like return on investment, payback period, net present value, and internal rate of return for measuring profitability; (b) laid stress on the use of net present value to be calculated at a discount rate of 12 percent, with a mention that different discount rates may have to be used for different projects; (c) emphasised the need for analysis of risk, though it did not suggest any particular method for doing so; and (d) underscored the need for assessing the 'national economic benefits' from the project.

A more comprehensive manual entitled *Guidelines for the Preparation of Feasibility Reports for Industrial Projects* (hereafter, the Guidelines) was issued in 1975 by the Project Appraisal Division of the Planning Commission. The Guidelines suggest that projects should be appraised from the technical, commercial, financial, and economic angles, without specifying the modes of such analysis. The following sequence of presentation has been suggested: (1) General information on alternatives, (2) Preliminary analysis, (3) Project description, (4) Market analysis, (5)

Capital requirements and costs, (6) Operating requirements and costs, (7) Financial analysis, and(8) Social profitability analysis.

In the *Guidelines* emphasis has been placed on the internal rate of return method as against the net present value method that was recommended by the Manual issued in 1966. To throw light on the risk characteristics of the project, sensitivity analysis has been recommended, particularly for the following variations: (i) increase in all capital costs by 30 percent, (ii) decrease in all labour costs by 30 percent, and (iii) reduction in raw material input costs by 10 percent.

## **Handicaps**

PSEs suffer from certain handicaps, arising largely from government ownership, which are manifested in the following:

- The minister and the senior bureaucrats dealing with the PSE enjoy enormous control over the top PSE managers. So PSEs usually provide opportunities for exercise of patronage without any accountability.
- PSEs are subject to review by parliamentary committees and CAG audits.
- Government approval is required for creating posts above a certain level and for fixing the compensation structure. The compensation levels of top PSE managers are considerably less than what their counterparts get in private sector.
- The process of selection of directors and CEOs of PSEs often takes a long time.
- The Prevention of Corruption Act does not define ‘public interest’ or ‘abuse of position.’ So, it is possible for the controlling ministry to initiate an inquiry by the CBI against any PSE top manager on frivolous grounds. Further, the ministry can also refuse permission for their prosecution if it thinks fit to do so. No wonder CEOs and directors want to keep the ministry in good humour.

## **Memorandum of Understanding<sup>1</sup>**

Memorandum of Understanding (MOU) is a negotiated performance agreement between the Government and the public sector enterprise(PSE). It specifies the intentions, obligations, and mutual responsibilities of the two parties.

MOUs, first introduced in 1987–88, received greater attention when the Statement of Industrial Policy (1991) stressed the need for MOUs in the following words: “There will be greater thrust on performance improvement through the Memorandum of Understanding (MOU) system through which management would be granted greater autonomy and will be held accountable.” The MOU attempts to move the management of PSEs from management by controls and procedures to management by results and objectives.

**Contents of MOU** The MOU contains three sections which are briefly described below:

*Section 1* contains the preamble, describes the mission of the PSE, and spells out its objective in terms of growth, profitability, customer focus, people orientation, technology, image, and so on.

*Section II* specifies quantitative and qualitative criteria for performance evaluation, the weights assigned to them, and performance targets.

*Section III* delineates the delegation of powers to the PSE and obligation/assistance from the government.

**Working of the MOU System** The MOU Division of the Department of Public Enterprises (DPE) issues guidelines for the preparation of MOUs. These guidelines indicate the broad structure and the aspects to be covered in the draft MOU including the weights to be assigned to the financial parameters.

Based on these guidelines, PSEs prepare the draft MOUs, after due consideration by their respective Boards and concerned Administrative Ministries/Departments, and submit the same to DPE. The draft MOUs are discussed in the MOU negotiation meetings which are attended by Task Force members, senior officials of the Administrative Ministries, top executives of PSEs, and representatives of the nodal agencies of the Government of India such as Planning Commission, Ministry of Finance, and Department of Programme Implementation. The MOUs finalised during

these meetings are signed by the Chief Executive of the PSE and the Secretary of the concerned Ministry before March 31.

**Performance Evaluation System** The manner in which performance is evaluated under the MOU system is as follows:

1. The quantitative and qualitative criteria for performance measurement are spelt out.
2. Weights are assigned to the criteria chosen in step 1.
3. Performance targets are spelt out on a 5-point scale for each criteria.
4. Actual achievement on each criterion is measured and the same is converted into a raw score on the basis of what is decided in step 3.
5. The raw score on each criterion is multiplied by the weight assigned to the criterion to get the weighted achievement.
6. The weighted achievement on all the criteria are added to obtain the composite score.
7. The overall performance is evaluated as follows:

<i>Composite Score</i>	<i>Performance Evaluation</i>
1.00–1.50	Excellent
1.51–2.50	Very Good
2.51–3.50	Good
3.51–4.50	Average
4.51–5.00	Poor

**Achievements of the MOU System** While it is difficult to objectively establish the achievements of the MOU system, the proponents of the MOU system claim that (a) the focus has shifted to achievement of results, (b) more financial and administrative powers have been granted to PSEs signing MOUs, (c) by laying greater emphasis on marketing and comparison with private sector enterprises, MOUs have helped PSUs face competition, and (d) the quarterly performance review (QPR) meetings have become more focused.

## **Disinvestment**

Since the 1950s, governments in many developing countries, including India, relied on the public sector to accelerate development and achieve a more equitable regional dispersal of industries. In several countries, the public sector attained “commanding heights” of the economy.

From the late 1970s, however, serious concerns have been raised about the effectiveness and efficiency of public enterprises. As a result, a number of countries have taken steps in the direction of privatisation which essentially involves transfer of ownership (generally represented by equity shares), partial or total, of public enterprises from the government to individuals and non-government institutions. It may also be referred to as “people-isation” or “de-govermentalisation” or “marketisation”.

**Rationale for Privatisation** The privatisation programmes of various countries have been motivated primarily by one or more of the following objectives:

- Improvement in efficiency
- Generation of resources
- Promotion of popular capitalism

*Improvement in Efficiency* It is generally argued that the private sector has a comparative advantage over the public sector in terms of efficiency. The right to profit in the private sector provides a strong incentive to be efficient. Owner-managers will strive for higher productivity and lower costs, as these get translated into extra profits. Even in firms where ownership and management are practically separated, the capital market and the threat of takeover prods managers to be more efficient. A survey of empirical studies on privatisation published in the June 2001 issue of *The Journal of Economic Literature* concludes that after privatisation firms ‘almost always become more efficient, more profitable,... financially healthier, and increase their capital spending.’ The principal sources of efficiency gains are as follows:

- *Autonomy* Distanced from political interference and bureaucratic control, the enterprise enjoys greater autonomy. This means more flexibility in investment, financing, and operating decisions.
- *Accountability* Private shareholders tend to be more demanding. Hence the management has to assume higher responsibility for performance.

- *Employee Pride* Typically, as part of privatisation, employees too acquire a stake in ownership. This leads to a greater identification with the enterprise and stronger commitment to excel.

*Generation of Resources* Governments in most of the countries are struggling to keep budgetary deficits within reasonable limits. This is true of developed countries as well as developing countries. Privatisation seems to be a very convenient way of raising resources for reducing fiscal deficits. Many governments may not find privatisation ideologically very palatable, yet they find it very appealing as a practical device to cope with fiscal problems.

*Promotion of Popular Capitalism* Privatisation invariably broadens the base of equity shareholders and promotes popular capitalism. Apart from the contribution it makes to the deepening of the capital market, it can be politically very appealing. In the United Kingdom, for example, the privatisation programme received an unexpectedly enthusiastic response from investors. As one financial commentator said: "It was a policy with almost everything going for it as if by a process of alchemy the dull metal of Britain's unloved public sector was being transformed into pure gold".

**Indian Experiment and What Needs to be Done** The first attempt in the direction of disinvestment was made by the Government of India in 1991–92 when it sold equity shares of about 30 public sector undertakings mainly to public sector mutual funds and realised over ₹ 3,000 crores. Enthused by this experience, the government planned to step up its privatisation programme. However, a variety of factors, most important being the lack of political will, marred this initiative. The sporadic disinvestment that occurred between 1992 and 1999 has been an apology for privatisation. It was done in a very *ad hoc* manner and driven mainly by the desire to generate resources and reduce budgetary deficit.

While a determined attempt has been made from 2001 and companies like CMC, BALCO, VSNL and IPCL have been privatised, a great deal of internal opposition within the NDA government slowed the process. The UPA government which came into power in 2004, with the support of the Left Front, could not make any progress, thanks to the stiff opposition of the Left Front. On its return to power in 2009, the UPA government has set in motion the disinvestment initiatives. In the fiscal year 2009-2010, disinvestment proceeds crossed ₹ 25,000 crore. Enthused by this experience the government has set a more ambitious target of ₹ 40,000 crore for the fiscal year 2010-2011. Coal India Limited (CIL), one of the

disinvestment candidates during this period, fetched more than ₹ 15,000 crore, the largest ever from an Indian company. Headquartered in Kolkata, the traditional bastion of anti-reformers, CIL has more than 4 lakh employees, most of them perhaps opposed to disinvestment. Coal being a strategic industry, the CIL issue marks a watershed in the disinvestment debate. The happy reality is that disinvestment is no longer a controversial issue as it used to be in the past. Apparently, the necessary political will is emerging to execute a more meaningful and comprehensive privatisation programme aimed primarily at achieving efficiency gains and ensuring a fair price to the government.

Two broad approaches may be adopted for privatisation, viz., strategic sale and open market sale. In a strategic sale, a controlling stake is sold to a single buyer, as was done in the case of VSNL and IPCL. The advantages of a strategic sale are that the buyer brings in new technology or expertise, the buyer decisively replaces the government as the controlling interest, and the buyer has the incentive to improve governance and management. The disadvantage of a strategic sale is that it increases the concentration of wealth and power in the hands of a few hundred families of the country.

In an open market sale the shares of the company are sold to the public at large. The advantage of an open market sale is that disinvestment can be done in stages over time as the political consensus builds up. It disperses share ownership and creates widely held, professionally managed companies. It can also be used to promote employee ownership of shares to some extent and strengthen the alignment of interest of managers and shareholders. On the whole, the open market sale strategy seems more appropriate for India and using this strategy the government can progressively bring down its stake.

## **39.2 ■ FINANCIAL MANAGEMENT IN INTANGIBLE-INTENSIVE COMPANIES**

The terms knowledge assets, intellectual capital, and intangible assets are used interchangeably. Economists call them as knowledge assets, management experts refer to them as intellectual capital, and accountants call them as intangible assets or simply intangibles. All of them essentially represent a non-physical claim to future benefits. When the claim enjoys legal protection, such as in the case of patents, trademarks, or copyrights, the asset is referred to as intellectual property. For the sake of simplicity we will use the term intangible assets.

The primary drivers of wealth and growth in today's economy are intangible (intellectual) assets. Physical and financial assets are turning into commodities which at best can earn an average return on investment. Superior returns and dominant competitive position can be achieved only through a judicious use of intangible assets along with other assets. No wonder intangibles now loom large in managerial literature.

The dramatic rise in the importance and value of intangibles in the last two decades can be traced to fundamental changes in the structure and scope of business enterprises. More specifically, the heightened competition in the wake of globalisation, deregulation, and technological changes is forcing companies to depend on continual innovation of products and services to survive and grow. Innovation, in turn, is induced by investment in intangibles (R&D, information technology, employee training, brand equity, and so on). Hence intangibles play a major role in the world of business today.

Gary Hamel stated forcefully the growing importance of intangibles in the new era: "We are at the dawn of a new industrial order. We are leaving behind a world in which scale, efficiency, and reputation are everything. We are taking our first tentative steps into a world where imagination, experimentation and agility are, if not everything, at least essential catalysts of wealth creation."

All organisations employ tangible assets such as land, building, plant and machinery, and intangible assets such as technical know-how, employee talent, and brand equity. The proportions in which tangible and intangible assets are employed, however, tend to vary widely across firms. Firms in sectors such as information technology, biotechnology,

pharmaceuticals, and fast moving consumer goods seem to be more intangible-asset intensive whereas firms in sectors such as oil, automobiles, and steel are more tangible asset intensive.

## **Characteristics or Features of Intangible Assets or Intangible-Intensive Firms**

The important characteristics or features of intangible assets or intangible-intensive firms are as follows:

1. While physical, human, and financial assets are rival in nature—a specific deployment of a rival asset precludes its simultaneous use elsewhere—intangible assets are, in general, non-rival, in nature. This means that they can be deployed simultaneously in multiple uses. Intangibles are non-rival mainly because they involve a large fixed (sunk) cost and negligible variable cost. The discovery of a drug or the development of a software programme often requires huge initial investment, but the cost of producing the pills or software diskettes is negligible. This means that intangibles are often characterised by increasing returns to scale.

Given the properties of non-rivalry and increasing returns, intangibles are scalable. This is manifested in the market dominance of many intangible-intensive firms. For example, Intel, Cisco, Microsoft, and American Online enjoy nearly three-fourths or more of the market in which they operate. Such market dominance is unknown in tangible-intensive sectors, where even the most efficient enterprises such as Exxon-Mobil, General Electric, or Ford have less than one-fourth of the market share.

2. Physical and financial assets have well defined property rights whereas intangible assets have hazy property rights. Managers of American Airlines do not worry about the possible misappropriation of their planes and facilities by their competitors but are concerned that their reservation system (SABRE) may be imitated by their rivals.

Even when an invention is patented, non-owners can derive benefits, generally referred to as **spillovers**, through imitation (product reengineering). The numerous patent infringement lawsuits reflect the difficulties and costs of appropriating the benefits of patents.

3. The investment in intangibles is inherently very risky. While a few products or processes may turn out to be blockbusters the rest are likely to be duds. The riskiness of intangibles is substantially higher than that of physical and financial assets. A research study shows that the earnings volatility associated with R&D is, on average, three

times the earnings volatility associated with physical assets. It is important to note that the level of risk decreases along the innovation process, as one moves from the discovery stage (new ideas, knowledge) to the commercialisation stage.

4. Intangibles do not generally have organised and competitive markets. As Griliches says: “A piece of equipment is sold and can be resold at a market price. The results of R&D investments are by and large not sold directly... the lack of direct measures of R&D output introduces inescapable layers of inexactitude and randomness in our formulation.”

According to some economists, the inability to write “complete contracts” with respect to the outcomes of intangible investments is the cause of the absence of organised markets in intangibles.

5. A very large portion of the value of an intangible-intensive firm is accounted for by the future growth value.
6. Empirical evidence indicates that investors systematically misprice the shares of intangible-intensive firms. Sometimes investors overvalue intangibles—as they did wildly for dotcoms—and squander capital. For established companies, however, investors often undervalue intangibles. This imposes a high cost of capital, leading to underinvestment in intangibles.
7. The returns on R&D are substantially higher than the returns on physical assets and above the risk-adjusted cost of capital. As Baruch Lev put it: “Annual rates of return on R&D have in recent decades hovered in the range of 25 percent to 30 percent. This is substantially above the returns on physical assets and, just as telling, above the firm’s cost of capital even after accounting for the relatively high risk of R&D.”
8. Managers often fly blind when they invest in intangibles. They have only a vague idea of the kind of returns intangibles provide. Very few companies have clear-cut answers to questions like “Should we increase or decrease R&D spending?” or “Should we increase or decrease adspend?” or “Should we develop technology in-house or acquire it from outside?” Surprisingly, managers don’t have the information because GAAP doesn’t require companies to report such information. Thanks to such information brownout, managers often rely on *ad hoc* methods when they invest in intangibles.
9. An intangible-intensive company depends heavily on the vision, ideas, drive, technical capabilities, and business acumen of its key

executives.

In traditional sectors like steel, aluminium, chemicals, petrochemicals, and automobiles the law of diminishing marginal returns on investments seems to apply. Not so in knowledge-intensive parts of the economy like computers, telecommunications, and pharmaceuticals. While these sectors require large investments in R&D, incremental manufacturing activity is relatively cheap, making it possible to achieve increasing—rather than decreasing returns. In such a system, if a product gets ahead by design or chance it tends to stay ahead. The dominance of VHS technology over beta technology is a good example of this kind of economic Darwinism. While making investments in such sectors the usual question ‘What is the expected internal rate of return on the investment?’ needs to be replaced by the question ‘If the investment is made today, will it create new opportunities, learning possibilities, or other advantages in future?’

## **Implications for Financial Management**

The implications of the above characteristics or features of intangible assets or intangible-intensive firms for financial management are as follows:

1. An intangible-intensive business is a high risk-high return proposition. The rewards for success are enormous and the penalties for failure are severe. While the risk associated with intangibles is substantially higher than that associated with physical and financial assets, risk is not necessarily bad. As option pricing models tell us, risk (volatility) creates value if the downside loss is limited. By properly managing the options embedded in intangibles a firm can leverage the higher risk of intangibles into substantial value.
2. The hazy property rights associated with most intangible assets poses a considerable challenge. Exploiting the potential of a machine is a fairly manageable proposition but using fully the knowledge, expertise, and talent of employees and the patents, trademarks, and copyrights owned by the company is far more challenging. This requires a special flair for knowledge management, the ability to extract maximal benefits from one's own innovations and exploit fully the knowledge of others (within the boundaries of law).
3. Since a very large portion of the value of intangible-intensive business reflects future growth expectations, managers of such a business must constantly strive to convert the potential value into actual value and invest judiciously to replenish and enhance intangible or knowledge assets.

To ensure that an intangible-intensive firm delivers on its growth expectation, its organisational architecture must promote decentralisation, encourage cooperative endeavour, and sharpen accountability. Bureaucratic set ups are an anathema for such a business.

4. An intangible-intensive firm has to rely primarily on equity financing for the following reasons: (a) The business risk of such a firm is high and it is unwise to add financial risk by employing debt finance. (b) Lenders are typically averse to grant loans against intangible assets. They normally insist on security in the form of tangible assets. (c) Intangible-intensive firms have valuable growth options. Such firms need greater financial flexibility. (d) Since raising external equity financing may not always be feasible or desirable, intangible-

intensive firms would do well to rely as much as they can on retained earnings.

5. As investors have difficulty in figuring out the real worth of an intangible-intensive firm, meaningful investor communication is particularly important for such a firm. The firm should communicate its value chain. Baruch Lev defines value chain as follows: "By value chain, I mean the fundamental economic process of innovation...that starts with the discovery of new products or services or processes, proceeds through the development phase of these discoveries and the establishment of technological feasibility, and culminates in the commercialisation of the new products or services".
6. In order to ensure the sustained commitment of its key executives in its formative stages, an intangible—intensive firm may have to offer them substantial equity in the company. One way to do this is to offer sweat equity, which refers to the shares given to a company's employees or directors at a substantial discount or for a consideration other than cash for providing know-how and other inputs. According to the Indian law, sweat equity issued during a year should not exceed 15 percent of the total paid-up capital of the company or a value of ₹ 5 crore, whichever is higher. Further, a company cannot issue sweat equity before completing one year of incorporation. The price of sweat equity has to be determined by an independent valuer. The issue of sweat equity should be approved by shareholders by means of a special resolution.

### Different Categories of Business

Businesses may be classified into three broad categories viz., physical, service, and knowledge.

**Physical companies** depend mainly on tangible assets such as land, buildings, plants, machineries, inventories, warehouses, and showrooms to create value. Steel, paper, chemicals, automobiles, retailing, and hospitality are examples of physical companies.

**Service companies** generally provide service on a one-to-one basis. Examples: banks, consultancy firms, IT services firms and advertising agencies. People are the primary source of advantage in service companies.

**Knowledge companies** use intellectual capital to develop products and then reproduce them over and over. Software, pharmaceuticals, and music are conspicuous examples. In order to cope with shifting consumer tastes and product

obsolescence, knowledge companies must focus on constant improvement of existing products and creation of new products.

### **39.3 ─ FINANCIAL MANAGEMENT IN SMALL AND MEDIUM ENTERPRISES<sup>2</sup>**

According to the Micro, Small, and Medium Enterprises Development (MSMED) Act, 2006, a micro enterprise is an enterprise where the investment in equipment does not exceed ₹ 10 lakhs, a small enterprise is an enterprise where the investment in equipment is more than ₹ 10 lakhs but does not exceed ₹ 2 crores, and a medium enterprise is an enterprise where the investment in equipment is more than ₹ 2 crores but does not exceed ₹ 5 crores. This section looks at financial management in small and medium enterprises (SMEs).

The general characteristics of SMEs are: (a) Equity is provided mainly by the promoter family or group. (b) Debt is obtained from banks and private money lenders. (c) The customer base tends to be narrow. (d) Finances are looked after by the promoter (owner) assisted by a trusted person.

The common weaknesses in the financial management of SMEs are:

1. The accounting and reporting system is geared mainly to meet the requirements of statutory authorities and bankers. As a result, even the management may not be aware of true costs. This may lead to mispricing of products and services.
2. There is often a mismatch between the maturity of assets and the maturity of the sources of finance. Short-term borrowings may be used for supporting capital investments.
3. Spare debt capacity is rarely maintained. The average drawing is almost equal to the drawing power, rendering the firm vulnerable to unexpected changes in market conditions. This can cause severe strain on cash flows and lead to unethical practices in reporting inventory to the banks. Over time, loans tend to become NPAs.
4. The components of working capital, namely trade receivables, inventory, cash, and trade payables are not adequately monitored.
5. The customer base is narrow and SMEs often have weak bargaining power vis-a-vis their customers.

To cope with the above problems, SMEs must focus on the following:

1. Maintain proper accounts and review the profit and loss account, balance sheet, and cash flows on a monthly basis.

- Set up a simple system of costing, budgeting, and planning that
2. spans at least one year. Clarity on costs helps in avoiding unprofitable contracts.
  3. Monitor working capital components, viz., trade receivables, inventories, cash, and trade payables closely.
  4. De-risk the business by diversifying the customer base and widening the product/service offerings.
  5. Maintain some reserve borrowing capacity by setting the internal debt-equity target lower than the norm applied by bankers and lenders.
  6. Ensure that capital investments are supported by long-term sources of finance such as equity capital, retained earnings, and term loans.
  7. Do things legally, ethically, and transparently.

Owners of SMEs must realise that if they have a viable business they have a long runaway ahead of them. To achieve their growth potential they must inculcate proper financial discipline, adhere to laws, become transparent, earn the trust of their lenders, and inspire confidence in future equity investors.

## SUMMARY

- The distinctive features of financial management in public sector enterprises arise from government ownership (substantial or total) and secondarily from the capital intensive nature of these enterprises.
- Memorandum of Understanding (MOU) is a negotiated performance agreement between the Government and the public sector enterprise (PSE).
- Privatisation involves transfer of ownership, partial or total, of public enterprises from the government to individuals and non-governmental institutions.
- The terms **knowledge assets**, **intellectual capital**, and **intangible assets** are used interchangeably.
- Firms in sectors such as information technology, biotechnology, pharmaceuticals, and fast moving consumer goods seem to be more intangible-intensive.
- The important characteristics or features of intangible assets or intangible-intensive firms are as follows (a) Intangible assets are, in general, **non-rival** in nature. (b) Intangible assets have **hazy property rights**. (c) The investment in intangibles is inherently very risky. (d) Intangibles do not generally have organised and competitive markets. (e) A very large portion of the value of an intangible-intensive firm is accounted for by the future growth value.

- The implications of an intangible-intensive business for financial management are as follows: (a) An intangible-intensive business is a high risk-high return proposition. (b) To ensure that an intangible-intensive firm delivers on its growth expectation, its organisational architecture must promote decentralisation, encourage cooperative endeavour, and sharpen accountability. (c) An intangible-intensive firm has to rely primarily on equity financing. (d) Meaningful investor communication is very important for an intangible-intensive firm.
- The common weaknesses in the Financial Management of SMEs are: weak management accounting system, mismatch between the maturity of assets and liabilities, inadequate debt capacity, and poor monitoring of working capital.
- To achieve their growth potential, SMEs must set up simple systems of costing and budgeting, monitor working capital, maintain some reserve borrowing power, and do things legally, ethically, and transparently.

## QUESTIONS

1. Discuss the guidelines provided by the *Manual of Feasibility Studies and the Guidelines for the Preparation of Feasibility Reports for Industrial Projects*.
2. What are the possible handicaps suffered by PSEs, arising largely from government ownership?
3. Discuss the various features of MOUs.
4. What is the rationale for privatisation?
5. Discuss the Indian experiment in disinvestment.
6. What has caused the dramatic rise in the importance and value of intangibles in the last two decades?
7. What are the important characteristics or features of intangible assets or intangible-intensive firms? What are their implications for financial management?

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<sup>1</sup> This section has been contributed by D.C. Misra.

<sup>2</sup> This section has been contributed CA Hema Krishnamurthy.

## Corporate Risk Management

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Explain why total risk matters.
- ✓ Discuss the principle of hedging.
- ✓ Explain how hedging is done with forward contracts and futures contracts.
- ✓ Describe interest rate swaps and currency swaps.
- ✓ Discuss how hedging is done with option contracts.
- ✓ List the conventional approaches and real options for dealing with risk.
- ✓ Discuss the guidelines for risk management.

Since the early 1970s financial prices have become more volatile. This has had a detrimental impact on a number of firms which were ill prepared for unexpected price shifts.

Initially firms responded to volatility in financial prices—interest rates, exchange rates, commodity prices, and equity prices—by resorting to forecasting. However, forecasters in general flunked. This is not surprising because in efficient markets—and financial markets in general seem to be characterised by a high degree of efficiency—price changes will be random. This means that there is no way to accurately predict future prices.

Since forecasting did not address the problem of financial price risk, firms looked for other methods. The financial market responded to this need by developing a range of risk management products like forwards, futures, swaps, and options. Many firms now use financial derivatives to tailor their exposures to currency, interest rate, and commodity price risks.

However, risk management (which may be more appropriately called risk-reward management or value management) can be accomplished, in many cases, through the use of real options.

This chapter explains why total risk matters, shows how risk is measured, discusses various risk management tools, looks at risk management in practice, and suggests a set of guidelines for risk management.

## 40.1 ■ CLASSIFICATION OF RISKS

The wide array of risks that a business firm is exposed to may be classified into five categories: technological risks, economic risks, financial risks, performance risks, and legal/regulatory risks.

*Technological risks* arise mostly in the R&D and operations stages of the value chain. Companies in high-tech sectors and pharmaceutical industry are subject to high R&D risks which can significantly impact their profitability. Operating risk arises when new technologies lead to problems in production or in delivery of services or when a production breakdown occurs or defective products lead to product liability suits.

*Economic risks* stem from fluctuations in revenues (output price and demand) and production costs (raw material cost, energy cost, and labour cost). General macroeconomic conditions (like GNP growth rate) and the competitive environment in which the firm operates determine the nature of economic risks.

*Financial risks* arise from the volatility of interest rates, currency rates, commodity prices, and stock prices. While these risks are at the core of the operations of financial services firms, they have a significant impact on non-financial companies as well.

Business firms enter into contracts with buyers, suppliers, subcontractors, and others. *Performance risks* arise when the contracting counterparties do not fulfill their obligations. For example, a supplier who has promised to supply a certain critical part may fail to deliver.

Companies are subject to laws and regulations. *Legal and regulatory risks* arise from changes in laws and regulations. For example, new environmental regulations may impose significant costs or a change in the tax structure may alter the after-tax profitability of the firm.

## 40.2 ■ WHY TOTAL RISK MATTERS

Modern finance theory (as reflected in the capital asset pricing model and the arbitrage pricing theory) regards hedging activities aimed at reducing total corporate risk (measured by the variability of the firm's cash flows) as irrelevant. Under certain plausible conditions, the capital asset pricing model as well as the arbitrage pricing theory show that unsystematic (or diversifiable or unique) risks are not priced in the financial market. Put differently, unsystematic risk has no bearing on the required rate of return. Only systematic risk (or market risk) is priced and, hence, has an influence on the required rate of return.

Since the price of systematic risk is identical for all the participants in the financial market, a firm does not benefit its shareholders by laying it off in the financial market. Thus, according to this line of reasoning, in an efficient financial market the expected net present value (NPV) of any risk hedging activity like taking an insurance cover or buying a forward contract is zero. As Alan C. Shapiro and Sherid Titman say: "In this light, management decisions to insure or hedge assets appear, at best, neutral mutations (having no effect on the value of the firm). At worst, such actions, to the extent they are costly, are viewed as irrational behaviour penalising corporate stockholders."

This argument implies that company-specific risks (or unsystematic risks), as long as they do not jeopardise the existence of the firm, do not hurt the shareholders.

Recent academic work, however, has questioned this view. Although unsystematic risk may have no bearing on the required rate of return in the financial market, unmanaged unsystematic risk can and often does hurt shareholders. In terms of the discounted cash flow (DCF) model of firm valuation, unsystematic risk may lower the expected cash flows (the numerator in the DCF model), even though it has no influence over the discount rate (the denominator in the DCF model).

Why does higher total risk lower the expected cash flows of the firm? Other things being equal, a firm with a high total risk exposure is likely to face financial difficulties which tend to have a disrupting effect on the operating side of the business. A distressed financial condition, *inter alia*, is likely to:

- Result in the problem of adverse incentives

- Weaken the commitment of various stakeholders
- Impair the ability of the firm to avail its tax shelter

**Adverse Incentives** Distressed financial circumstances adversely affect managerial incentives and behaviour in the following ways:

- Managers are inclined to choose highly risky investments, even if their NPV is negative, as such investments benefit equity shareholders at the expense of creditors. Remember that while equity shareholders enjoy most of the upside potential of such investments, creditors suffer most of the downside risk.
- Managers tend to, or may be forced to, abandon promising fields and liquidate them, even if it is worthwhile to continue operations. This happens because when the firm is financially distressed, creditors call the shots. As creditors enjoy prior claim in liquidation proceedings, they may exert pressure for the liquidation of the firm.
- Managers of a financially distressed firm typically turn myopic. They may lower the quality of goods, provide inadequate after sales service, ignore employee welfare, and unfairly stretch payments to suppliers and creditors. In a bid to survive in the short run, they may sacrifice actions meant to build the long-term reputation and image of the firm.

**Weakened Commitment** Adverse incentives and actions on the part of the management of a financially distressed firm are anticipated by its customers, suppliers, distributors, employees, and other stakeholders. As a consequence, they become reluctant to deal with, or are less committed to, a financially troubled firm. The weakened commitment of various stakeholders has an adverse impact on sales, operating costs, and financial costs.

**Sales** Since a financially distressed firm tends to compromise on quality and lower standards of after sales service, it turns away potential customers. More important, the threat of liquidation, looming large over it, scares away customers looking for a steady and dependable source of supply. Thus, heightened risk hurts sales, more so when customers have to incur substantial costs in switching to new suppliers.

**Operating Costs** Suppliers, like customers, prefer to deal with a low-risk firm. As they are interested in building a long-term relationship with such a firm, they may be willing to offer concessions and discounts. Suppliers, however, normally do not adopt such an accommodating stance toward a

high-risk firm because they are not sure of building an enduring relationship. Hence they tend to charge more to a high-risk firm and accord it low priority.

Just as suppliers are more comfortable in dealing with a low-risk firm, employees too prefer to work for a low-risk firm. This preference may mean that a low-risk firm can save on its employee cost to some extent. A high-risk firm, on other hand, normally incurs higher employee costs—it has to offer higher compensation to attract people.

*Financing Costs* A high-risk firm has difficulty in borrowing and securing credit under favourable terms. It has to pay a higher rate of interest and accept onerous covenants which may curtail its flexibility to exploit opportunities. Thus the direct and indirect costs associated with financing tend to be more for a firm which is perceived to be risky.

**Diminished Tax Shelters** If a firm has highly variable operating profits, it may not be able to fully exploit the tax shelter available to it. Some of the tax shelters may have to be foregone because they are available only for a limited period and some other tax shelters may be availed of later thereby reducing the present value of tax savings.

## 40.3 ■ MEASUREMENT OF RISK IN NON-FINANCIAL FIRMS

To assess and measure a firm's exposure to financial price risks you may (a) examine financial statements to get an idea of risk exposure, (b) assess the sensitivity of the firm's value or cash flow to changes in financial prices, and (c) conduct Monte Carlo simulation.

**Examination of Financial Statements** You can get an idea about a firm's financial price risk by perusing its financial statements viz., the balance sheet and the profit and loss account. An analysis of these statements sheds light on a number of questions.

- Does the firm have a strong liquidity position as evidenced by a high current ratio and quick ratio? A strong liquidity position provides cushion against the volatility of cash flows caused by changes in financial prices.
- Does the firm have a low gearing (leverage) ratio? A low gearing ratio provides greater financial flexibility to cope with volatility in financial prices.
- What is the foreign exchange transaction risk exposure? If the balances of receivables or payables, whose value would change in response to shifts in exchange rates, are high, the firm has to bother about its transaction exposure.
- Is the firm exposed to interest rate risk? If the firm relies mainly on floating rate debt it obviously has a high interest rate exposure.
- What is the economic exposure of the firm? If there is a substantial mismatch between the currency in which the firm incurs its costs and the currency in which it gets its revenues, its economic exposure is definitely a cause for concern.
- What is the state of the market for the output of the firm? If the demand for the output of the firm is very strong then it has freedom in setting its prices in response to variations in financial prices.

**Sensitivity of the Firm's Value or Cash Flow** One way to measure a firm's risk exposure is to analyse the historical data on firm value, cash flows, and financial prices. By regressing the past changes in firm value (or its cash flow) against past changes in financial prices, you can learn about the firm's financial risk.

For example, the sensitivity of a firm's value to exchange rate changes may be estimated as follows:

$$\Delta \text{ Firm value}_t = a + b \Delta \text{ Exchange rate}_t \quad (40.1)$$

where  $\Delta \text{ Firm value}_t$  is the percentage change in firm value in period  $t$ ,  $\Delta \text{ Exchange rate}_t$  is the percentage change in exchange rate of dollar (or some other currency) in period  $t$ .

The slope of the above regression,  $b$ , reflects the exposure of firm value to changes in exchange rate. This analysis can be done with equity value and cash flow as the dependent variable. Further, it can be expanded to include other financial prices like interest rate, inflation rate, and oil price as independent variables. Thus, a firm interested in assessing the exposure of its cash flows to changes in exchange rate, interest rate, oil price, and inflation rate can run the following regression:

$$\begin{aligned} \Delta \text{ Cash flow}_t = & a + b \Delta \text{ Exchange rate}_t + c \Delta \text{ Interest rate}_t + \\ & d \Delta \text{ Oil price}_t + e \Delta \text{ Inflation rate}_t \end{aligned} \quad (40.2)$$

The coefficient of each of the independent variables (exchange rate, interest rate, and so on) reflects sensitivity of the firm's cash flow to that variable.

**Monte Carlo Simulation** Monte Carlo simulation is a process of deriving a simulated distribution of an output variable (like cash flow or firm value) by randomly combining values of input variables in repeated drawings. It involves the following steps:

- Step 1** Model the firm's value or cash flow as a function of macroeconomic variables (exchange rates, interest rates, inflation rate and so on).
- Step 2** Specify the probability distribution of each of the macroeconomic variables.
- Step 3** Select a value, at random, from the probability distributions of each of the macro-economic variables.
- Step 4** Determine the firm's value or cash flow corresponding to the randomly generated values of exogenous variables.
- Step 5** Repeat steps (3) and (4) a number of times to get a large number of values of the firm's value or cash flow so that the simulated distribution of firm's value or cash flow can be defined.

## 40.4 ■ PRINCIPLE OF HEDGING

As John Hull argues, a hedge is “a trade designed to reduce risk... goal of a hedging program is to reduce the risk, not to increase expected profits.” David K. Eitneman *et. al* define a hedge as “a contract (including forward foreign exchange) or tangible good that will rise in value and offset a drop in value of another contract or tangible good. Hedges are undertaken to reduce risk by protecting an owner from loss.” It must be emphasised that hedging is aimed at reducing risk, not saving cost or earning profit.

In [Chapter 9](#) we learnt how diversification across a number of securities reduces risk. The principle underlying hedging is different. Ideally, when you want to hedge you look at two investments that are perfectly correlated. Suppose you find that the returns of  $A$  and  $B$  are perfectly correlated. To hedge, you buy  $A$  and sell  $B$  or to do the other way. When you do so your net position is riskless. In real life, however, the correlation is often imperfect and, hence, despite the hedge some residual risk exists.

Irrespective of whether the correlation is perfect or not, the manner in which a hedge is set up is the same. Imagine that you have a liability  $P$ . You want to hedge this liability by purchasing  $Q$ . Your investment in  $Q$  depends on how  $P$  and  $Q$  are related. Suppose the following relationship exists:

$$\text{Expected change in the value of } P = a + \delta (\text{Change in the value of } Q) \quad (40.3)$$

where  $a$  is a constant and  $(\delta)$  delta, reflecting the sensitivity of  $P$  to changes in the value of  $Q$ , is the hedge ratio. If you buy delta units of  $Q$ , you minimise your risk on account of your liability  $P$ .

An illustration may be given. Suppose that a portfolio manager has short sold ₹ 10 million of Reliance stock. If the market moves up, the Reliance stock is likely to rise and the portfolio manager would incur a loss on his short sale. He can mitigate this risk by purchasing the market portfolio. (In practice, since one can't buy the market portfolio, one buys the stock index futures)<sup>1</sup>. To decide how much he should invest in market portfolio, he must assess the sensitivity of Reliance's stock prices to changes in the market index. Based on past evidence, he estimates the following regression relationship:

$$\begin{aligned} \text{Change in Reliance's stock price} &= a + \delta (\text{Change in the market index}) \\ &= 1.20 + 1.50 (\text{Change in the market index}) \end{aligned}$$

$R^2 = 0.55$ ; where  $R^2$  refers to the coefficient of multiple correlation

Note that the sensitivity factor (1.50) in the above equation is nothing but the beta of Reliance's stock. In order to minimise the risk of short sale, the portfolio manager must make an investment of  $1.50 \times 10$  million = ₹ 15 million in the market portfolio.

To what extent is the risk from the short sale eliminated by the investment in the market portfolio? Since  $R^2$  is 0.55 it means only 55 percent to the total variance in Reliance's stock price change is explained by the market movement. Put differently, 55 percent of its risk is market risk and 45 percent of its risk is unique risk. Thus, hedging with the market portfolio can offset only the market risk (55 percent) and not the unique risk (45 percent).

Note that the portfolio manager hedges a ₹ 10 million short position in Reliance by investing ₹ 15 million in the market portfolio. Even though he is protected against variations in the value of Reliance stock, the value of his short position in Reliance is not the same as that of his investment in the market portfolio. If he wishes to create a zero value hedge, he should borrow ₹ 5 million from the bank.

<i>Liability (₹)</i>	<i>Asset (₹)</i>
*PV (Reliance stock) 10 million	PV (Market portfolio) 15 million
PV (Bank loan) 5 million	

\*PV = Present Value

With the passage of time, the portfolio manager may find that the value of his assets and liabilities may diverge. For example, the market index may fall by 10 percent but Reliance's price may rise by 5 percent<sup>2</sup>. In such a case the investment in the market portfolio will be only 129 percent (₹ 13.5 million/10.5 million) of the short position in Reliance. So the portfolio manager's risk position is not minimised any more. In order to restore the hedge ratio to 1.5, he must invest ₹ 2.25 million in the market portfolio. Thus, the portfolio manager has to periodically buy or sell the market portfolio to maintain a given hedge ratio.

## 40.5 ■ HEDGING WITH FORWARD CONTRACTS

Forward contracts are perhaps the oldest and simplest tools for managing financial risk. A forward contract represents an agreement between two parties to exchange an asset for cash at a predetermined future date called the *settlement date* for a price that is specified today. For example, if you agree on January 1 to buy 100 bales of cotton on July 1 at a price of ₹ 800 per bale from a cotton dealer, you have entered into a forward contract with the cotton dealer. As per this contract, on July 1 you will have to pay ₹ 80,000 and the cotton dealer will have to supply 100 bales. According to this agreement, you have *bought* forward cotton or you are long forward cotton, whereas the cotton dealer has sold forward cotton or is short forward cotton. No money or cotton changes hand when the deal is signed. The forward contract only specifies the terms of a transaction that will occur in future.

Note that the terms “buy” and “sell” have a somewhat different meaning here. It is helpful to think in terms of a:

- *Short position* which commits the seller to deliver an item at the contracted price on maturity.
- *Long position* which commits the buyer to purchase an item at the contracted price on maturity.

The forward buyer is obliged to purchase the underlying asset at the contract price or enter into an offsetting transaction.

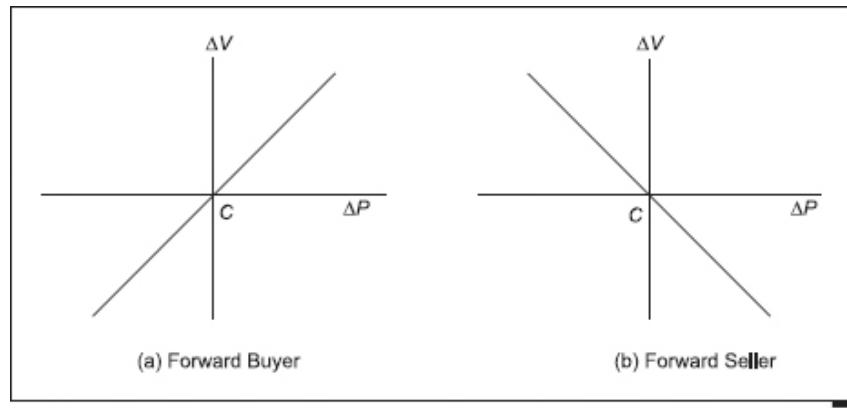
**The Payoff Profile** What are the payoffs to the forward buyer and forward seller? When the spot price in future exceeds the contract price, the forward buyer’s gain is: spot price- contract price.

If it is the other way, the forward buyer’s loss is: contract price-spot price. The payoff to the seller of a forward contract is the mirror image of the payoff to the buyer. The gain of the buyer is the loss of the seller and vice versa. The payoffs to the forward buyer and forward seller are shown in [Exhibit 40.1](#).

**Hedging with Forward Contracts** To illustrate how forward contracts can be used for hedging, let us consider the case of a power company that uses oil as fuel. Assuming that the tariff that this company can charge cannot be adjusted quickly, a sudden change in the price of oil is a source

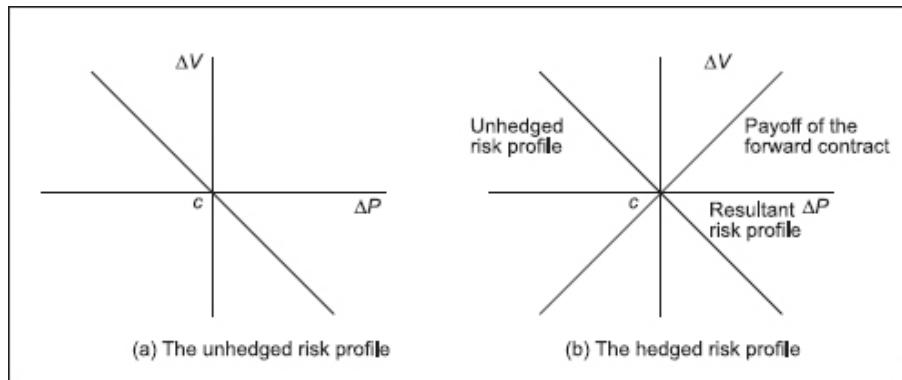
of risk. The risk profile for this company, an oil buyer, is depicted in Part (a) of [Exhibit 40.2](#).

### Exhibit 40.1 Payoff Profiles for a Forward Contract



What should this company do to cope with its oil price risk? It should buy a forward contract. If it does so, its exposure to unexpected changes in oil prices will be eliminated. The result is shown in Part (b) of [Exhibit 40.2](#).

### Exhibit 40.2 Hedging with a Forward Contract



**Forward Rate Agreement** Based on your financial plans, you know that you will need a six-month loan at the end of three months. If you are concerned about a rise in interest rate over the three-month period, you can fix the interest rate on the loan by purchasing a forward rate agreement (FRA) from a bank. An FRA is an agreement to borrow or lend at a predetermined future date at an interest rate that is specified now. For example, the bank may offer you a  $3 \times 9$  (3 months against 9 months) FRA at 8 percent on an amount of ₹ 10 million. At the end of the three months (called the settlement day), if the six-month interest rate happens to be say

8.5 percent per annum, the bank will pay you the present value of the extra interest that you would have to incur on a six month loan, on account of the increased interest, viz:  $[(0.085 - 0.080) \times 10,000,000 \times 6/12]/[1 + 0.085 \times 6/12] = ₹ 23,981$ . This payment would be made to you on the settlement day irrespective of whether you actually go for any loan or not. Of course, if the interest rate falls at the end of the three months, you will have to pay a certain amount to the bank.

## 40.6 ■ HEDGING WITH FUTURES CONTRACTS

A futures contract is a standardised forward contract. The key differences between forwards and futures are as follows:

- A forward contract is a tailor-made contract (the terms are negotiated between the buyer and seller) whereas a futures contract is a standardised contract (quantity, date, and delivery conditions are standardised).
- While there is no secondary market for forward contracts, futures contracts are traded on organised exchanges.
- Forward contracts usually end with deliveries, whereas futures contracts are mostly settled with the differences.
- Usually no collateral is required for a forward contract. In a futures contract, however, a margin is required.
- Forward contracts are settled on the maturity date whereas futures contracts are ‘marked to market’ on a daily basis. This means that profits and losses on futures contracts are settled daily.

The marking-to-market feature of futures contract, which is perhaps its most distinctive feature, may be illustrated with an example. Suppose on Monday morning you take a long position in a futures contract that matures on Friday afternoon. The agreed upon price is, say, ₹ 100. At the close of trading on Monday, the futures price rises to ₹ 105. The marking-to-market feature means that three things occur.

- First, you will receive a cash profit of ₹ 5.
- Second, the existing futures contract with a price of ₹ 100 is cancelled.
- Third, you will receive a new futures contract at ₹ 105.

The marking-to-market feature implies that the futures contracts are settled every day. Put differently, a futures contract is converted into a sequence of one-day forward contracts.

**Futures and the Exchanges Where They are Traded** Broadly there are two types of futures: commodity futures and financial futures. A commodity futures is a futures contract in a commodity like cocoa or aluminum; a financial futures is a futures contract in a financial instrument like treasury bill, currency, or stock index. [Exhibit 40.3](#) lists some illustrative

commodity futures and financial futures and the exchanges in India where they are traded. [Exhibit 40.4](#) lists some illustrative commodity futures and financial futures and the exchanges on which they are traded abroad.

### **Exhibit 40.3 Commodity Futures and Financial Futures in India**

<i>Commodity Futures</i>	<i>Exchange</i>	<i>Financial Futures</i>	<i>Exchange</i>
Aluminum	MCX, NCDEX	S&P BSE Sensex	BSE
Cashew	NCDEX	Nifty 50	NSE
Gold	MCX, NCDEX		
Coffee	NMCE, NCDEX		
Sugar	MCX, NCDEX, NMCE		
MCX:	Multi Commodity Exchange of India Limited		
NCDEX:	National Commodity and Derivatives Exchange Limited		
NMCE:	National Multi-Commodity Exchange of India Limited		
BSE:	Mumbai Stock Exchange		
NSE:	National Stock Exchange		

### **Exhibit 40.4 Commodity Futures and Financial Futures Abroad**

<i>Commodity Futures</i>	<i>Exchange</i>	<i>Financial Futures</i>	<i>Exchange</i>
Cocoa	CSCE, FOX	U S Treasury bills	IMM, MCE
Cotton	CTN	Eurodollar deposits	IMM, LIFFE
Aluminum	COMEX, LME	Standard & Poor's	
Gold	LME	(S&P) Index	IMM
Crude oil	IPE, NYMEX	Sterling	IMM, LIFFE, MCE
Soyabean oil	CBT		Phil SE
CSCE	Coffee, Sugar and Cocoa Exchange, New York		
FOX	London Futures and Options Exchange		
CTN	New York Cotton Exchange		
COMEX	Commodity Exchange, New York		
LME	London Metal Exchange		
IPE	International Petroleum Exchange of London		
NYMEX	New York Mercantile Exchange		
CBT	Chicago Board of Trade		
IMM	International Monetary Market (at the Chicago Mercantile Exchange)		
LIFFE	London International Financial Futures Exchange		
MCE	Mid America Commodity Exchange		
Phil SE	Philadelphia stock Exchange		

**Spot and Futures Prices: Financial Instruments** When you buy a security, you have a choice. You can buy it in the spot market and get immediate delivery or you can buy it in the futures market and obtain deferred delivery. If you buy in the spot market, you make payment now and

you are entitled to the benefits of ownership (like dividend and interest) from now onwards. If you buy in the futures market, you make payment at a specified time (designated as  $t$ ) in future and, hence, get the benefits of ownership from that point of time onwards.

These differences between purchases in the spot market and futures market suggest the following relationship between the spot and futures prices

$$\frac{\text{Futures price}}{(1 + \text{Risk-free rate of interest})^t} = \frac{\text{Spot price} - \text{Present value of interest or dividend payments foregone}}{\text{dividend payments foregone}}$$

The above formula may be illustrated with the help of an example. The stock index currently is 2,000 and six months stock index futures is trading at 2,110. The risk-free annual interest rate  $r_f$  is 14.5 percent and the average annual dividend yield on the stocks in the index is 3 percent. Is there consistency among these numbers?

Suppose you buy the six month stock index futures contract for 2,110. In order to meet your obligation, you set aside an amount equal to:

$$\frac{\text{Futures price}}{(1+r_f)^2} = \frac{2110}{(1.145)^{0.5}} = \frac{2110}{(1.07)} = 1,972$$

Your payoff from this investment would be what you get by buying the stock index in the spot market, except the dividend on it for the next six months. Assuming that the dividend return for six months will be 1.5 percent, receivable at the end of the six month period, the payoff will be:

$$\text{Spot price} - \frac{\text{Present value of dividend}}{\text{of dividend}} = 2000 - \frac{2000(0.015)}{(1.07)} = 1,972$$

Thus an investment of 1972 gives a payoff of 1972. Hence, the numbers are internally consistent.

**Spot and Futures Prices: Commodities** If you buy a commodity in the futures market, rather than in the spot market, you gain on two counts: (i) You can earn interest on your money, as your payment is deferred. (ii) You save on storage, insurance, and wastage costs as you don't have to store the commodity. As against these advantages, you have to forego the convenience of having the commodity readily on hand. For example, if you run out of your inventory of aluminium you can't replace it with aluminium futures.

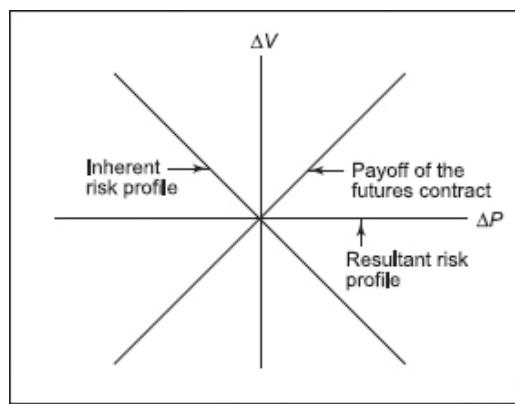
Given the above advantages and disadvantages, one would expect the following relationship to hold for commodities

$$\frac{\text{Futures price}}{(1+r_f)^t} = \text{Spot price} + \frac{\text{Present value of storage costs}}{\text{convenience yield}}$$

**Futures and Hedging** Suppose a coffee plantation firm expects a harvest of 1,000 tons of coffee three months from now. If the uncertainty about the future price bothers it, it can sell a futures contract for 1,000 tons. Such a simple hedge eliminates the risk of price fluctuation. [Exhibit 40.5](#) shows how the futures contract neutralises the inherent risk associated with price volatility.

The type of futures contract a firm wants may not be available. For example, a soyabean oil producer may not be able to get soyabean oil futures contracts. In such a case, it may have to make do with some surrogate. It may perhaps substitute groundnut oil futures for soyabean oil futures if the soyabean oil and groundnut oil prices tend to move in unison. Such a substitution is referred to as a **cross-hedge**.

### Exhibit 40.5 | Hedging with Futures



When a firm resorts to cross-hedging it must take into account how the relative prices move. In the above case, for example, it should know the relationship between the movements of the soyabean oil prices and groundnut oil prices. Suppose it finds that the following regression relationship holds.

Percent change in soyabean oil price = 0.9 (Percent change in groundnut oil price)

According to this relationship, a 1 percent change in the price of soyabean oil leads to an 0.9 percent change in the price of groundnut. Hence, the soyabean oil producer must sell 0.9 units of groundnut oil futures for every unit of soyabean oil to be sold.

Thanks to their unique contractual features, futures provide several advantages over other hedging devices: (i) There is no need for an initial cash flow, but for the margin amount which is a type of security deposit. (ii) It is easy to take a short position in futures as it is to take a long position. (iii) It is easy to close a futures contract by on offsetting trade. (iv) The wide range of commodities and financial instruments on which futures contract are available exceeds anything available in other markets.

## 40.7 ■ HEDGING WITH SWAPS

A swap contract is an agreement between two parties to exchange one set of cash flows for another. In essence it is a portfolio of forward contracts. While a forward contract involves one exchange at a specific future date, a swap contract entails multiple exchanges over a period of time.

In principle, a swap contract can be tailored to exchange just about anything. In practice, interest rate swaps and currency swaps are the most popular.

**Interest Rate Swaps** An *interest rate swap* is a transaction involving an exchange of one stream of interest obligations for another. Typically, it results in an exchange of fixed rate interest payments for floating rate interest payments. Occasionally, it involves an exchange of one stream of floating rate interest payments for another.

The principal features of an interest rate swap are:

- It effectively translates a floating rate borrowing into a fixed rate borrowing and vice versa. The net interest differential is paid or received, as the case may be.
- There is no exchange of principal repayment obligations.
- It is structured as a separate contract distinct from the underlying loan agreement.
- It is applicable to new as well as existing borrowings.
- It is treated as an off-the-balance sheet transaction.

To illustrate the cash flows of a swap, consider an example. Metachem has a 7 year floating rate loan of \$100 million dollars, carrying an interest rate of LIBOR plus 100 basis points. The principal amount is repayable in a lumpsum at the end of 7 years. The firm wants to convert its variable rate obligation into a fixed rate obligation. One way to do this is to borrow \$100 million on a fixed rate basis and use the proceeds to retire the existing variable rate loan. Although feasible, this option tends to be expensive as it entails underwriting a new loan and repurchasing the existing loan. A less expensive option would be to do an interest rate swap that converts the variable rate obligation into a fixed rate obligation.

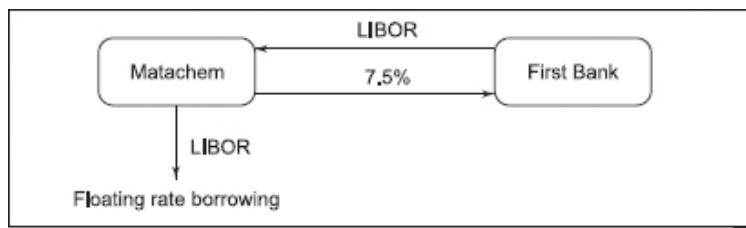
Given Metachem's credit rating, First Bank is ready to do a swap in which Metachem would pay a fixed rate of 7.5 percent in return for LIBOR plus 100 percent. [Exhibit 40.6](#) shows the cash flows associated with this

swap. In this exhibit, we have assumed that LIBOR starts at 5.5 percent, rises for four years at the rate of 0.5 percent per year and then drops by 0.5 percent per year for the remaining two years.

### Exhibit 40.6 Floating to Fixed Swap

Year	1	2	3	4	5	6	7
A. Original loan							
LIBOR floating	- 6.5	- 7.0	- 7.5	- 8.0	- 8.5	- 8.0	- 107.5
B. Swap							
LIBOR floating	6.5	7.0	7.5	8.0	8.5	8.0	7.5
Fixed	- 7.5	- 7.5	- 7.5	- 7.5	- 7.5	- 7.5	- 7.5
Net cash flow from swap	- 1.0	- 0.5	0	0.5	1.0	0.5	0
C. Net payment	- 7.5	- 7.5	- 7.5	- 7.5	- 7.5	- 7.5	- 107.5

Diagrammatically, the above swap is shown below:



**Principal Only Swaps** A *principal only swap* is an exchange of principal between two currencies. For example, a corporate having a fixed rate liability in the US \$ (or INR) and holding the view that the USD (or INR) would appreciate against the INR (or USD) in future, may want to pay a fixed amount of INR (or USD) and receive a fixed amount of USD (INR). For example, the Indian Railway Finance Corporation (IRFC) did a ‘principal only’ swap with banks. IRFC replaced an USD 80 million eurocurrency borrowing with Indian currency from banks. Under this swap banks would pay USD 80 million to IRFC in 5 equal annual installments of USD 16 million each and in return IRFC would pay banks the rupee equivalent in installments at a predetermined conversion rate.

**Currency Swaps** In a *currency swap* both the principal and interest in one currency are swapped for principal and interest in another currency. On maturity the principal amounts are swapped back. Thus, a currency swap involves (i) an exchange of principal amounts today, (ii) an exchange of interest payments during the currency of the loans, and (iii) a re-exchange of principal amounts at the time of maturity.

Let us look at an example of a currency swap. Hitech Company needs 100 million British pounds for five years to finance its British operations. The pound interest rate is 4 percent whereas the dollar rate is 5 percent. Because Hitech is listed in NASDAQ it is better known in the US. So, the financial manager of Hitech raises USD 120 million (which is worth GBP 100 million) by issuing five-year 5 percent notes in the US and then it does a currency swap with a counterparty (a swap bank). As a result, Hitech's cash flows are as follows:

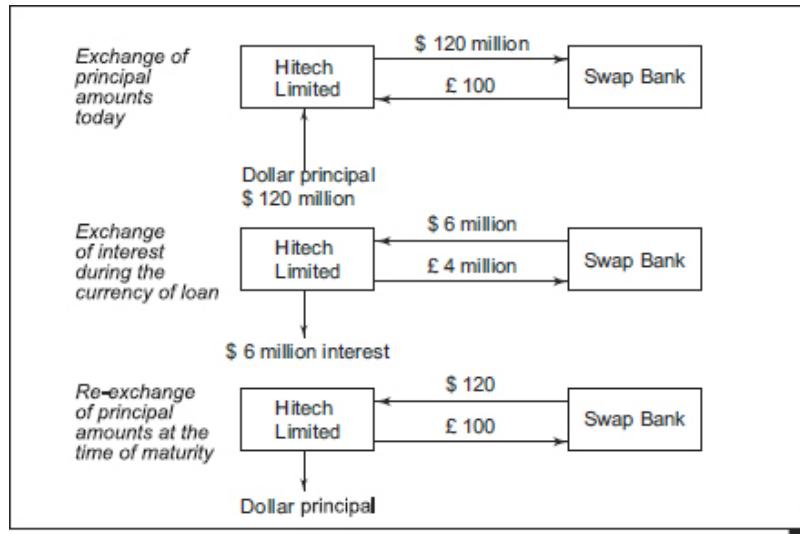
	Year 0		Years 1 – 4		Year 5	
	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds
1. Raise dollar loan	+ 120		- 6.0		- 126	
2. Swap dollars for pounds	- 120	+ 100	+ 6.0	- 4.0	+ 126	- 104
3. Net cash flow	0	+ 100		- 4.0		- 104

In year 0, Hitech issues dollar notes and receives \$120 million which it exchanges with the swap counterparty for £100 million. In years 1 through 4, Hitech receives \$6 million annually from the swap counterparty and uses the same to pay interest on its dollar loan; in return it pays the swap counterparty £4 million. Finally, in year 5 Hitech receives \$126 million from the swap counterparty which it uses to make the final interest payment and repay the principal amount of its dollar loan; in return Hitech pays £104 million to the counterparty. Diagrammatically this swap is shown in [Exhibit 40.7](#).

**Credit Default Swaps** A *credit default swap* is a credit derivative that can be used to protect against default risk. This is how it works. Bank *P* agrees to pay a fixed amount annually to bank *Q*, as long as *A*, a borrower of bank *P*, does not default. In return, bank *Q* promises to compensate bank *P*, should *A* default. In essence, bank *P* is buying long-term insurance from bank *Q* against default risk by paying an insurance premium every year.

In principle, a bank that has a portfolio of loans can enter into a default swap of each loan separately. In practice, it would be simpler for it to do a portfolio debt swap that protects its entire portfolio from default risk.

## Exhibit 40.7 | Currency Swap



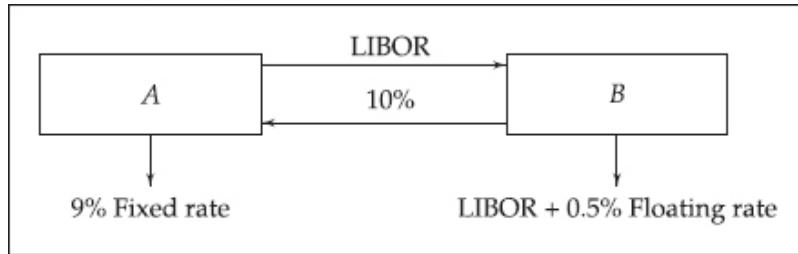
**Reason for Swaps** Financial swaps may be induced by the following factors:

- Spread compression
- Market segmentation
- Market saturation
- Difference in financial norms

**Spread Compression** When there is a variation in the spreads of interest rates applicable to two parties in different markets, there is an opportunity for a mutually advantageous financial swap. As an illustration, consider the following rates at which *A* (a party with superior credit rating) and *B* (a party with inferior credit rating) can borrow in the fixed rate and floating rate markets:

	<i>Fixed Rate</i>	<i>Floating Rate</i>
<i>A</i>	9%	LIBOR
<i>B</i>	11%	LIBOR + 0.5%

*A* is interested in borrowing on a floating rate basis, whereas *B* is interested in borrowing on a fixed rate basis. If *A* borrows in the floating rate market, it pays LIBOR rate; likewise if *B* borrows in the fixed rate market it pays 11%. *A* and *B*, however, can reduce their respective costs if *A* borrows in the fixed rate market, *B* borrows in the floating rate market, and the two make a swap deal say as shown below:



The net costs to *A* and *B* as a result of the above arrangement are as follows:

$$\begin{aligned} A: \text{LIBOR} + 9\% - 10\% &= \text{LIBOR} - 1\% \\ B: \text{LIBOR} + 0.5\% + 10\% - \text{LIBOR} &= 10.5\% \end{aligned}$$

It may be noted that an arrangement of this kind brings about a combined saving of 1.5 percent (*A* saves 1 percent and *B* saves 0.5 percent) which represents the difference in spreads in the two markets. (In the fixed rate market, the spread is 2 percent, whereas in the floating rate market, the spread is 0.5 percent.) In practice, however, the swap is usually intermediated by a bank which takes away a portion of the saving, leaving the balance to be shared by the two parties.

A question that naturally arises in this context is: Why do spreads in different market tend to vary? Perhaps the most common reason is that credit evaluation and risk compensation norms vary across financial markets. In the US, for example, credit evaluation is based mainly on the credit rating provided by independent credit rating agencies and a BBB rated firm may have to pay 2 percent more in interest than a AAA rated firm. In Europe, on the other hand, the name of the firm (based on the reputation of its product, general public image, etc.) is perhaps as important as its credit rating. Further, the European market is not very sensitive to fine gradations in credit ratings.

**Market Segmentation** Due to regulations, capital markets may be segmented. As a result, opportunities for swapping arise. For example, the amount of non-yen bonds that can be held by Japanese pension funds is restricted to a very small portion of their portfolio. Borrowers in the US find it advantageous to issue zero coupon yen bonds (tax regulations in Japan make zero coupon bonds very attractive) and swap them into dollars.

**Market Saturation** An issuer may find that a particular capital market, saturated with its (issuer's) debt, is unwilling to absorb any more. In such a situation, a proxy borrower may be used along with a swap transaction. For example, in 1981, the Swiss market, saturated with World Bank debt, was

unwilling to absorb any more. The World Bank, however, could borrow in the US market on attractive terms. With the help of IBM, which was quite acceptable in the Swiss market, the problem was solved. IBM borrowed in the Swiss market, World Bank borrowed in the US market, and IBM and World Bank swapped their debts.

**Differences in Financial Norms** Differing debt equity norms across various capital markets may induce swap transactions. For example, liberal debt equity ratios are permitted in Japan, but not in the US. As a result, a highly levered Japanese firm, interested in dollar financing, may not have direct access to the US capital market. In order to obtain dollar financing, such a firm may obtain a yen loan and swap it with a dollar loan.

**Swap Dealers** Unlike futures contracts, swap contracts are not standardised contracts that are traded on an organised exchange. Hence, a firm interested in a swap agreement typically contacts a swap dealer—commercial banks are the dominant swap dealers—to take the other side of the swap agreement. The swap dealer in turn will try to enter into an offsetting transaction with some other party or dealer. Otherwise, the swap dealer may cover its exposure using futures contracts.

## 40.8 ■ HEDGING WITH OPTION CONTRACTS

An option contract is an agreement under which the seller (or writer) of the option grants the buyer (or holder) the right, but not the obligation, to buy or sell (depending on whether it is a call option or a put option) some asset at a predetermined price during a specified period. Clearly, the buyer (or holder) of an option has to pay a premium to enjoy the right.

Thus, there are two key differences between a forward contract and an option contract:

- In a forward contract both parties are obligated to transact in future. In an option contract the transaction occurs only if the buyer (or holder) of the option chooses to exercise it.
- When a forward contract is created no money changes hand. On the other hand, when an option contract is created, the buyer of the option contract pays *option premium* to the seller of the option.

We discussed stock options in [Chapter 10](#). Here we will review the payoffs profiles of options and discuss how options are used for hedging.

**Option Payoffs Profiles** [Exhibit 40.8](#) depicts the payoffs profiles for call and put options. The horizontal axis shows the difference between the value of the asset and the exercise price of the option; the vertical axis shows the payoffs from the options. Part A of [Exhibit 40.8](#) shows the payoff profile of a call option from the buyer's point of view; Part B of [Exhibit 40.8](#) shows the payoffs profile of call option from the seller's point of view. Since a call option is a zero-sum game, the seller's payoffs profile is exactly the mirror image of the buyer's.

Part C of [Exhibit 40.8](#) shows the payoff profile for the buyer of a put option. Remember that a put option gives its buyer the right to sell an asset at the strike price. Hence if the value of the asset falls below the strike price the buyer profits because the seller of the put option is obliged to pay the strike price. Part D of [Exhibit 40.8](#) shows the payoff profile for the seller of a put option.

**Hedging with Options** Suppose that a firm has a risk profile of the kind shown in Part A of [Exhibit 40.9](#). What should it do if it wishes to use options to hedge against adverse price movements? Looking at the payoffs

in [Exhibit 40.8](#) it appears that buying a put option suits this firm. If it does do, its net exposure changes as shown in Part B of [Exhibit 40.9](#).

By buying the put option the firm eliminates the “downside” risk while retaining the “upside” potential. Put differently, the put option serves like an insurance policy. Of course, like any insurance it costs money because the firm has to pay the option premium.

**Options in Debt Contracts: Caps and Floors** Consider a firm that is negotiating a long-term floating rate loan. The attraction of such a loan is that it carries an interest rate that is lower than that on a fixed rate loan. The risk is that the interest rate can rise sharply, thereby raising the debt-servicing burden.

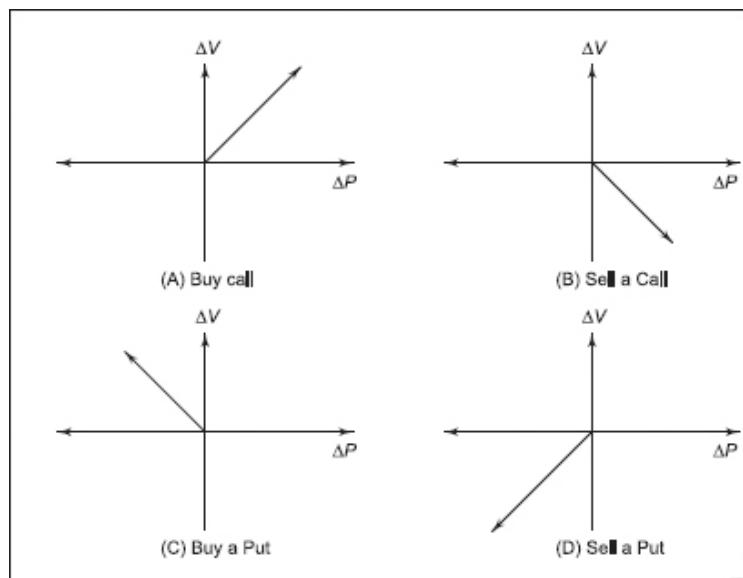
One way to solve this problem is to incorporate an interest rate cap in the debt contract. For example, the debt contract may set the floating rate equal to the current T-bill yield subject to a ceiling of 15 percent. Of course, such protection is not costless. The borrower who seeks the shield of an interest rate cap has to pay a higher interest rate. For example, a floating rate loan with a 15 percent cap may have a current rate of 12 percent, whereas a floating rate loan with no cap may have a current interest rate of 11 percent.

If the protection offered by the cap appears expensive, the borrower can reduce the cost of capped floating rate loan by accepting a floor rate, irrespective of how low the benchmark rate falls. For example, the borrower may agree to a floor rate of 10 percent, regardless of what happens to the Treasury bill rate. Accepting an interest rate floor (the floor rate) is often a low cost method for reducing the risk of floating rate borrowing. In essence, the borrower sacrifices the potential gain from a large drop in the benchmark rate to seek insurance in the form of a cap. [Exhibit 40.10](#) shows how caps and floors influence the cost of floating rate borrowings.

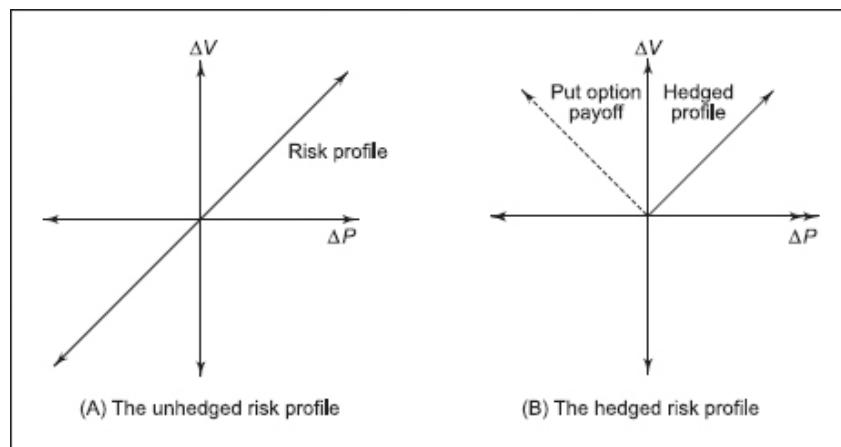
## 40.9 ■ HEDGING WITH INSURANCE

Most business firms buy insurance against a variety of risks: the risk of plant destruction in a fire, the risk of liabilities arising from legal suits, the risk of losing key persons, and so on.

### Exhibit 40.8 Payoff Profiles for Call and Put Options



### Exhibit 40.9 Hedging with Options



## Exhibit 40.10 | Floating Rate Borrowing With Caps and Floors

■ Floating rate loan	LIBOR + 1%
■ Floating rate loan with an interest cap of 10%	LIBOR + 1.5%
■ Floating rate loan with an interest cap of 10% and an interest floor of 6%	LIBOR + 1.25%

When a firm buys insurance, it pays premium to shift the risk to the insurance company. Is it worthwhile to do so? The answer depends on how the advantages offered by the insurance company compare with the disadvantages suffered by it. The main advantages offered by an insurance company are:

- It can price risks reasonably accurately as it has considerable experience in insuring similar risks.
- It can provide low-cost claims administration service, thanks to specialisation and economies of scale.
- It has expertise in providing advice on measures to reduce risks and may lower premia to clients that follow its advice.
- It can pool risks by holding a large, diversified pool of assets.

As against the above advantages, an insurance company may suffer from the following disadvantages which can increase the cost of insurance.

- Like any other business, an insurance company incurs administrative costs.
- It faces the problem of **adverse selection**. If *a priori* the insurance company cannot distinguish between 'good' and 'bad' risks, its portfolio is likely to be dominated by 'bad' risks. After all, a 'bad' risk firm has a greater incentive to buy insurance.
- It is exposed to the problem of **moral hazard**. This is the risk that the insured parties, comforted by the insurance cover, tend to behave negligently. Isn't it true that if you have a comprehensive insurance policy for your car you become somewhat careless in driving.

When the above costs are small, the '**loading fee**' which represents the difference between the insurance premium and the expected payoff from insurance is negligible and it may be worthwhile to insure. On the other hand, when these costs are large, insurance may be a costly way to shed risk.

Most large companies self-insure against routine risks but seek insurance against large potential losses. Departing from this conventional

wisdom, British Petroleum insured against routine risks, but not against large risks. Its rationale for doing so was that routine risks are competitively priced whereas large nonroutine risks are not. It believed that the stock market, compared to the insurance industry, was more efficient in absorbing large, low-probability risks. For many years, British Petroleum's strategy was hailed by many as innovative and sensible. But, in the wake of the huge losses incurred by British Petroleum on account of oil spillage in 2010, its strategy may be considered questionable.

## 40.10 ■ RISK MANAGEMENT PRACTICES

### Risk Management in the US

Several surveys have been conducted in the US to find out how important risk management is, what firms are doing with regard to risk management, and what are the perceived bottlenecks in this area. Broadly, these surveys suggest the following:

- Managing risk is considered important; it comes next only to minimising borrowing costs and maintaining/improving the firm's credit. However, formal statements of risk management policy are rare.
- Firms often reduce some exposure, leaving others unhedged. The principal emphasis is on hedging transaction exposures.
- While banks and financial institutions use gap analysis and duration analysis, non-financial companies commonly use simulation analysis.
- The most widely used instrument is the foreign exchange forward contract. Futures contract are used mainly by companies where the treasury is run as a profit centre.
- In general, forwards and swaps are preferred over futures and options. This suggests a preference for risk hedging through the banking system rather than the capital market, as well as a preference for risk-hedging instruments that meet specific needs of the hedging company over standard hedging tools.
- Companies which do not manage risk cite lack of knowledge and understanding, non- availability of suitable instruments, and resistance by senior management as the principal reasons.

## **OTC Derivatives in India**

The RBI, the primary regulator of the OTC derivatives market in India, allows various OTC derivatives to be used by market participants for hedging risks. Presently, the following OTC derivatives are permitted in India:

*Rupee Interest Rate Derivatives* Interest rate swaps (IRS) and forward rate agreements (FRAs).

*Foreign Currency Derivatives* Foreign currency spot-forward swaps (FX swaps), cross currency swaps, and currency options

*Credit Default Swaps* Credit default swaps (CDS) on single name corporate bonds.

While certain eligible entities can do market making in IRS contracts, corporates can do IRS contracts only for hedging. Foreign currency spot-forward swaps (FX swaps) are the most actively traded OTC derivatives. More than 90 percent of the FX swaps are executed in USD-INR pair.

## Treasury and Risk Management in India

A recent survey of corporate treasury management practices in India, conducted by Ernst and Young, revealed the following:

- While forwards and currency swaps are the most commonly used tools for managing forex exposure, many companies are using more exotic instruments as well.
- The horizon for hedging forex exposure is typically less than 3 years, with most firms having a hedging horizon of 1 year.
- Value at Risk (VAR), globally the most popular measure of risk, is used by about one-quarter of the respondents and that too mainly for measuring forex and interest rate risk. 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 percent, it means that there is only a 5 percent probability that the loss in portfolio value will exceed ₹ 10 million.
- Not many companies have a well articulated hedging policy that specifies permissible instruments, acceptable hedge ratios, and maximum tenors.
- Generally, companies invest surplus funds in money market mutual funds with an investment horizon of less than six months.
- Except in the petroleum and non-ferrous metal industries, commodity price risk management is not commonly practiced. Companies prefer to use exchange traded futures and fixed-floating price swaps to hedge commodity price risk. Typically, the hedge horizon is less than 12 months.
- About 90 percent of the companies had a debt-equity ratio of less than 1 and 67 percent of the companies had an average debt maturity of less than 5 years.

The study suggests the following measures for improving treasury management in Indian companies.

- In managing forex risks, companies should develop a robust procedure for recognising exposure and demonstrating the links between hedges and exposures.
- Since investible surpluses with companies have increased substantially, more thought has to be given to the choice of

investment avenues, the horizon for investment decisions, and the strategy for investment allocation.

- The financial supply chain should be restructured to optimise float.
- More companies should resort to commodity price risk management.

The study concludes by saying: "While in the earlier part of the decade, treasuries were expected to display efficiency through negotiations and execution of sacrosanct strategies, corporate treasuries today are required to develop meaningful strategies that are consistent with the overall risk philosophy and risk appetite of the organisation."

## 40.11 ■ GUIDELINES FOR RISK MANAGEMENT

In today's world, managing corporate risks is a daunting task. In coping with this challenge the following inter-related guidelines need to be borne in mind.

- Align risk management with corporate strategy
- Proactively manage uncertainties
- Employ a mix of real and financial methods
- Know the limits of risk management tools
- Don't put undue pressure on corporate treasuries to generate profits

**Align Risk Management with Corporate Strategy** Corporate value is created primarily by making good investments (positive NPV investments). Hence, the over-riding objective of risk management is to ensure that the company has the cash to support value enhancing investments. As external financing is often costly, the risk management strategy of the firm should seek to align the internal generation of funds to the demand for funds.

**Proactively Manage Uncertainties** Uncertainties—changing prices, shifting consumer behaviour, unpredictable competitive reactions, fluctuating interest rates—are inherent in business. Once uncertainties are identified and understood they may be proactively managed and even controlled by employing appropriate strategies.

The key guidelines to be followed in proactively managing uncertainty are as follows:

- If you are confronted with a high level of uncertainty and if you are employing a low degree of flexibility, you are in a threatening situation. To escape such a situation, you need to employ greater flexibility.
- If you are confronted with a low level of uncertainty and if you are employing a high degree of flexibility, you have wasteful flexibility. You may shed unnecessary flexibility and pursue a focused strategy.

**Employ a Mix of Real and Financial Tools** Risk management methods may be divided into two categories as shown as follows:

*Financial Methods*

*Real Methods*

- Restriction of debt-equity ratios
- Futures and forward contracts
- Options
- Swaps
- Financing instruments like convertible debentures and commodity bonds
- Insurance
- Loss prevention
- Joint ventures
- Avoidance of high risk projects
- Reduction of the degree of operating leverage

A firm must carefully look at various risk management methods and select a judicious mix of the same. The objective of such a selection is to achieve a given risk management reduction objective at a minimal cost. It appears that the financial methods often cost less than the real methods, wherever there is scope for mutual substitution.

**Know the Limits of Risk Management** Although immensely useful, financial risk management tools have their own shortcomings which are briefly described below:

- The transaction costs, such as commissions and bid-ask spreads, associated with risk management products may be high, deterring a potential user from employing them.
- Standardised risk management products often do not exactly match the underlying exposure. Hence, complete hedging may not be possible.
- Risk management products are not completely devoid of credit risk, what to talk of political or economic risk.
- In a financial crisis or in a volatile environment, derivatives markets may not work in an orderly fashion. Further, if liquidity dries up, it may be virtually impossible to implement a risk management strategy.

**Do not Put Undue Pressure on Corporate Treasuries to Generate Profits** Despite substantial evidence in favour of efficient market hypothesis, the world is full of managers who are convinced that they have the ability to forecast interest rates, exchange rates, commodity prices, and stock prices. Based on this belief companies often treat their treasuries as profit centres, thereby subtly prodding treasurers to speculate in financial markets. However, many companies where treasuries have

resorted to speculation under an expectation to produce profits have suffered grievous losses. Some of the conspicuous examples of recent times are Procter & Gamble, Orange County, and Metallgesellschaft. Experiences of such companies suggest that it makes little sense to put pressure on corporate treasuries to generate profit by taking bets on the movements of financial prices.

It is advisable not to view treasury as an active profit centre. If at all currency trading is regarded as a profit centre, use rigorous transfer pricing to “ring fence” the operations of the company from the effect of currency trading. Further, maintain sound and effective controls.

**Properly Document the Risk Management Policy** A properly articulated policy for managing price risks is an integral component of a firm’s internal control system. It should clearly address the following issues: Should the treasury be regarded as a profit centre or cost centre? What instruments may be used and what limits should apply to them? How should the performance of treasury be evaluated?

Without proper policies, parameters, and performance norms, managers will tend to confuse hopes with expectations and behave irrationally. Regrets will stem from “what might have been.” *Remember the principle that the less we articulate our expectations, the more likely we are to be disappointed.*

### Derivatives and Speculative Losses

Many companies have incurred huge losses on account of speculation in derivatives. Here are some conspicuous examples.

- Metallgesellschaft, a German metals and oil trading company, suffered a loss of about \$1.3 billion from oil futures.
- Showa Shell, a Japanese company, incurred a loss of \$1.5 billion from foreign exchange futures.
- Baring Brothers, a hoary British merchant bank, collapsed when a rogue trader in its Singapore office took huge positions in the Nikkei index futures leading to a loss of \$1.4 billion.

Corporates can draw two lessons from the various tales of disasters caused by derivatives. First, senior managers should regularly monitor the risk associated with the derivatives positions taken by the firm. Second, the firm should speculate on derivatives only when it has some comparative advantage in doing so. Otherwise, derivatives should be used only for hedging, not for speculation.

## SUMMARY

- Although **unsystematic risk** may have no bearing on the required rate of return in the financial market, **unmanaged unsystematic risk** may lower the expected cash flow in the DCF model.
- A firm with a **high total risk exposure** is likely to face financial difficulties which tend to have a disruptive effect on the operating side of the business.
- To assess and measure a firm's risk exposure to financial risks you examine financial statements, assess the sensitivity of the firm's value or cash flow to changes in financial prices, and conduct Monte Carlo simulation.
- Ideally, when you want to hedge, you look at two investments that are perfectly correlated.
- Forwards, futures, swaps, and options are the important financial methods of risk management.
- A **forward contract** is an agreement between two parties to exchange an asset for cash at a pre-determined future date for a price specified today. A **futures contract** is a standardised forward contract. Broadly there are two types of futures: **commodity futures** and **financial futures**.
- The relationship between the spot and futures prices for financial instruments is as follows:

$$\frac{\text{Futures price}}{[1+r_f]^t} = \frac{\text{Spot price}}{\text{Present value of interest and dividend payments foregone}}$$

- A **swap** involves an exchange of one set of financial obligations with another. An **interest rate swap** is a transaction involving an exchange of one stream of interest obligations for another. In a **currency swap**, both the principal and interest in one currency are swapped for principal and interest in another currency.
- Swaps may be induced by **spread compression**, **market segmentation**, **market saturation**, and **differences in financial norms**.
- An **option** is a right to buy or sell some asset at a predetermined price during a specified period.
- Most firms buy **insurance** against a variety of risks.
- Risk management products have been developed to cope with increased volatility in exchange rates, interest rates, oil prices, and metal prices.
- In today's world, managing corporate risks is a daunting task. In coping with this challenge the following guidelines should be borne in mind: align risk management with corporate strategy; proactively manage uncertainties; employ a mix of real and financial methods; know the limits of risk management tools; and don't put undue pressure on corporate treasuries to generate profits.

## QUESTIONS

1. Why does total risk matter?
2. What information can you get about a firm's financial price risk by perusing its financial statements?
3. How would you measure the sensitivity of firm value or cash flow to financial prices?
4. What steps are involved in Monte Carlo simulation?
5. Explain the principle of hedging with a suitable example.
6. Show how a forward contract can be used for hedging.
7. What are the key differences between forwards and futures?
8. Explain the 'marking-to-market' feature with an example.
9. Describe the major types of futures contracts.
10. What relationship can be expected between the spot and futures prices of financial instruments? of commodities?
11. What are the principal features of an interest rate swap?
12. What is a currency swap?
13. Discuss the factors that have induced financial swaps?
14. Show graphically how the put option provides protection against downside risk while preserving the upside potential.
15. Explain the functions of caps and floors in debt contracts.
16. Describe the major types of option contracts.
17. What are the advantages and disadvantages of buying insurance?
18. How have risk management tools evolved in response to volatility of financial prices?
19. Discuss briefly the findings of surveys on risk management.
20. Discuss the guidelines for risk management.
21. What are the limitations of financial risk management tools?

## SOLVED PROBLEMS

40.1 Price changes of two software stocks,  $X$  and  $Y$ , are positively correlated. The historical relationship has been as follows:

Percentage change in  $X = 0.02 + 0.80$  (Percentage change in  $Y$ )

- (a) If an investor owns ₹ 2 million of  $X$ , how much of  $Y$  should he short sell to minimise his risk?
- (b) What is his hedge ratio?
- (c) How should he create a zero value hedge?

*Solution*

- (a) The investor must short sell ₹ 2.5 million  
(₹ 2 million/0.80) of  $Y$
- (b) His hedge ratio is 0.8

- (c) To create a zero value hedge he must deposit ₹ 0.5 million in a bank.
- 40.2 The stock index is currently at 1400 and the six-months stock index futures is trading at 1500. The risk-free annual rate is 11 percent. What is the average annual dividend yield on the stocks in the index?

*Solution*

$$\frac{\text{Futures price}}{(1 + \text{Risk-free rate})^T} = \text{Spot price} - \frac{\text{Spot price} \times \text{Dividend yield}}{(1 + \text{Risk-free rate})^T}$$

$$\frac{1500}{(1.11)^{1/2}} = 1400 - \frac{1400 \times \text{Dividend yield}}{(1.11)^{1/2}}$$

Hence the dividend yield is 0.038 or 3.8 percent.

- 40.3 The following information is available for steel scrap:

- Spot price : ₹ 4500 per ton
- Futures price : ₹ 5000 for a one year contract
- Risk-free interest rate : 12 percent
- PV (storage cost) : ₹ 2.00

What is the PV (convenience yield) of steel scrap?

*Solution*

$$\frac{\text{Futures price}}{(1+r_f)} = \text{Spot price} + \text{Present value of storage} - \text{Present value of convenience yield}$$

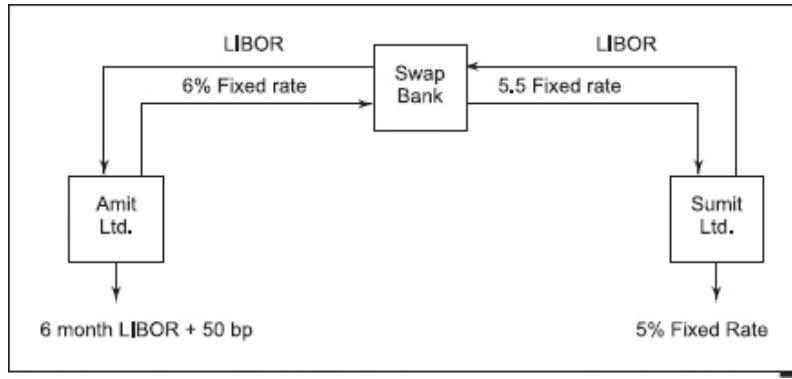
$$\frac{5000}{(1.12)} = 4500 + 200 - \text{Present value of convenience yield}$$

Hence the present value of convenience yield is ₹ 235.7 per ton.

- 40.4 Consider the following data:

	Amit Ltd.	Sumit Ltd
■ Desired Funding	Fixed Rate \$ 50 million	Floating Rate \$ 50 million
■ Cost of Fixed Rate Funding	7.0%	5.0%
■ Cost of Floating Rate Funding	6-month LIBOR + 50bp	6 month LIBOR

Show how both the parties can save on funding cost by entering into an interest rate swap with the help of a swap bank. Assume that the bank wishes to earn 0.5% and the balance of savings is shared equally between the two firms.



## PROBLEMS

**40.1 Hedging** Price changes of two chemical stocks, *A* and *B*, are positively correlated. The historical relationship is as follows:

$$\text{Average percentage change in } A = 0.01 + 0.70 \text{ (Percentage change in } B\text{)}$$

Changes in *B* account for 50 percent of the variation of changes in *A* ( $R^2 = 0.5$ ).

- (a) If an investor owns ₹ 1 million of *A*, how much of *B* should he sell to minimise his risk?
- (b) What is his hedge ratio?
- (c) How should he create a zero value hedge?

**40.2 Dividend Yield** The stock index is currently at 4,000 and the six month stock index futures is trading at 4,200. The risk-free annual rate is 14.5 percent. What is the annual dividend yield on the index stocks?

**40.3 Convenience Yield** The following information about steel scrap is given:

- Spot price : ₹ 5000 per ton
- Futures price : ₹ 5400 for a one year contract
- Interest rate : 15 percent
- PV (storage costs) : ₹ 250 per year

What is the PV (convenience yield) of steel scrap?

**40.4** Consider the following data:

	<i>Excel Corp.</i>	<i>Apple Ltd</i>
Desired Funding	Fixed Rate \$	Floating Rate \$
Period	5 years	5 years
Amount required	200 million	200 million
Cost of Fixed Rate Funding	6.25%	5%
Cost of Floating Rate Funding	6 month LIBOR + 50bp	6 month LIBOR

As a swap banker, arrange a swap in such a way that the savings is split equally among all the three. Show it diagrammatically.

## **MINICASE**

Matrix Pharma is a mid-sized pharmaceutical company that focuses mainly on branded formulations with a significant proportion of its sales coming from international operations in several countries. Given its healthy growth in the last five years, partly fueled by an acquisition in the UK, the company has in recent years stepped up its R&D activity. While the primary thrust of R&D is on developing generic drugs, it is also actively pursuing several programmes for developing new chemical entities.

Mahesh Thakker, the CEO, is convinced of the need for instituting a comprehensive risk management programme. He has asked you to prepare a report for the board that covers the following issues:

- (a) What are the principal risks faced by a business firm?
- (b) Why does higher total risk lower the expected cash flows of the firm?
- (c) How can one assess the risk of a non-financial firm?
- (d) What is the principle of hedging? Explain it with a suitable example.
- (e) How does a firm hedge with a forward contract?
- (f) What are the key differences between forwards and futures?
- (g) What is an interest rate swap and a currency swap?
- (h) What is an option? How can one use options for hedging?
- (i) What are the advantages and disadvantages of insurance?
- (j) What are the conventional tools and real options for hedging? How do they compare with financial derivatives?
- (k) What are the key guidelines for managing risk?

## **PRACTICAL ASSIGNMENT**

Identify the key risks faced by the company selected by you. How should they be addressed?

- 
- <sup>1</sup> Stock index futures are currently available in India.
  - <sup>2</sup> Remember that since  $R^2$  is only 0.55, Reliance's stock will not always move by 1.5 times the market change.

### **Online Resources**

[http://highered.mheducation.com/sites/9353166527/student\\_view0/chapter40/index.html](http://highered.mheducation.com/sites/9353166527/student_view0/chapter40/index.html)



- Additional Self-Test Problems
- Excel on Solved Problems

- Additional Solved Problems

## 41 CHAPTER

# Behavioural Finance

## Learning Objectives

After studying this chapter you should be able to:

- ✓ Identify the key differences between ‘traditional finance’ and ‘behavioural finance’.
- ✓ Explain the important biases that people are prone to.
- ✓ Discuss the heuristics or mental shortcuts that people resort to.
- ✓ Explain prospect theory, mental accounting, and narrow framing.

The book so far has covered important techniques that help managers, theoretically, in making value-maximising decisions, for their firms. In practice, however, psychological pitfalls often hinder managers from applying these techniques properly.

This chapter examines psychological phenomena that cause managers to commit mistakes, thereby eroding the values of their firms. While psychological parlance is used, the phenomena explored here are intuitive and easy-to-understand. Moreover, a formal exposure to psychology is not required to appreciate these concepts.

Pitfalls such as agency conflicts often lead management to act in ways that hurt the interest of shareholders. The psychological pitfalls stem from mistakes managers, like most people, are prone to make and are not the consequence of managers and investors having conflicting interests. It is important to make this distinction because the two sources of shareholder cost typically call for different solutions. Agency conflicts can be alleviated by designing proper incentive structures; while behavioural pitfalls can be mitigated by emphasizing training and improving decision-making processes.

This chapter discusses three kinds of psychological phenomena, viz., biases, heuristics, and framing effects, which impair rationality. Before we look at these phenomena, the key differences between ‘traditional finance’ and ‘behavioural finance’ need to be understood.

## 41.1 ■ TRADITIONAL FINANCE AND BEHAVIOURAL FINANCE

From the mid-1950s, the field of finance has been dominated by the traditional finance model (also referred to as the standard finance model) developed primarily by the economists of the University of Chicago. The central assumption of the traditional finance model is that people are rational. However, psychologists challenged this assumption; they argued that people often suffer from cognitive and emotional biases and act in a seemingly irrational manner.

The finance field was reluctant to accept the view of psychologists who proposed the behavioural finance model. Indeed, the early proponents of behavioural finance were regarded as heretics. As the evidence of the influence of psychology and emotions on decisions became more convincing, behavioural finance has received greater acceptance. Although there is disagreement about when, how, and why psychology influences investment decisions, the award of 2002 Nobel Prize in Economics to psychologist Daniel Kahneman and experimental economist Vernon Smith is seen by many as a vindication of the field of behavioural finance.

The key differences between ‘traditional finance’ and ‘behavioural finance’ are as follows:

- Traditional finance assumes that people process data appropriately and correctly. In contrast, behavioural finance recognises that people employ imperfect rules of thumb (heuristics) to process data which induces biases in their beliefs and predisposes them to commit errors.
- Traditional finance presupposes that people view all decisions through the transparent and objective lens of risk and return. Put differently, the form (or frame) used to describe a problem is inconsequential. In contrast, behavioural finance postulates that perceptions of risk and return are significantly influenced by how decision problems are framed. In other words, behavioural finance assumes frame dependence.
- Traditional finance assumes that people are guided by reason and logic and independent judgment. Behavioural finance, on the other hand, recognises that emotions and herd instincts play an important role in influencing decisions.

- Traditional finance argues that markets are efficient, implying that the price of each security is an unbiased estimate of its intrinsic value. In contrast, behavioural finance contends that heuristic-driven biases and errors, frame dependence, and effects of emotions and social influence often lead to discrepancy between market price and fundamental value.

This chapter discusses biases, heuristics, and frame dependence. While these phenomena are discussed separately for pedagogic convenience they are interrelated in subtle ways.

## 41.2 ■ BIASES

A bias reflects psychological predisposition towards error. This section discusses the following biases we are all prone to:

- Overconfidence
- Optimistic bias
- Confirmation bias
- Illusion of understanding

**Overconfidence** People tend to be overconfident and hence overestimate the accuracy of their forecasts. Overconfidence stems partly from the illusion of knowledge. The human mind is perhaps designed to extract as much information as possible from what is available, but may not be aware that the available information is not adequate to develop an accurate forecast in uncertain situations. Overconfidence is particularly seductive when people have special information or experience—no matter how insignificant—that persuades them to think that they have an investment edge. In reality, however, most of the so-called sophisticated and knowledgeable investors do not outperform the market consistently.

Another factor contributing to overconfidence is the illusion of control. People tend to believe that they have influence over future outcomes in an uncertain environment. Such an illusion may be fostered by factors like active involvement and positive early outcomes. Active involvement in a task like online investing gives investors a sense of control. Positive early outcomes, although they may be purely fortuitous, create an illusion of control.

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 Ellen Langer describes this phenomenon as ‘heads I win, tail it is 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.

Overconfidence manifests itself in excessive trading in financial markets. It also explains the dominance of active portfolio management, despite the

disappointing performance of many actively managed funds.

**Optimistic Bias** One of the most important cognitive biases is optimistic bias. As Daniel 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.'

An optimistic attitude is a blessing. As Daniel 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.

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

Optimists play a significant role in shaping our lives. As Daniel 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.'

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

**Confirmation Bias** People tend to overlook information that is contrary to their views in favour of information that confirms their views. Investors often only hear what they want to hear. They spend more time searching for reasons supporting their views and less time searching for reasons opposing their views.

**Illusion of Understanding** In our constant attempt to make sense of the world, we construct flawed stories of the past and believe them to be true. In his book *Black Swan*, Nassim Taleb calls this as the narrative fallacy. According to Daniel Kahneman, 'The explanatory stories that people find compelling are simple and 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.' A salient recent event can become the core of a causal narrative. Since inconsistencies diminish the clarity of our understanding and feelings, the narrative is kept simple and coherent.

## 41.3 ■ HEURISTICS

Many decisions are based on beliefs about the probability of uncertain events such as the outcome of an R&D project or the future value of the rupee. These beliefs are usually expressed in statements such as 'I think that the prospects are really bright,' 'It is unlikely that the rupee will fall below 65,' and so forth. Sometimes, such beliefs are expressed numerically as odds or subjective probabilities.

The subjective assessment of probabilities is typically based on data of limited validity, which are processed according to heuristics or simple rules of thumb that lead to biases. The most important heuristics are:

- Representativeness
- Availability heuristic
- Anchoring and adjustment
- Affect heuristic

**Representativeness** It 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.

**Availability Heuristic** 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?).

**Anchoring and Adjustment** While making a quantitative judgment, people are subconsciously anchored to some arbitrary stimulus. Daniel Kahneman and Amos 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 UN. 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.

After forming an opinion, people are often unwilling to change it easily, even though they receive new information that is relevant. Suppose that investors have formed an opinion that company A has above-average long-term earnings prospect. Suddenly, A reports much lower earnings than expected. Thanks to anchoring (also referred to as conservatism), investors will persist in the belief that the company is above-average and will not react sufficiently to the bad news. So, on the day of earnings announcement the stock price would move very little. Gradually, however, the stock price would drift downwards over a period of time as investors shed their initial conservatism.

**Affect Heuristic** People tend to make judgments and decisions by consulting their emotions. 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.

## **41.4 ■ FRAME DEPENDENCE**

Proponents of traditional finance argue that framing is transparent, implying that investors can see through all the different ways cash flows might be described. 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.’

In reality, behaviour is frame-dependent. This means that the form used to describe a problem has a bearing on decision making. Frame dependence stems from a mix of cognitive and emotional factors. The cognitive aspects relate to how people organise information mentally, in particular how they code outcomes into gains and losses. The emotional aspects pertain to how people feel as they register information.

## Prospect Theory

The prospect theory proposed by Kahneman and Tversky describes how people frame and value a decision involving uncertainty. The key elements of prospect theory are as follows:

**Reference Dependence** People derive value (the prospect theory analogue of utility) from gains and losses relative to some **reference point**, rather than absolute levels of wealth (as per utility theory). [Exhibit 41.1A](#) shows the utility function as per the utility theory, whereas [Exhibit 41.1B](#) shows the value function as per the prospect theory.

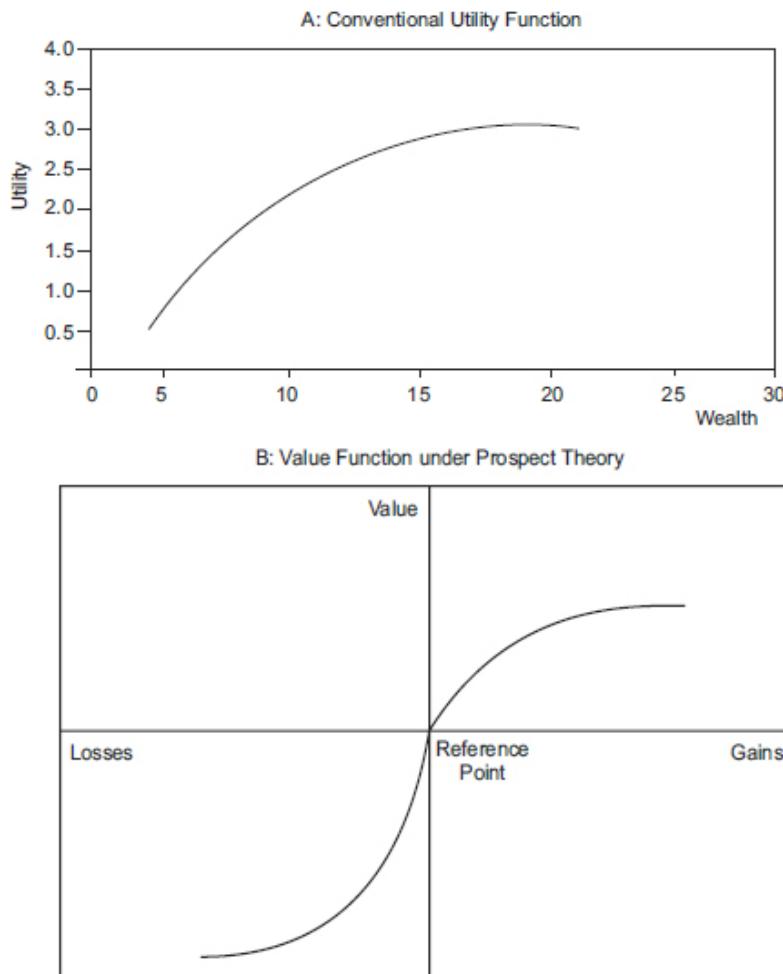
**Diminishing Sensitivity** The value function is concave for gains. This means that people feel good when they gain, but twice the gain does not make them feel twice as good. The value function is convex in losses. This means that people experience pain when they lose, but twice the loss does not mean twice the pain.

**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**.

**Decision Weights** In utility theory, people weight outcomes by their objective probabilities, but in prospect theory, people weight outcomes by transformed probabilities or decision weights. Typically, the weighting function over-weights low probabilities and under-weights high probabilities.

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## Exhibit 41.1 | Prospect Theory Value Function



Because of loss aversion, the manner in which an outcome is described—either in the vocabulary of gains or in the vocabulary of losses—has an important bearing on decision-making.

## 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 camera or throwing a party) will have a bearing 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.
- Investors often have an irrational preference for stocks paying high dividends, because they do not mind spending the dividend income, but are not inclined to sell a few shares and ‘dip into the capital’.
- Managers are reluctant to terminate losing projects.

## Narrow Framing

Ideally, investors should pay attention to changes in their total wealth (comprising real estate, stocks, bonds, capitalised future income, and other assets) over their investment horizon for it determines how much they can spend on goods and services. 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 at 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.

## SUMMARY

- The central assumption of the traditional finance model is that people are rational. The behavioural finance model, however, argues that people suffer from cognitive and emotional biases and act in a seemingly irrational manner.
- The important heuristic-driven biases and cognitive errors that impair judgment are: **representativeness, overconfidence, anchoring, aversion to ambiguity, and innumeracy**.

- The form used to describe a problem has a bearing on decision-making frame **dependence**, which stems from a mix of cognitive and emotional factors.
- The **prospect theory** describes how people frame and value a decision involving uncertainty.
- People feel more strongly about the pain from a loss than the pleasure from an equal gain – about two and half times as strongly. This phenomenon is referred to as **loss aversion**.
- People tend to 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.
- Investors engage, in **narrow framing**—they focus on changes in wealth that are narrowly defined, in both a cross-sectional as well as a temporal sense. Since people are loss-averse, narrow framing leads to **myopic risk aversion**.

## QUESTIONS

1. What are the key differences between ‘traditional finance’ and ‘behavioural finance’?
2. Discuss the following: overconfidence, optimistic bias, representativeness, availability heuristic, anchoring and adjustment, affect heuristic, endowment effect, status quo bias, cognitive dissonance.
3. Discuss the basic ingredients of prospect theory?
4. What is mental accounting and what are its common manifestations?
5. Describe what ‘narrow framing’ means.

**42**  
**CHAPTER**

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## The State of Our Knowledge<sup>1</sup>

### Learning Objectives

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After studying this chapter you should be able to:

- ✓ Describe the central ideas of finance.
- ✓ Discuss the unresolved issues or puzzles of finance.

We have discussed a lot. Let us conclude by stating the central ideas of finance and the unresolved puzzles of finance.

## 42.1 THE CENTRAL IDEAS OF FINANCE

While there are a number of interesting ideas of finance, the central ones appear to be the following eight:

- Net present value
- Portfolio theory
- Capital asset pricing model
- Efficient market hypothesis
- Value additivity principle
- Capital structure theory
- Option pricing model
- Agency theory

**Net Present Value** To know the value of future cash flows, you look at prices of securities in the capital market—a market where claims to future cash flows are traded. If a firm can buy cash flows for its shareholders at a price less than what they would have to pay in the capital market, it enhances the value of their investment.

This is the idea underlying net present value (NPV). When you calculate a project's NPV, you determine whether the benefits of the project exceed its costs. You are essentially asking what will be the worth of its cash flows now, if a claim on them is traded in the capital market. This is the reason why the cash flows of a project are discounted at the opportunity cost of capital which reflects the expected rate of return offered by securities that are just as risky as the project.

Although the idea of NPV looks simple, see how useful it is. The NPV rule enables shareholders with divergent levels of wealth and risk disposition to invest in the same firm and entrust its operations to a professional manager. They simply have to tell the professional manager to maximise present value.

**Portfolio 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 return and risk somewhat loosely. Intuitively smart investors knew the benefit of diversification which is reflected in the traditional adage “Do not put all your eggs in one basket”. Harry Markowitz showed

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.

He also developed the technique of mean-variance portfolio optimisation, which allows an investor to determine the portfolio with the lowest level of variance. Markowitz's approach forms the core of portfolio optimisation methods employed in Wall Street.

**Capital Asset Pricing Model** While the notion that risk and return go together is ageless, the capital asset pricing model (CAPM) is perhaps the first formal attempt to quantify the relationship between risk and return.

The CAPM makes an important distinction between unique (diversifiable) risk and market (non-diversifiable) risk. Since unique risk can be diversified away, investors are rewarded only for bearing market risk, which reflects the sensitivity of an investment's return to changes in the aggregate value of all assets. It is called the beta of the investment. According to CAPM, the required rate of return is linearly related to its beta.

The validity of CAPM has been vigorously challenged. Perhaps in the years to come we will have better theories to explain the relationship between risk and return. However, it is unlikely that these theories will ignore the crucial distinction between diversifiable risk and non-diversifiable risk, the key idea underpinning the CAPM.

It is interesting to learn how William Sharpe arrived at CAPM, a contribution that fetched him Nobel Prize in Economics. In an interview with Jonathan Burton he commented: "Portfolio theory focused on the actions of a single investor with an optimal portfolio. I said, what if everyone was optimizing. They've got their copies of Markowitz and they are doing what he says. Then some people decide that they want to hold more IBM, but there aren't enough shares to satisfy demand. So they put price pressure on IBM and up it goes, at which point they have to change their estimates of risk and return, because now they are paying more for the stock. That process of upward and downward pressure on prices continues until prices reach an equilibrium and everyone collectively wants to hold what is available. At that point, what you can say about the relationship between risk and return? The answer is that expected return is proportionate to beta relative to the market portfolio."

**Efficient Market Hypothesis** According to the efficient market hypothesis, security prices accurately reflect available information and respond to new information, no sooner it becomes available. Eugene Fama

suggested that it is useful to distinguish three levels of efficiency: weak-form, semi-strong form, and strong-form. The weak-form says that prices reflect all information found in the record of past prices and volumes; the semi-strong form holds that prices reflect all publicly available information; finally, the strong-form says that prices reflect all available information, public as well as private.

The idea that intense competition in capital market leads to fair pricing of securities is indeed very sweeping. No wonder it has been challenged by many and Benjamin Friedman refers to it as a “credo”—a statement of faith and not a scientific proposition. For most financial economists, however, the efficient market hypothesis is a central idea of modern finance that has profound implications.

**Value Additivity Principle** The value additivity principle says that the value of the whole is simply the sum of the value of the parts. It is also referred to as the law of the conservation of value.

For example, the present value of a project that produces a series of cash flows is simply the sum of the present values of each of the cash flows:

$$PV(\text{Project}) = PV(C_1) + PV(C_2) + \dots PV(C_t) + \dots$$

Value additivity also implies that value cannot be increased by merging two companies, unless the merger produces synergistic benefits that increase the total cash flow. A merger aimed only at diversification cannot increase value.

**Capital Structure Theory** Just as the law of conservation works when cash flows are added, it works when cash flows are subtracted. This means that a capital structure decision, that merely splits the operating cash flows in a different manner, cannot alter the overall firm value. This is the essence of the leverage irrelevance hypothesis proposed by Franco Modigliani and Merton Miller (MM): The value of a firm is independent of its capital structure, as long as the capital structure does not change the total cash flow generated by the assets of the firm.

Merton Miller, who won the Nobel Prize in Economics, described the MM proposition very vividly as follows :“People often ask: Can you summarise your theory quickly? Well, I say, you understand the M&M theorem if you know why this is a joke. The pizza delivery man comes to Yogi Berra after the game and says, ‘How do you want this pizza cut, into quarters or eighths.’ And Yogi says, ‘Cut it in eight pieces. I’m feeling hungry tonight.’

Everyone recognises that's a joke because obviously the number and shape of the pieces don't affect the size of the pizza. And similarly, the stocks, bonds, warrants, issued don't affect the aggregate value of the firm. They just slice up the underlying earnings in different ways."

Due to various imperfections in the real world, the MM proposition may not be true. However, it tells us when the capital structure matters. It may matter (a) in the presence of taxes as debt provides interest tax shield, (b) at high levels of debt that can cause costly financial distress, and (c) when lenders impose onerous restrictions that can impair operational efficiency.

### Conservation of Investment Value

It may be noted that the MM work formalised the views about financial markets expressed long back by John Burr Williams in his 1938 classic, *The Theory of Investment Value*. Williams said: "If the investment value of an enterprise as a whole is by definition the present worth of all its future distributions to security holders, whether on interest or dividend account, then this value in no wise depends on what the company's capitalization is. Clearly, if a single individual or a single institutional investor owned all of the bonds, stocks and warrants issued by the corporation, it would not matter to this investor what the company's capitalization was (except for details concerning the income tax). Any earnings collected as interest could not be collected as dividends. To such an individual it would be perfectly obvious that total interest and dividend paying power was in no wise dependent on the kind of securities issued to the company's owner. Furthermore no change in the investment value of the enterprise as a whole would result from a change in its capitalization. Bonds could be retired with stock issues, or two classes of junior securities could be combined into one, without changing the investment value of the company as a whole. Such constancy of investment value is analogous to the indestructibility of matter or energy: it leads us to speak of the Law of the Conservation of Investment Value, just as physicists speak of the Law of the Conservation of Matter, or the Law of the Conservation of Energy."

**Option Pricing Model** In ordinary usage, option means choice. In finance, option refers to the right to buy or sell in the future on terms that are determined now.

Since options are important, you should know how to value them. Intuitively, finance professionals are aware that the value of an option depends on the exercise price, the period of expiration, the interest rate, and the risk of the underlying asset. In a seminal contribution, Fisher Black and Myron Scholes incorporated these variables in an easy-to-use formula. Robert Merton also made significant contributions to option pricing literature.

Developed for simple call options, the Black–Scholes formula cannot be directly applied to complicated real options encountered in corporate finance. Yet their basic ideas (like the risk-neutral valuation method) work even if the formula is not directly applicable. Valuing real options may require additional numerical computation, but no additional concepts.

Robert Merton and Myron Scholes were awarded the 1997 Nobel Prize in Economics for their seminal contribution to option pricing. The Nobel citation acknowledged their contribution in the following words:

“In a modern market economy, it is essential that firms and households are able to select an appropriate level of risk in their transactions. Markets for options and other so-called derivatives are important in the sense that agents who anticipate future revenues or payments can ensure a profit above a certain level or insure themselves against a loss above a certain level. A prerequisite for efficient management of risk, however, is that such instruments are correctly valued, or priced. A new method to determine the value of derivatives stands out among the foremost contributions to economic sciences over the last 25 years. This year’s laureates, Robert Merton and Myron Scholes, developed this method in close collaboration with Fischer Black, who died in his mid-fifties in 1995. Black, Merton, and Scholes thus laid the foundation for the rapid growth of markets for derivatives in the last ten years. Their method has more general applicability, however, and has created new areas of research—inside as well as outside of financial economics. A similar method may be used to value insurance contracts and guarantees, or the flexibility of physical investment projects.”

**Agency Theory** Traditionally, economists assumed that managers, shareholders, bondholders, and other players in a company worked to promote the common good. In recent decades, financial economists have explored in greater detail the possible conflicts of interest among various players and the means by which such conflicts may be resolved or mitigated. Collectively, these ideas are referred to as *agency theory*.

In the neoclassical theory of the firm, the firm is regarded as a monolithic entity to which a profit-maximising objective is ascribed. Agency theory, on the other hand, considers the firm as a nexus of contracts. As Jensen and Meckling put it, “Viewing the firm as a nexus of a set of contracting relationships... serves to make it clear that the firm is not an individual... [but] is a legal fiction which serves as a focus for a complex process in which the conflicting objectives of individuals (some of which may

'represent' other organisations) are brought into equilibrium within a framework of contractual relations."

## 42.2 ■ THE UNRESOLVED ISSUES OR PUZZLES OF FINANCE

In finance, as in other disciplines, the realm of the unknown is greater than the realm of the known. Here is a short description of the unresolved issues and puzzles in finance.

- Strategic financial decisions
- Drivers of present value
- Risk and return relationship
- Anomalies to the efficient market hypothesis
- Success of new securities
- Dividend puzzle
- Appropriate level of risk
- Value of liquidity
- Merger waves
- Financial crises

**Strategic Financial Decisions** We do not know much about how strategic financial decisions are taken. Take the case of strategic planning which is concerned with identifying promising businesses in which the firm has a competitive advantage and allocating resources to them. It is essentially the “top down” part of capital budgeting or as Brealey and Myers put it “capital budgeting on a grand scale.” We understand well the “bottom up” part of capital budgeting, but not so well the “top down” part. True, some firms excel in integrating the two approaches to capital budgeting. But we do not have a general understanding of how they do it.

The option pricing theory offers the promise of improving the strategic planning process. Let us hope that this promise is fulfilled.

**Drivers of Present Value** We know how to calculate NPV, but we have a limited understanding of what drives NPV. Positive NPV stems from economic rents. What are the sources of economic rents? How long will they continue before competition dissipates them? Not much is known about these important questions.

**Risk and Return Relationship** The CAPM is a giant step in our understanding of risk and return, but there are many unresolved statistical and theoretical issues.

Statistically, it is hard to say conclusively whether the CAPM is valid or not. The actual relationship between risk (as measured by beta) and return appears to be flatter than what the CAPM predicts. Is there a problem with the statistical tests or with the model? It's hard to say. Fama and French found that the expected returns are related to firm size and the ratio of the stock's book value to market value. Is it because these variables are a proxy for a second risk variable? We do not know for sure.

**Anomalies to the Efficient Market Hypothesis** Empirically a number of anomalies to the efficient market hypothesis have been found. According to the "week-end effect" anomaly, stock returns tend to be negative over the period from Friday's close to Monday's opening. Another puzzling calendar anomaly is the "January effect": Stock prices seem to rise more in January than in any other month of the year. Robert Shiller and others have marshaled evidence suggesting that the volatility of stock prices is too large to be justified by the volatility of dividends.

The advocates of efficient market hypothesis argue that if data is mined extensively, one is bound to find some anomalies. And even if inefficiencies exist, it is difficult to exploit them profitably.

Behaviouralists, however, argue that the efficient market hypothesis overlooks important aspects of human behaviour. For example, people tend to place too much importance on recent information and are liable to overreact to new information. Perhaps such behavioural tendencies may help us to explain anomalies.

**Success of New Securities** The last 30 years or so have witnessed a veritable explosion of new securities such as futures, options, swaps, zeroes, floating rate bonds, inverse floaters, index-linked bonds, commodity bonds, collateralised mortgage obligations, increasing rate notes, and so on. What explains the success of new securities and markets? In some cases, success can be explained easily: the product helps in better risk management, or reduces taxes, or improves liquidity, or mitigates agency costs, or circumvents some regulatory restriction. In other cases, it is not easy to explain. As Brealey and Myers put it: "Why do investment bankers continue to invent, and successfully sell, complex new securities that outstrip our ability to value them? The truth is we don't understand why some innovations in markets succeed and others never get off the ground."

**Dividend Puzzle** Some argue that companies should pay generous dividends; others reason that companies should pay niggardly dividends;

still others feel that the dividend decision is irrelevant. We are not sure which is the right position.

**Appropriate level of Risk** Firms take various measures to manage risk. They diversify the product line, reduce the debt ratio, outsource, insure against specific hazards, and use options, futures, and swaps. While these actions reduce risk, we are not sure that they add value, which should be the goal of risk management.

We do not have reliable guidelines on what bets a firm should take and what is its appropriate level of risk.

**Value of Liquidity** Apart from balances in bank accounts, firms have short-term investments in liquid mutual fund schemes and other money market instruments.

How much liquidity should a firm have? How much money should a firm be able to raise at a short notice? We do not have a good theory to answer these questions.

**Merger Waves** From time to time we see a flurry of merger activity, but we do not have a general hypothesis that explains merger waves.

Just as we have merger waves, we see other financial fashions. For instance, there are periods of heightened activity in the new issues market. We do not know why hard-nosed businessmen display herdlike behaviour. A recent theory about fads, trends, and crowd behaviour perhaps offers an explanation. 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. 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.

**Financial Crises** A survey of financial history reveals that the world is convulsed by periodic credit booms and busts. Charles Kindleberger, an eminent economic historian, counted forty-six such booms and busts from 1618 to 2000. Of course, he did not count the global financial crisis that began in 2007. 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.

We do not have a satisfactory understanding of why such crises occur. The regularity of financial crises suggests that there may be some defect in the hardwiring of our brains which makes us prone to cycles of greed and fear. To counter these inherent human tendencies, we have to improve our governance structure, design proper compensation arrangements, and implement efficient risk management systems.

## **QUESTIONS**

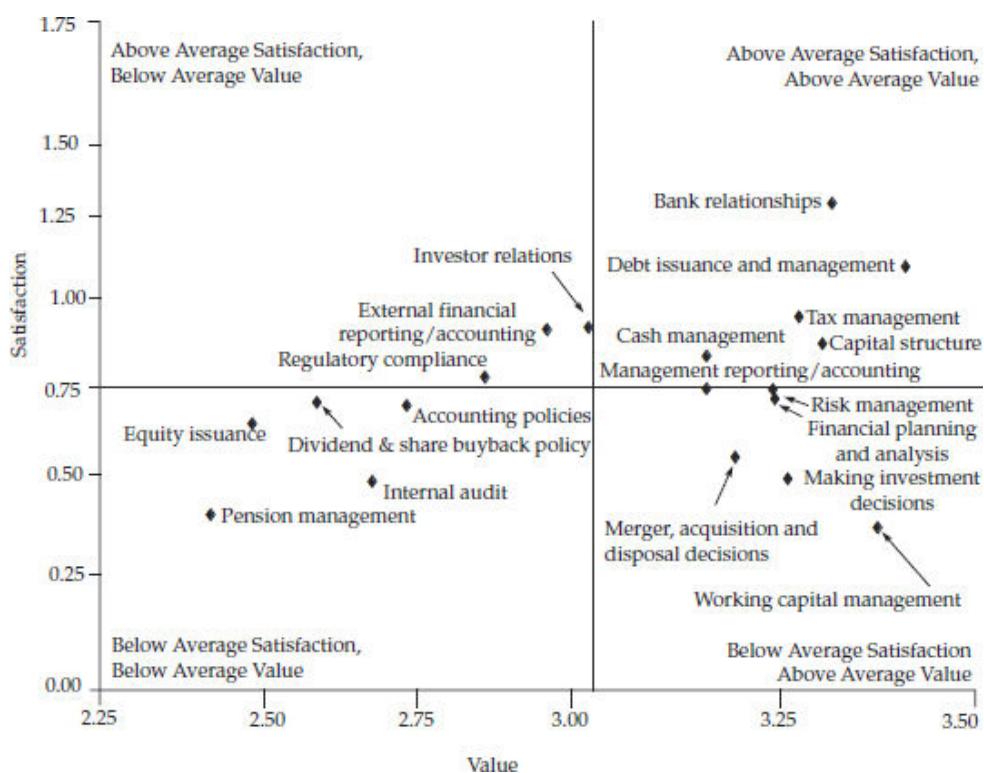
1. Discuss the central ideas of finance.
2. Comment on the unresolved issues or puzzles in finance.

## Appendix 42A

### State of the Art: Satisfaction and Contribution to Value

A global survey of corporate financial policies and practices was done by Henri Servaes and Peter Tufano in mid 2005. (The survey was sponsored by Deutsche Bank AG with the Global Association of Risk Professionals). In this survey 334 companies across the world participated. Based on this survey, Servaes and Tufano wrote a paper titled “CFO Views on the Importance and Execution of the Finance Function.” According to this paper, the satisfaction that CFOs have with respect to various financial management activities and the value created by these activities are reflected in [Exhibit 42.1](#).

**Exhibit 42.1** Satisfaction Versus Value



<sup>1</sup> This chapter draws heavily on Chapter 35 titled “Conclusion: What we do and do not know about finance” from the book *Principles of Corporate Finance*, 6<sup>th</sup> Edition, authored by R.A. Brealey and S.C. Myers and published by McGraw Hill Higher Education.

## **Integrated Case on ITC\***

ITC is the fourth largest company in India with a market capitalisation of ₹ 3.4 lakh crores (as on 31-3-2018). Incorporated in 1910 as Imperial Tobacco Company of India Limited, it became a public limited company in 1954. In 1970 it changed the name to India Tobacco Company Limited. In 1974 the name was changed to the present ITC Limited and also the three tobacco companies of UK, who were the major shareholders, sold shares to bring down the foreign shareholding level to 40 percent.

Originally a tobacco and cigarette company, it diversified over the years into various businesses as follows: 1925 – Paper; 1975 – Hotels; 1979 – Paperboards; 1988 – Agri-oilseeds/oil; 1990 – Speciality paper (which are special grades of paper); 1992 – IT (through a wholly owned subsidiary ITC Infotech Ltd); 1993 – Financial services, through a subsidiary ITC Classic Finance Ltd in collaboration with a foreign company, which was later amalgamated with ICICI Ltd in 1997; 1993 – Lifestyle retailing (branded clothes); 2002 to 2004 – Wheat flour, confectionery, matches, Agarbatti, salt, stationery, biscuits; 2009 – Personal care, and 2014 – e-cigarettes.

Besides being the undisputed market leader in their staple business of cigarettes and tobacco, ITC is the market leader in paperboards, specialty paper and packaging material, branded wheat flour (Ashirwad brand), cream biscuit (Sunfeast), chips (Bingo!), notebooks (Classmate), and has the second largest in turnover in agricultural products exports, noodles (brand Yippee!), deodorants (Engage), and agarbattis (Mangaldeep). ITC has one of the largest hotel chains in the country with over 100 hotels (9000 rooms) and has plans to add another 5000 within three years (which reportedly is also meant as investment in real estate).

ITC's plan is to make the branded consumer goods the new growth engine and rapidly scale up to achieve an envisioned turnover of ₹ 1 lakh crore by 2030 in the non-cigarette FMCG segment.

It is reported that ITC has some big plans to foray into quite a few new segments like dairy, fruits and vegetables and health and wellness including multi-specialty hospitals (a conscience call) and become an end-to-end player in the growing medical tourism industry. ITC has at present 24 subsidiaries out of which a very important one is ITC Infotech India Limited with software consultancy operations in India, UK, US and many other places.

The Balance Sheets and Statements of Profit and Loss of ITC for the Past few Years are Summarised as Follows:

As on	Balance Sheet			₹ in crore
	31-3-2015	31-3-2016	31-3-2017	31-3-2018
<b>Assets</b>				
Non-current assets	<u>22,185</u>	<u>26,829</u>	<u>29,674</u>	<u>37,895</u>
Fixed assets	16,475	16,988	18,946	21,363
Investments	1,413	5,126	6,694	11,484
Other non-current assets	4,297	4,715	4,034	5,048
Current assets	<u>24,362</u>	<u>24,863</u>	<u>26,269</u>	<u>26,394</u>
Inventories	8,507	9,062	8,116	7,495
Investments	6,266	6,622	10,887	10,569
Trade receivables	1,978	1,917	2,474	2,682
Cash & Bank balances	6,571	6,063	2,967	2,900
All other current assets	1,040	1,198	1,824	2,748
<b>Total</b>	<b>46,547</b>	<b>51,692</b>	<b>55,943</b>	<b>64,289</b>
<b>Equity and Liabilities</b>				
Equity	<u>38,560</u>	<u>42,940</u>	<u>46,708</u>	<u>52,845</u>
Equity share capital (par value ₹ 1)	802	805	1,215	1,220
Others	37,758	42,136	45,493	51,624
Non-current liabilities	<u>1,895</u>	<u>2,093</u>	<u>2,115</u>	<u>2,194</u>
Borrowings	40	27	18	12
Deferred tax liabilities	1,688	1,880	1,879	1,923
All other non-current liabilities	166	186	217	260
Current liabilities	<u>6,093</u>	<u>6,658</u>	<u>7,121</u>	<u>9,250</u>
Borrowings	185	44	19	17
Trade payables	1,977	2,339	2,659	3,496
All other current liabilities	3,931	4,275	4,443	5,737
<b>Total</b>	<b>46,547</b>	<b>51,692</b>	<b>55,943</b>	<b>64,289</b>
<i>Statement of Profit and Loss for Year Ended</i>				
	31-3-2016	31-3-2017	31-3-2018	
Revenue from operations*	55,061	58,705	47,689	
Other income	1,531	1,762	1,832	
<b>Total Income</b>	<b>56,592</b>	<b>60,466</b>	<b>49,520</b>	

\*Gross sales for 2018 was 70,852.18 cr. as against 67,782.73 cr. in 2017. Revenue from operation figure is reduced in 2018 only because of GST accounting etc.

<b>Expenses</b>			
Cost of materials consumed	11,169	11,979	11,944
Purchases of stock-in-trade	2,595	3,478	2,884
Changes in inventories	-195	593	1,028
Excise duty	15,869	15,928	4,240
Employee benefits expense	3,441	3,632	3,761
Finance costs	54	24	90
Depreciation and amortization expense	1,077	1,153	1,236
Other expenses	7,723	7,660	7,350
Total expenses	41,733	44,440	32,524
Profit before exceptional items and tax	14,859	16,026	16,996
Exceptional items			413
Profit before tax	14,859	16,026	17,409
<i>Tax expense</i>			
Current Tax	5,150	5,546	5,893
Deferred Tax	208	3	23
Profit for the year	9,501	10,477	11,493

### Some Additional Data is as Follows:

<i>As on</i>	<i>31-3-2016</i>	<i>31-3-2017</i>	<i>31-3-2018</i>	
Market price per share (₹)	328.25	280.30	255.50	on 31-3-2015 325.85
Dividend paid per share (₹)	6.25	8.5	4.75	
Bonus (declared during FY ended)		1:2		
Bonus adjusted market price (₹)	328.25	420.45	383.25	
Bonus adjusted DPS (₹)	6.25	8.5	7.125	
Dividend paid date		30/5/2016		
Bonus record date		4/7/2016		

The Level of Nifty Index, ITC Stock Price, Its Dividend Per Share and Split/Bonus Issue Dates/terms for the Past 21 Years are as Follows:

<i>For Year Ended March 31</i>	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Nifty	1117	1078	1528	1148	1130	978	1772	2036	3403	3822	4734
ITC Market Price (₹)	711	975	741	814	697	628	1043	1342	195	151	206
Dividend Per Share (₹)		4.5	5.5	7.5	10	13.5	15	20	3.1 in May 2005	2.65	3.1
Nifty dividend yield (%)		1.48%	1.05%	1.13%	1.34%	2.93%	1.77%	1.97%	1.33%	1.25%	1.06%
Bonus									1 : 2 in Sept 2005		
Split									10 : 1 in Sept 2005		
<i>For year ended March 31</i>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Nifty	3021	5249	5834	5296	5683	6704	8491	7738	9174	10114	
ITC Market Price (₹)	184	263	182	227	309	353	326	328	280	256	
Dividend per Share (₹)	3.5	3.7	10 in May 2010	4.45	4.5	5.25	6	6.25	8.5 in May 2016	4.75	
Nifty dividend yield (%)	1.85%	0.94%	1.07%	1.50%	1.46%	1.37%	1.28%	1.49%	1.25%	1.29%	
Bonus			1 : 1 in Aug 2010						1 : 2 in July 2016		
Split											

### ITC's Dividend History for the Past few Years is as Follows:

<i>Year ended March 31</i>	2012	2013	2014	2015	2016*	2017	2018	₹ in crore
Profit for the year	6,258	7,608	8,891	9,663	9,912	10,477	11,493	
Total dividend paid for that year (including tax)	3518	4148	4772	5010	6840	5770	6285	

\*including special dividend

A Summary of ITC's Segment-wise Position as at 31-3-2018 is as Follows:

<i>Segment</i>	<i>Capital Expenditure</i>	<i>Net Turnover (As a Percentage of the Total)</i>	<i>Profit Before Tax</i>	<i>₹ in crore</i>
FMCG – Cigarettes	90	46.52	13,341	
– Others	834	10.29	164	
Hotels	611	3.58	140	
Agri-business (including tobacco)	92	11.60	849	
Paperboards, paper, packaging materials	910	9.52	1,042	
Tax			5628	
<b>Profit after tax</b>			<b>11,223</b>	

ITC now has no visible promoter in the sense that word is defined by SEBI. The single largest shareholder (24.4%) is Tobacco Manufacturers (India) Limited, a foreign company owned by the original promoter British American Tobacco (BAT). Government of India owns a substantial chunk of shares (about 30%) through various insurance companies, SUUTI etc. As on 31-3-2018, the shareholding pattern is as follows:

<i>Category of Investors</i>	<i>Percentage of the Equity Shares Held</i>
Institutions – Domestic (FIs, Ins. cos, MFs, Banks etc.)	37
– Foreign (FIIs, FPIs)	18
Companies – Foreign	30
– Domestic	4
NRIs, OCIs, Foreign Nationals etc.	1
Public and others	10

## QUESTIONS

1. (a) Calculate the following ratios pertaining to financial years 2015-2016, 2016-2017 and 2017-2018:  
Current ratio, acid-test ratio, debt-equity ratio, debt ratio, interest coverage ratio, inventory turnover ratio, debtors turnover ratio, fixed assets turnover, average collection period, total assets turnover, net profit margin, return on assets, earning power, return on capital employed, return on equity, price-earnings ratio, yield, and market value to book value ratio  
(b) Comment on the solvency, liquidity, leverage and profitability of the company, based on the ratios calculated and their trend over the three years.  
(c) Draw a DuPont chart for FY 2017-18.
2. From the given historical returns data calculate the beta coefficient of ITC stock.
3. Calculate the cost of capital for ITC and the intrinsic value of the ITC stock. You may assume that (i) the historical CAGR of dividend will decline linearly to settle at 10 percent in the next 10 years (ii) Yield on 10 year G-Secs is 7.76 percent.
4. What are the inventory period, account receivable period, account payable period and operating cycle for ITC for the years 2016-17 and 2017-18? Are they improving?
5. What is the dividend distribution policy of the company? Does the dividend data shown above corroborate that policy? Comment on the payout ratio over the past six years. Do you think that it has something to do with information signaling or clientele effect?
  - (i) From the stock split, bonus and dividend actions of the company what picture do you get of the company's attitude towards investors?
6. What do you think is the rationale behind the company's persistent efforts at an image makeover?

Can you see any method in the company's foray into the various segments?

Comment on the capital allocation, relative performance and profitability of the various segments.

7. What comments would you like to make on its shareholding pattern? What effect the shareholding pattern may have on the management and policies of the company? On the beta of the stock?
8. (a) What are the important risks faced by the company's businesses and what specific measures are adopted to manage them?  
(b) How business risk and financial risks are managed at the corporate level and what are the control mechanisms in place?

To answer the above questions use the information given in the case and the annual report of ITC for 2017-2018 and other sources of information in public domain.

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\* Contributed by Venugopal Unni

# A P P E N D I X

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## Tables

**Table A.1 Future Value Interest Factor (*FVIF*)**  
 $FVIF(r, n) = (1 + r)^n$

<i>n</i>	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.188	1.210	1.232	1.254	1.277
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	1.368	1.405	1.443
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	1.518	1.574	1.630
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	1.685	1.762	1.842
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	1.870	1.974	2.082
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	2.076	2.211	2.353
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	2.305	2.476	2.658
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	2.558	2.773	3.004
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	2.839	3.106	3.395
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853	3.152	3.479	3.836
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	3.498	3.896	4.335
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	3.883	4.363	4.898
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	4.310	4.887	5.535
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	4.785	5.474	6.254
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	5.311	6.130	7.067
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	5.895	6.866	7.986
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	6.544	7.690	9.024
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	7.263	8.613	10.197
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.728	8.062	9.646	11.523
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835	13.585	17.000	21.231
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449	22.892	29.960	39.116

<i>Period</i>	<i>n</i>	14%	15%	16%	17%	18%	19%	20%	24%	28%	32%	36%	40%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	1.140	1.150	1.160	1.170	1.180	1.190	1.200	1.240	1.280	1.320	1.360	1.400	
2	1.300	1.322	1.346	1.369	1.392	1.416	1.440	1.538	1.638	1.742	1.850	1.960	
3	1.482	1.521	1.561	1.602	1.643	1.685	1.728	1.907	2.097	2.300	2.515	2.744	
4	1.689	1.749	1.811	1.874	1.939	2.005	2.074	2.364	2.684	3.036	3.421	3.842	
5	1.925	2.011	2.100	2.192	2.288	2.386	2.488	2.392	3.436	4.007	4.653	5.378	
6	2.195	2.313	2.436	2.565	2.700	2.840	2.986	3.635	4.398	5.290	6.328	7.530	
7	2.502	2.660	2.826	3.001	3.185	3.379	3.583	4.508	5.629	6.983	8.605	10.541	
8	2.853	3.059	3.278	3.511	3.759	4.021	4.300	5.590	7.206	9.217	11.703	14.758	
9	3.252	3.518	3.803	4.108	4.435	4.785	5.160	6.931	9.223	12.166	15.917	20.661	
10	3.707	4.046	4.411	4.807	5.234	5.695	6.192	8.549	11.806	16.060	21.647	28.925	
11	4.226	4.652	5.117	5.624	6.176	6.777	7.430	10.657	15.112	21.199	29.439	40.496	
12	4.818	5.350	5.936	6.580	7.288	8.064	8.916	13.215	19.343	27.983	40.037	56.694	
13	5.492	6.153	6.886	7.699	8.599	9.596	10.699	16.386	24.759	36.937	54.451	79.372	
14	6.261	7.076	7.988	9.007	10.147	11.420	12.839	20.319	31.961	48.757	74.053	111.120	
15	7.138	8.137	9.266	10.539	11.974	13.590	15.407	25.196	40.565	64.359	100.712	155.568	
16	8.137	9.358	10.748	12.330	14.129	16.172	18.488	31.243	51.923	84.954	136.969	217.795	
17	9.276	10.761	12.468	14.426	16.672	19.244	22.186	38.741	66.461	112.139	186.278	304.914	
18	10.575	12.375	14.463	16.879	19.673	22.901	26.623	48.039	85.071	148.023	253.388	426.879	
19	12.056	14.263	16.777	19.748	23.214	27.252	31.948	59.568	108.890	195.391	344.540	597.630	
20	13.743	16.367	19.461	23.106	27.393	32.429	38.338	73.864	139.380	257.916	468.574	836.683	
25	26.462	32.919	40.874	50.658	62.669	77.388	95.396	216.542	478.905	1033.590	2180.081	4499.880	
30	50.950	66.212	85.850	111.065	143.371	184.675	237.376	634.820	1645.504	4142.075	10143.019	24201.432	

**Table A.2 Future Value Interest Factor for an Annuity  $FVIFA(r, n) = \frac{(1 + r)^n - 1}{r}$**

<i>Period</i>	<i>n</i>	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100	2.110	2.120	2.130	
3	3.030	3.060	3.091	3.122	3.152	3.184	3.215	3.246	3.278	3.310	3.342	3.374	3.407	
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641	4.710	4.779	4.850	
5	5.101	5.204	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105	6.228	6.353	6.480	
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716	7.913	8.115	8.323	
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487	9.783	10.089	10.405	
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436	11.859	12.300	12.757	
9	9.369	9.755	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579	14.164	14.776	15.416	
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937	16.722	17.549	18.420	
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531	19.561	20.655	21.814	
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.495	22.953	24.523	26.212	28.029
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523	26.212	28.029	29.985	
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975	30.095	32.393	34.883	
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772	34.405	37.280	40.417	
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950	39.190	42.753	46.672	
17	18.430	20.012	21.762	23.698	25.840	28.813	30.840	33.750	36.974	40.545	44.501	48.884	53.739	
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599	50.396	55.750	61.725	
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159	56.939	63.440	70.749	
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275	64.203	72.052	80.947	
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347	114.413	133.334	155.620	
30	34.785	40.568	47.575	56.805	66.439	79.058	94.461	113.283	136.308	164.494	199.021	241.333	293.199	

<i>Period</i>	<i>n</i>	14%	15%	16%	17%	18%	19%	20%	24%	28%	32%	36%	40%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.140	2.150	2.160	2.170	2.180	2.190	2.200	2.240	2.280	2.320	2.360	2.400	
3	3.440	3.473	3.506	3.539	3.572	3.606	3.640	3.778	3.918	4.062	4.210	4.360	
4	4.921	4.993	5.066	5.141	5.215	5.291	5.368	5.684	6.016	6.362	6.725	7.104	
5	6.610	6.742	6.877	7.014	7.154	7.297	7.442	8.048	8.700	9.398	10.146	10.946	
6	8.536	8.754	8.977	9.207	9.442	9.683	9.930	10.980	12.136	13.406	14.799	16.324	
7	10.730	11.067	11.414	11.772	12.142	12.523	12.916	14.615	16.534	18.696	21.126	23.853	
8	13.233	13.727	14.240	14.773	15.327	15.902	16.499	19.123	22.163	25.678	29.732	34.395	
9	16.085	16.786	17.518	18.285	19.086	19.923	20.799	24.712	29.369	34.895	41.435	49.153	
10	19.337	20.304	21.321	22.393	23.521	24.709	25.959	31.643	38.592	47.062	57.352	69.814	
11	23.044	24.349	25.733	27.200	28.755	30.404	32.150	40.238	50.399	63.122	78.998	98.739	
12	27.271	29.002	30.850	32.824	34.931	37.180	39.580	50.985	65.510	84.320	108.437	139.235	
13	32.089	34.352	36.786	39.404	42.219	45.244	48.497	64.110	84.853	112.303	148.475	195.929	
14	37.518	40.505	43.672	47.103	50.818	54.841	59.196	80.496	109.612	149.240	202.926	275.300	
15	43.842	47.580	51.660	56.110	60.965	66.261	72.035	100.815	141.303	197.997	276.979	386.420	
16	50.980	55.717	60.925	66.649	72.939	79.850	87.442	126.011	181.868	262.356	377.692	541.988	
17	59.118	65.075	71.673	78.979	87.068	96.022	105.931	157.253	233.791	347.310	514.661	759.784	
18	68.394	75.836	84.141	93.406	103.740	115.266	128.117	195.994	300.252	459.449	700.939	1064.697	
19	78.969	88.212	98.603	110.285	123.414	138.166	154.740	244.033	385.323	607.472	954.277	1491.576	
20	91.025	102.440	115.380	130.033	146.628	165.418	186.688	303.601	494.213	802.863	1298.817	2089.206	
25	181.871	212.793	249.214	292.105	342.603	402.042	471.981	898.092	1706.803	3226.844	6053.004	11247.199	
30	356.787	434.745	530.321	647.439	790.948	966.712	1181.882	2640.916	5873.231	12940.859	28172.276	60501.081	

**Table A.3 Present Value Interest Factor  $PVIF(r, n) = (1 + r)^{-n}$**

<i>Period</i>	<i>n</i>	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783	
3	0.971	0.924	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693	
4	0.961	0.924	0.889	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613	
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543	
6	0.942	0.888	0.838	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480	
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.425	
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376	
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.391	0.361	0.333	
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.352	0.322	0.295	
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261	
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231	
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.258	0.229	0.204	
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.232	0.205	0.181	
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.209	0.183	0.160	
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141	
17	0.844	0.714	0.605	0.513	0.436	0.377	0.311	0.270	0.231	0.198	0.170	0.146	0.125	
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.153	0.130	0.111	
19	0.828	0.686	0.570	0.475	0.396	0.331	0.276	0.232	0.194	0.164	0.138	0.116	0.098	
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087	
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092	0.074	0.059	0.047	
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057	0.044	0.033	0.026	

<i>Period</i>	<i>n</i>	14%	15%	16%	17%	18%	19%	20%	24%	28%	32%	36%	40%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.877	0.870	0.862	0.855	0.847	0.840	0.833	0.806	0.781	0.758	0.735	0.714	
2	0.769	0.756	0.743	0.731	0.718	0.706	0.694	0.650	0.610	0.574	0.541	0.510	
3	0.675	0.658	0.641	0.624	0.609	0.593	0.579	0.524	0.477	0.435	0.398	0.364	
4	0.592	0.572	0.552	0.534	0.516	0.499	0.482	0.423	0.373	0.329	0.292	0.260	
5	0.519	0.497	0.476	0.456	0.437	0.419	0.402	0.341	0.291	0.250	0.215	0.186	
6	0.456	0.432	0.410	0.390	0.370	0.352	0.335	0.275	0.227	0.189	0.158	0.133	
7	0.400	0.376	0.354	0.333	0.314	0.296	0.279	0.222	0.178	0.143	0.116	0.095	
8	0.351	0.327	0.305	0.285	0.266	0.249	0.233	0.179	0.139	0.108	0.085	0.068	
9	0.308	0.284	0.263	0.243	0.226	0.209	0.194	0.144	0.108	0.082	0.063	0.048	
10	0.270	0.247	0.227	0.208	0.191	0.176	0.162	0.116	0.085	0.062	0.046	0.035	
11	0.237	0.215	0.195	0.178	0.162	0.148	0.135	0.094	0.066	0.047	0.034	0.025	
12	0.208	0.187	0.168	0.152	0.137	0.124	0.112	0.076	0.052	0.036	0.025	0.018	
13	0.182	0.163	0.145	0.130	0.116	0.104	0.093	0.061	0.040	0.027	0.018	0.013	
14	0.160	0.141	0.125	0.111	0.099	0.088	0.078	0.049	0.032	0.021	0.014	0.009	
15	0.140	0.123	0.108	0.095	0.084	0.074	0.065	0.040	0.025	0.016	0.010	0.006	
16	0.123	0.107	0.093	0.081	0.071	0.062	0.054	0.032	0.019	0.012	0.007	0.005	
17	0.108	0.093	0.080	0.069	0.060	0.052	0.045	0.026	0.015	0.009	0.005	0.003	
18	0.095	0.081	0.069	0.059	0.051	0.044	0.038	0.021	0.012	0.007	0.004	0.002	
19	0.083	0.070	0.060	0.051	0.043	0.037	0.031	0.017	0.009	0.005	0.003	0.002	
20	0.073	0.061	0.051	0.043	0.037	0.031	0.026	0.014	0.007	0.004	0.002	0.001	
25	0.038	0.030	0.024	0.020	0.016	0.013	0.010	0.005	0.002	0.001	0.000	0.000	
30	0.020	0.015	0.012	0.009	0.007	0.005	0.004	0.002	0.001	0.000	0.000	0.000	

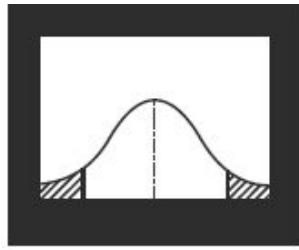
**Table A.4 Present Value Interest Factor for an Annuity  $PVIFA (r, n) = \frac{1 - 1/(1 + r)^n}{r}$**

<i>Period</i>	<i>n</i>	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	
6	5.795	5.601	5.417	5.242	5.076	4.917	4.766	4.623	4.486	4.355	4.231	4.111	3.998	
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	
12	11.255	10.575	9.945	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.060	7.606	7.191	6.811	6.462	
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.312	7.824	7.379	6.974	6.604	
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.128	8.514	7.963	7.469	7.025	
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330	
30	25.808	22.397	19.600	17.292	15.373	13.765	12.409	11.258	10.274	9.427	8.694	8.055	7.496	

<i>Period</i>	<i>n</i>	14%	15%	16%	17%	18%	19%	20%	24%	28%	32%	36%	40%
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1	0.877	0.870	0.862	0.855	0.847	0.840	0.833	0.806	0.781	0.758	0.735	0.714	
2	1.647	1.626	1.605	1.585	1.566	1.547	1.528	1.457	1.392	1.332	1.276	1.224	
3	2.322	2.283	2.246	2.210	2.174	2.140	2.106	1.981	1.868	1.766	1.674	1.589	
4	2.914	2.855	2.798	2.743	2.690	2.639	2.589	2.404	2.241	2.096	1.966	1.849	
5	3.433	3.352	3.274	3.199	3.127	3.058	2.991	2.745	2.532	2.345	2.181	2.035	
6	3.889	3.784	3.685	3.589	3.498	3.410	3.326	3.020	2.759	2.534	2.339	2.168	
7	4.288	4.160	4.039	3.922	3.812	3.706	3.605	3.242	2.937	2.678	2.455	2.263	
8	4.639	4.487	4.344	4.207	4.078	3.954	3.837	3.421	3.076	2.786	2.540	2.331	
9	4.946	4.772	4.607	4.451	4.303	4.163	4.031	3.566	3.184	2.868	2.603	2.379	
10	5.216	5.019	4.883	4.659	4.494	4.339	4.193	3.682	3.269	2.930	2.650	2.414	
11	5.453	5.234	5.029	4.836	4.656	4.486	4.327	3.776	3.335	2.978	2.683	2.438	
12	5.660	5.421	5.197	4.988	4.793	4.611	4.439	3.851	3.387	3.013	2.708	2.456	
13	5.842	5.583	5.342	5.118	4.910	4.715	4.533	3.912	3.427	3.040	2.727	2.469	
14	6.002	5.724	5.468	5.229	5.008	4.802	4.611	3.962	3.459	3.061	2.740	2.478	
15	6.142	5.847	5.575	5.324	5.092	4.876	4.675	4.001	3.483	3.076	2.750	2.484	
16	6.265	5.954	5.669	5.405	5.162	4.938	4.730	4.033	3.503	3.088	2.758	2.489	
17	6.373	6.047	5.749	5.475	5.222	4.990	4.775	4.059	3.518	3.097	2.763	2.492	
18	6.647	6.128	5.818	5.534	5.273	5.033	4.812	4.080	3.529	3.104	2.767	2.494	
19	6.550	6.198	5.877	5.584	5.316	5.970	4.844	4.097	3.539	3.109	2.770	2.496	
20	6.623	6.259	5.929	5.628	5.353	5.101	4.870	4.110	3.546	3.113	2.772	2.497	
25	6.873	6.464	6.097	5.766	5.467	5.195	4.948	4.147	3.564	3.122	2.776	2.499	
30	7.003	6.566	6.177	5.829	5.517	5.235	4.979	4.160	3.569	3.124	2.778	2.500	

**Table A.5 Normal Distribution**

(Area of the Normal Distribution, that is, Z Standard Deviations to the Left or Right of the Mean)



Number of Standard Deviations from Mean, (Z)	Area to the Left or Right (One tail)	Number of Standard Deviations from Mean (Z)	Area to the Left or Right (One tail)
0.00	0.5000	1.55	0.0606
0.05	0.4801	1.60	0.0548
0.10	0.4602	1.65	0.0495
0.15	0.4404	1.70	0.0446
0.20	0.4207	1.75	0.0401
0.25	0.4013	1.80	0.0359
0.30	0.3821	1.85	0.0322
0.35	0.3632	1.90	0.0287
0.40	0.3446	1.95	0.0256
0.45	0.3264	2.00	0.0228
0.50	0.3085	2.05	0.0202
0.55	0.2912	2.10	0.0179
0.60	0.2743	2.15	0.0158
0.65	0.2578	2.20	0.0139
0.70	0.2420	2.25	0.0122
0.75	0.2264	2.30	0.0107
0.80	0.2119	2.35	0.0094
0.85	0.1977	2.40	0.0082
0.90	0.1841	2.45	0.0071
0.95	0.1711	2.50	0.0062
1.00	0.1587	2.55	0.0054
1.05	0.1469	2.60	0.0047
1.10	0.1357	2.65	0.0040
1.15	0.1251	2.70	0.0035
1.20	0.1151	2.75	0.0030
1.25	0.1056	2.80	0.0026
1.30	0.0968	2.85	0.0022
1.35	0.0885	2.90	0.0019
1.40	0.0808	2.95	0.0016
1.45	0.0735	3.00	0.0013
1.50	0.0668	3.05	0.0011
		3.10	0.0010
		3.25	0.0006
		3.50	0.00023
		4.00	0.00003
		4.99	0.0000003

**B**  
**APPENDIX**

## Solutions to End-of-Chapter Problems and Mini Cases

<b>CHAPTER 2</b>			
<b>Problem no.</b>			<b>Answer</b>
2.1	NR	5%	0.06 %
		10%	0.23 %
		20%	0.91 %
		60%	5.71 %

<b>CHAPTER 4</b>			
<b>Problem no.</b>			<b>Answer</b>
4.1			25%
4.2			₹ 8 mn.
4.3			8
4.4			1200
4.5			43.8 days
4.6			1,200,000
4.7	Short-term bank borrowing		66,000
	Total liabilities/assets		176,000
	Plant & equipment		54,560
	Inventories		42,240
	Cash equivalents		49,867
	Trade receivables		29,333
	Sales		264,000
	Cos of goods sold		211,200
4.8	Current ratio		1.50
	Acid-test ratio		0.80
	Debt-equity ratio		1.31

	Times interest earned ratio	3.00
	Inventory turnover ratio	3.60
	Average collection period	57.6 days
	Total assets turnover ratio	1.30
	Net profit margin	5.40%
	Earning power	20.10%
	Return on equity	15.70%
<i>Miniaise</i>	Current ratio	1.41
	Acid-test ratio	0.90
	Debt-equity ratio	0.52
	Debt-assets ratio	0.34
	Times interest earned ratio	32.91
	Inventory turnover ratio	6.56
	Debtors turnover ratio	11.42
	Average collection period	31.95 days
	Fixed assets turnover ratio	4.81
	Total assets turnover ratio	0.98
	Net profit margin	16.90%
	Return on assets	16.52%
	Earning power	21.30%
	Return on equity	25.60%
	ROCE	16.60%
	Yield	19.24%
	Market to book value ratio	10.08
	PE ratio	42.55

<b>CHAPTER 5</b>		
<b>Problem no.</b>		<b>Answer</b>
5.1	Retained earnings	9
5.2	Retained earnings	38
5.3	EFR	5
5.4	1	₹ 144
5.5	(a)	52.5
	(c)	For 20X0 For 20X1
	Current ratio	1.5 1.8
	Debt to total assets ratio	0.53 0.54
	Return on equity	14.30% 14.50%
	(d) EFR For	20X1 9.38
		20X2 8.75
		20X3 8.11
		20X4 7.49
5.6		7.14%
5.7	(a)	₹ 50
	(b) (i)	STL <= ₹ 102.50
	(ii) Short-term borrowings	₹ 42.5
	Long-term loans	7.5
5.8		4140
5.9	a. g =	3.70%
	b. d must be reduced to	46.60%
	c. A/E ratio to be increased	to 3.33
	d. m should be increased	to 7.92%
<i>Minicase</i>	Additional term loan	389.6
	Additional equity	100

#### **CHAPTER 6**

<b>Problem no.</b>			<b>Answer</b>
6.1	a		1469
	b		1611
	c		1762
	d		2011
6.2			30 years
6.3			18.00%

6.4			₹ 79,481
6.5			₹ 56,983
6.6			20.30%
6.7			17.40%
6.8	(i)		₹ 4,670
	(ii)		₹ 4,040
	(iii)		₹ 3,270
6.9			₹ 7,582
6.10			a
6.11			₹ 10,608
6.12			₹ 22,683
6.13			₹ 26,212
6.14			₹ 13,165
6.15			15.10%
6.16	Stream A		₹ 2,590.90
	Stream B		₹ 3,625.20
	Stream C		₹ 2,825.10
6.17			₹ 21,910
6.18			₹ 9,030
6.19	a		0.60%
	b		2.20%
	c		2.80%
6.20			₹ 40,388
6.21	For 10 years		₹ 20,000
6.22			₹ 26530
	With inflation		₹ 12,283
6.23			₹ 2,544
6.24			₹ 6,326
6.25			₹ 7,994
6.26			₹ 82,540
6.27			20% p.a.
6.28		₹ Million	376.68
6.29			7.3 years
6.31			30 years
6.32			₹ 2,224 mn.
6.33	a		₹ 700,000
6.34	a. Option e		₹ 80 crore.
	b.		₹ 77.8 crore.

6.35			\$ 16,654,633
6.36			\$ 30,781,329
6.37			₹ 9,434,536
6.38			8.32%
6.39			9.90%
6.41			7 years
6.42			14.84%
6.43			17.65%
6.44			9.60%
6.45			₹ 1,609,757
Minicase-1	1. Money needed 15 years hence		₹ 4,042,000
	2. Investment savings		₹ 48,338
	3. Donation need		₹ 157,676
	4. PV.life time salary		₹ 7,254,962
Minicase-2	1. Monthly deposit in RD 1		₹ 17,742
	in RD 2		₹ 20,236
	2.Deposit		₹ 61,53,292
	3. Deposit		₹ 45,95,432

7.9			₹ 264
7.10			5.75%
7.11			14%
7.12			₹ 23.77
7.13			₹ 136.37
7.14			17.39%
7.15			₹ 74.80
7.16			₹ 75
7.17			₹ 133.4
7.18			10.88%
7.19			9.06%
7.20			₹ 6.86
7.21			₹ 88.76
7.22			₹ 46.3
7.23			9.30%
7.24	A	B	
	Current yield	9.62%	8.32%
	Capital gains yield next year	0.67%	0.65%
7.25	Return for seller		13%
	Return for buyer		11.55%
7.26			₹ 5
Minicase-1	b		₹ 1,080.30
	c		8.93%
	d		9%
	g (i)		₹ 250.88
	(ii) Dividend yield		3%
	Cap.gain yield		12%
	h		₹ 295.67
	i		₹ 250
Minicase-2	1		10.64%
	2. P/E ratio		10
	3. Possible price		₹ 131.47
	PVGO		₹ 108.42

CHAPTER 8			
Problem no.			Answer
8.1	a.		₹ 10.80
8.2		E(R)	$\sigma$
	a	1,150	143.18
	b	1,200	264.58
	c	1,175	84.41
	d	1,165	57.66
8.3	a.	RA =	0.96
	b	0.52 + 0.96RM	
8.4			₹ 22.74
8.5			1.75
8.6			13%
8.7			₹ 34.45
8.8			0.71
8.9		A	B
	Average return	9.83%	8.33%
	Standard deviation	12.88%	14.51%
	Variance	165.77%	210.67%
8.10	A.M		11.60%
	G.M.		10%
8.11			14.20%
8.12			7%
Minicase-1		A.M	G.M
	Tata Motors	-2.83%	3.21%
	TCS	1.73%	1.48%
	HUL	2.50%	2.38%
	Nifty	0.97%	0.91%
		Std.dev.	Beta
	Tata Motors	8.61%	1.47
	TCS	7.41%	1.15
	HUL	5.09%	0.91
	Nifty	3.66%	
Minicase-2	A.M	G.M	St.dev
	NTPC	2.27%	1.12%
			16.67%

	Escorts	68.4%	26.45%	137.90%
	MRF	54.71%	34.20%	93.67%
CHAPTER 9				
Problem no.			Answer	
9.1	a.	E(R)	$\sigma$	
	Asset 1		12.90%	9.17%
	Asset 2		13%	2.24%
	b			16.7
	c			0.81
9.2	a.			7.83%
	b			8.50%
	c			8.67%
	d			8.88%
9.3				10.60%
9.4				0.21
9.5				25.62%
9.6				11.75%
Minicase	a.	Exp. Return	Std.dev.	
		A 19	19.08	
		B 4	15.62	
		C 14	10.44	
	Mkt portfolio	15	13.89	
	b.	COV(A, B)	(-) 296	
		COV(A, C)	199	
	c.	$\rho_{AB}$	(-) 1	
		$\rho_{AC}$	1	
	d.	Exp. Return	Std.dev.	
	Equal weights	11.50%	2%	
	Other weights	12	3.61%	
	e.(i)	Required Return	$6\% + \beta \times 9\%$	
	(ii)	Stock A	2.20%	
		Stock B	4.30%	
		Stock C	(-) 0.1%	
	f.	Beta	1.53	

<b>CHAPTER 10</b>		
<b>Problem no.</b>		<b>Answer</b>
10.1		₹ 18.37
10.2		102%
10.3		₹ 31.90
10.4		₹ 11.86
10.5		₹ 3.27
<i>Minicase</i>	b	In-the-money Out of-the-money
	Calls with st.price.	280, 300, 320
	Puts with st.price	340, 360
	d. Max. profit	₹ 11
	Max.loss	₹ 9
	B.E. price	₹ 349
	g	₹ 24.42

<b>CHAPTER 11</b>		
<b>Problem no.</b>		<b>Answer</b>
11.1	a.	-44,837
	b	-27,264
11.2		9.20%
11.3		Rule breaks down
11.4		₹ 93,721
11.5		₹ 141,256
11.7	b. P	20.13%
	Q	9.34%
c.		in both cases choose P
d. P		18%
Q		10.41%
11.8	a.	NPV IRR
	Project	₹ 2.79 mn. 12.98%
	Project B	₹ 3.45 mn 14.40%
b	Differ.Project	₹ -0.67 mn 11.53%
11.9	Project	M N
a		2.63 years 1.55 years
b		3.1 years 1.92 years
c		Both projects acceptable

	d		Project M
	e		Project N
	f	23.01%	23.26%
11.10	a		18.32%
	b		14.96%
11.11			16.61%
11.12			0.38
11.13	IRR rule breaks down		
11.14	NPV	\$ 23,094	
	IRR		15.75%
<i>Minicase</i>		Payback period	Discounted Payback period
	a. A	1.57 yrs	1.93 yrs
	B	2.27 yrs	2.59 yrs
		NPV	IRR
	b & c. A	3,820	28.84%
	B	3,758	23.43%
	C	19,318	rule breaks down
			MIRR
	d. A		20.80%
	B		20.70%
	C		60.80%

<b>CHAPTER 12</b>		
<b>Problem no.</b>		<b>Answer</b>
12.1	a. (₹ in mn.)	Year NCF
		0 -200.00
		1 116.25
		2 113.44
		3 111.33
		4 109.75
		5 108.56
		6 107.67
		7 205.00
b		55.17%
12.2	a. (₹ in mn.)	Year NCF
		0 -140.00

		<b>1</b>	10.20
		<b>2</b>	20.55
		<b>3</b>	31.46
		<b>4</b>	62.80
		<b>5</b>	49.25
		<b>6</b>	35.94
		<b>7</b>	55.00
	<b>b</b>		₹ 1.70mn.
<b>12.3</b>	a. (₹ in mn.)	Year	NCF(Rs)
		<b>0</b>	-2,600,000
		<b>1</b>	620,000
		<b>2</b>	578,750
		<b>3</b>	547,813
		<b>4</b>	524,609
		<b>5</b>	2,307,207
	<b>b</b>		₹ 267,849
<b>12.4</b>			₹ 22,051
<b>12.5</b>		Year	NCF(Rs)
		<b>0</b>	-310,000
		<b>1</b>	28,700
		<b>2</b>	21,210
		<b>3</b>	15,656
		<b>4</b>	11,540
		<b>5</b>	23,494
<i>Minicase-I</i>	a. (₹ in mn.)	Year	NCF
		<b>0</b>	-23
		<b>1</b>	7.425
		<b>2</b>	7.144
		<b>3</b>	6.933
		<b>4</b>	6.775
		<b>5</b>	19.656
	b. (₹ in mn.)	Year	NCF
		<b>0</b>	-10
		<b>1</b>	6.095
		<b>2</b>	3.866
		<b>3</b>	3.865
		<b>4</b>	3.917
		<b>5</b>	12.009

<i>Minicase-II</i>	IRR		21.07%
<b>CHAPTER 13</b>			
<b>Problem no.</b>		<b>Answer</b>	
13.1		(₹ mn.)	NPV
	a	Pessim.	-171.47
		Expect.	21.31
		Optim.	260.1
	b	Acct.BEP	₹ 112.5mn.
		Fin. BEP	₹ 186.26 mn.
13.2	2 a(i)	Quantity	NPV (Rs)
		800	-16,732
		1400	-5,360
		1800	2,222
	a(ii)	unit price	NPV (Rs)
		20	-31,895
		30	-5,360
		50	47,711
	a(iii)	Variable cost per unit	NPV (Rs)
		40	-43,268
		20	-5,360
		15	7,908
	b. Acct.BEP		15,000
		Fin. BEP	50,484
13.3	Exp. NPV		₹ 2 mn.
	Std. deviation		₹ 1.0 mn.
13.4	Exp. NPV		₹ 7,708
	Std. deviation		₹ 18,152
13.5	a.		3,044
	b.		0.009
	c.		0.709
<i>Minicase-I</i>	<b>1</b>		2,369
	<b>2</b>		929
	<b>3</b>		886
	<b>4</b>		44
	<b>5</b>		477

<i>Minicase-II</i>	a		58.24%
	b		16.40%
<b>CHAPTER 14</b>			
<b>Problem no.</b>		<b>Answer</b>	
14.1	a.		12.60%
	b		8.19%
14.2			10.85%
14.3			14.18%
14.4			14.68%
14.5			0.488
14.7	a.	BV weight	MV weight
	Equity	0.54	0.78
	Debt I	0.2	0.09
	Debt II	0.13	0.06
	Bank loan	0.13	0.07
14.8	a.		12.50%
	b		19.72%
14.9	Marginal cost of capital of first chunk		13.27%
	Marginal cost of capital of 2nd chunk		13.50%
14.10	a. i		11.99%
	ii		11.90%
	b. Range of total financing	0-50 mn.	10.75%
		50-100 mn.	11.00%
14.11	a.		16.37%
	b		9%
	c		₹ 8.51 mn.
14.12	P,Q,R would be rejected and S accepted		
<i>Minicase</i>			
a	Post-tax cost of debt		5.55%
	Post-tax cost of preference		7.53%
b	As per DDM		13.85%
	As per CAPM		14.70%
c			10.32%
d			12.60%

<b>CHAPTER 15</b>			
<b>Problem no.</b>			<b>Answer</b>
15.1	Plas. emu.EAC		₹ 65,732
	Dist EAC		₹ 74,938
15.2			₹ 770,311
15.3	Less costly overhaul EAC		₹ 121,433
15.4	a.		₹ -2,022,000
	b.		₹ -2,840,182
	c		₹ 1,022,076
15.5	a.		₹ -1,004,000
	b.		₹ -1,337,333
	c		₹ 834,036
15.6	Cheaper option	Plastic emulsion	
15.7	First offer preferred with EAC		₹ 197,563
15.8			₹ 23,419,490
<i>Minicase</i>		Import option	SIDCO offer
	NPV (₹)	64,558,783	62,560,391
<b>CHAPTER 18</b>			
<b>Problem no.</b>			<b>Answer</b>
18.1	a.		₹ 25
b			₹ 176.7
c	For subsc.180		₹ 180
	For subsc.100		₹ 166.7
<b>CHAPTER 19</b>			
<b>Problem no.</b>			<b>Answer</b>
19.1			₹ 233 mn.
19.2		(₹ mn)	Mkt. val
	Box	Equity	13.33
		Debt	0
		Firm	13.33
	Cox	Equity	10
		Debt	5
		Firm	15
	a.	Box	15.00%

		Cox	13.64%
	b. Av.cost of cap.		12%
	c. Av.cost of cap.		15%
19.3	D/E		2
19.5			₹ 125 mn.
19.6			₹ 0.37
<b>CHAPTER 20</b>			
<b>Problem no.</b>		<b>Answer</b>	
20.1	a.	₹	4,950,000
20.3			0.887
20.4			2.67
20.5			5.52%
20.6			26.12%
20.7	a.		3.75
	b.		2
20.8			1.66
20.9	a.		0.191
	b. Debt		₹ 94.67 mn.
20.10		Plan A	Plan B
	PBIT	36	36
	Int	6	9.6
	PBT	30	26.4
	Tax	15	13.2
	PAT	15	13.2
	No of equity Shares	5m	4m
	EPS	3	4.4
	P/E	10.2	9.8
	M.P	30.6	33.34
20.11	Quantity	8000	10,000
	DOL	1.75	1.52
	DFL	1.07	1.15
	DTL	1.87	1.75
<i>Minicase</i>	a		₹ 148 crore
	b		₹ 7.14
	c		DTL
		Current	2.67

		Equity option	2.51
		Debt option	2.77
<b>CHAPTER 21</b>			
<b>Problem no.</b>			<b>Answer</b>
21.1	a.	Ratio 50%	₹ 28.13
		Ratio 75%	₹ 26.56
		Ratio 100%	₹ 25.00
	b.	Ratio 25%	₹ 100
		Ratio 50%	₹ 33.33
		Ratio 75%	₹ 27.27
21.2	P		₹ 69.23
	Q		₹ 68.65
<b>CHAPTER 22</b>			
<b>Problem no.</b>			<b>Answer</b>
22.1	a.	Year 1	₹ 1.20
		Year 2	₹ 1.70
		Year 3	₹ 0.80
		Year 4	₹ 2.20
	b.	Year 1	₹ 3,000
		Year 2	₹ 500
		Year 3	₹ 6,500
		Year 4	Nil
	c. External Financing		required
		DPS 1.20	₹ 4,000
		DPS 1.44	₹ 2,200
		DPS 1.08	₹ 6,400
		DPS 1.80	₹ 2,000
2	A sensible DPS would be		₹ 1.20
<i>Minicase</i>	c (i) (₹ mn.)	Year	Dividend
	Pure residual dividends	1	26.67
		2	45.33
		3	24
		4	43
		5	19

	c(ii) under fixed payout ratio	1	28.8
		2	32.4
		3	25.2
		4	34.5
		5	44.1
	c(iii) smoothed residual div.	1	30
	(suggested)	2	30
		3	30
		4	34
		5	34
	d		₹ 2,42

### CHAPTER 23

Problem no.		Answer	
23.1	Op. cycle		124.2 days
	Cash cycle		80.77 days
23.2	Op. cycle		108.9 days
	Cash cycle		78.2 days
23.3			₹ 841,417
Mimicase	Total cash cost	₹ million	630
	W.C.required	₹ million	107.5

### CHAPTER 24

Problem no.		Answer	
24.1	Surplus/deficit	January	nil
		February	-18,000
		March	-10,000
24.2	Negative net float		₹ 68,000
24.3			₹ 346,410
24.4	RP		₹ 149,695
	UL		₹ 249,085
24.5			₹ 1,979,899
24.6			₹ 1,256,354
Mimicase	Surplus/deficit 20X1	Jan.	13.3
		Feb	26.81
		Mar	34.3
		Apr	23.78

		May	45.56
		Jun	47.53

### CHAPTER 25

Problem no.		Answer	
25.1	ΔRI		₹ 207,500
25.2	ΔRI		Nil
25.3	ΔRI		₹ 79,200
25.4	ΔRI		-₹ 289,495
25.5	ACP		38 days
	Avg. investment in receivables		₹ 4,222,222xV (where V=VC/sales)
25.6	a.		19 days
	b.		₹ 395,833
25.7			₹ 537,333
25.8	Exp.profit		₹ 850
25.9			0.8
<i>Mimicase-I</i>			
	a Increase in RI		₹ 2,533,333
	b Decrease in RI		₹ 1,666,667
	c Decrease in RI		₹ 1,454,667
<i>Mimicase-II</i>			₹ 1,503,682

### CHAPTER 26

Problem no.		Answer	
26.1	a.	Order 1	₹ 3,950
		Order 2	₹ 2,275
		Order 5	₹ 1,750
		Order 10	₹ 2,375
	b.		58 units
26.2	a.		980
	b.		10.2
			₹ 6,122.5
26.3	Δπ		₹ 27,898
26.4	Δπ		₹ 13,093
26.5	a. Optimal safety stock		13.6 tons
	b.		0.18

26.6	Percentage of total value	Class A	69.2
		Class B	19.2
		Class C	11.6
<i>Minicase</i>	b optimal level		0 tonnes
	Stock-out probability		0.27
	c		162 tonnes
<b>CHAPTER 27</b>			
<b>Problem no.</b>		<b>Answer</b>	
27.1	a.		18.20%
	b.		36.70%
	c.		31.80%
	d.		36.40%
27.2	a.		10.40%
	b.		21%
	c.		22.30%
	d.		14.50%
27.3	Method 1		₹ 18 mn.
	Method 2		₹ 15 mn.
	Method 3		₹ 1.5 mn.
<i>Minicase</i>	1 RM & stores holding		4 months
	WIP holding		0.6 months
	Finished goods holding		1.6 months
	Receivables holding		4.1 months
	Credit taken		8.2 months
	2	₹ in lacs	100.8
<b>CHAPTER 28</b>			
<b>Problem no.</b>		<b>Answer</b>	
28.1	a. $Z_i = 6.079X_i + 0.1089Y_i$		
	b.		6.211
28.2			0.2
28.3	Zi =		$0.1261X_i - 0.8325Y_i$
<b>CHAPTER 29</b>			
<b>Problem no.</b>		<b>Answer</b>	
29.1	NPV of refunding		1,358,500

29.2	NPV of refunding		-1,466,000
29.3	Bond	P	Q
	Duration (years)	4.92	3.92
	Volatility	4.17	3.31
29.4		f1	7.00%
		f2	7.40%
		f3	7.50%
		f4	7.70%
		f5	7.90%
<i>Minicase</i>	NPV of refunding		₹ 12,401,312
<b>CHAPTER 30</b>			
<b>Problem no.</b>		<b>Answer</b>	
30.1	NAL of leasing	₹	-429,000.00
30.2	NAV of HP	₹	-1,369,383
	NAV of leasing	₹	-1,302,207
<i>Minicase</i>	a.	₹	-18.89 mn.
	b.	₹	-19.54 mn
	c.	₹	-15.09 mn
<b>CHAPTER 31</b>			
<b>Problem no.</b>		<b>Answer</b>	
31.1			₹ 22.15
31.2			₹ 27.21
31.3	a.		₹ 679.05
	b.		9%
<i>Minicase</i>	1		₹ 24.57
	2	Cost of equity	Cost of debt
		19.31%	12%
	3	16.17%	
	4	15.70%	
	5	17.69%	
<b>CHAPTER 32</b>			
<b>Problem no.</b>		<b>Answer</b>	
32.1	a. FCFF for year 2	₹	18.4 mn.
	FCFF for year 3	₹	27.8 mn.

	c. FCF for yr. 2		₹ 15.4 mn.
	FCF for yr. 3		₹ 21.8 mn.
32.2			₹ 4,571.06 mn
32.3			₹ 5429.77 mn
<i>Minicase-I</i>	1 Firm value		₹ 1,321.4 mn.
	2 Value of equity		₹ 1,121.4 mn
<i>Minicase-II</i>	International	Elegant	Modern
a	EV/EBIDTA 9.96	7.47	7.33
b	Retrospective PE 13.60	12.84	8.92
	Prospective PE 14.63	12.46	9.83
d			90

### CHAPTER 33

Problem no.	Answer		
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33.1			34
33.2		₹	833.3 mn.
33.3	a. Year	1	100
		2	128
		3	156
		4	184
		5	212
	b.	NPV	510.3
33.4	Depreciation	1	162,540
		2	185,296
		3	212,237
		4	240,810
33.5			98,503
33.6	Depreciation	1	786,963
		2	881,399
		3	987,166
		4	1,105,626
		5	1,238,301
	Economic depreciation		₹ 787,030
33.7	a.	Year 1	Year 4
	ROCE	11.62%	16.59%

	ROGI	21.62%	21.62%
	CFROI	15.79%	15.79%
	b. EVA ₹	-3.382 mn.	-1.118 mn.
	CVA ₹	0.79 mn.	0.79 mn.
33.8		₹	4869.6 mn.
33.9	NPV	₹	2893.12 mn
33.10		Year	Depreciation (₹)
		1	1,018,100
		2	1,180,996
		3	1,369,955
		4	1,589,148
		5	1,843,412
33.11		Year 1	Year 5
	ROCE	17.50%	25%
	ROGI	25%	25%
	CFROI	21.48%	21.48%
	EVA	₹ 6 mn	₹ 25.2 mn
	CVA	₹ 21.93 mn	₹ 21.93 mn

### CHAPTER 34

Problem no.	Answer		
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34.2			0.6
34.3	NPV to Alpha		₹ 3 mn.
	NPV to Beta		₹ 1 mn.
34.4	a.		₹ 1.75 mn.
	b.		₹ 2.25 mn.
	c.		₹ 1.75 mn.
34.5	a.		₹ 6.22 mn.
	b(i)		₹ 6 mn.
	b(ii)		₹ 6.04 mn.
34.6			2.33
34.7			0.731
34.8	a.		0.1
	b.		0.3
	c. Will intersect when	PE =	9
34.9			₹ 183.7 mn.
<i>Minicase</i>	a		0.44
	c.		0.54

	d.		₹ 24.2
	e.		0.21
	f.		0.36
	g		13.61
<b>CHAPTER 37</b>			
<b>Problem no.</b>		<b>Answer</b>	
37.1			2.86%
37.2			1.325
37.3	a	discount	61.02%
	b.	yen/\$	103
	c.		-0.12%
37.4			₹ 5398.29 mn.
37.5		Per £	1.322
37.6			₹ 99.76
37.7	a.		₹ 38.89
	b.		₹ 45
37.8		Per £	140.35 yen

37.12			0.011
37.13		70.3524 /	70.353
37.14		premium	0.65%
<i>Miniaise</i>	a.		7,11,900
	b.		6.49%
	Outright rate better as CIP rate which is		73.41
	Outright rate		73.92
	d.		₹ 575,120
	e.		49.10%
<b>CHAPTER 40</b>			
<b>Problem no.</b>		<b>Answer</b>	
40.1	a.	Short sell B	₹ 1.43 mn.
	b.		0.7
	c. a + deposit approximately		₹ 0.43 million
40.2	Approximately		4% p.a
40.3		Per ton	₹ 554.3

## C APPENDIX

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# Sources of Financial Information

As a financial manager, you should monitor the financial and economic developments in the environment and continually enhance your professional knowledge and skills. In this endeavour you will find the following sources of information helpful.

**Financial Dailies** A convenient way of monitoring financial and economic developments is to review a financial daily. The important dailies published in India are *The Economic Times*, *The Business Line*, *The Financial Express*, and *The Business Standard*. Major foreign dailies are *The Wall Street Journal*, *The Financial Times*, and *The Asian Wall Street Journal*.

**Business and Economic Periodicals** A wealth of information, analysis, and insight is provided by business and economic periodicals. The important periodicals published in India are *Business Today*, *Business India*, *Business World*, and *The Capital Market*. Major foreign periodicals are *The Economist*, *Business Week*, *Fortune International*, and *Euromoney*.

**Professional and Academic Journals** The focus of professional and academic journals is on literature that has an enduring value. They cover conceptual developments, theoretical models, new techniques, empirical studies, and insights which represent advancement of knowledge. The important professional and academic journals of interest to the serious student of applied finance are *The Journal of Applied Corporate Finance*, *The Journal of Finance*, *Financial Management*, *Harvard Business Review*, and *Financial Executive*.

**Other Publications** Some of important other publications of interest to finance professionals are *Reserve Bank of India Bulletin*, *Money & Finance* (An ICRA publication), and a series of publications provided by The Economic Intelligence Service of the Centre for Monitoring Indian Economy.

**Corporate Data Bases** Several computerised data bases are available currently. The important ones are Prowess of the Centre for Monitoring Indian Economy and Capitaline of Capital Market.

**Websites** A number of websites are of interest to finance professionals. In particular, you should regularly visit [www.sebi.gov.in](http://www.sebi.gov.in) and [www.nse-india.com](http://www.nse-india.com) to get an update on the regulatory framework and the happenings in the Indian capital market.

## **SELECT BIBLIOGRAPHY**

I have benefited from scores of books and hundreds of articles. As it is impossible to list all of them, I have given here a selected list of books, organised in terms of the ten parts of the book. Also, at the end is a list of books relevant for the entire book.

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## Glossary

**ABC Analysis** A selective approach to inventory control which calls for a greater concentration on inventory items accounting for the bulk of usage value.

**Abnormal Return** Part of return that is not accounted for by systematic influences like the market movement.

**Accounting Rate of Return** The rate of return on an investment defined as accounting profit divided by book value of investment. It is also referred to as the average rate of return.

**Accounts Payable** Money owed by a firm to its suppliers.

**Accounts Receivable** Money owed to a firm by its suppliers.

**Accruals** Liabilities which represent expenses that have been incurred but not yet paid. Wages and taxes are the most common accruals.

**Acid Test Ratio** A liquidity measure which is defined as:  $(\text{current assets} - \text{inventories})/\text{current liabilities}$ .

**Adjusted Present Value (APV)** Net present value of an asset, if solely financed by equity, plus the present value of financing side effects.

**Adverse Selection** An incentive problem in which the buyer of insurance is likely to be more at risk than the general population.

**Ageing Schedule** A statement showing age-wise distribution of debtors (accounts receivable).

**Agency Theory** A theory about the relationship between a principal and an agent.

**Aggressive Security** A security which has a beta greater than one.

**Allocation** The process of apportioning costs (or revenues) to products, departments, divisions or other organisation units.

**American Depository Receipt (ADR)** A security issued in the US to represent shares of a foreign company.

**American Option** Option that is exercisable anytime on or before the expiration date (*cf. European Option*).

**Amortisation** This term is used in two senses: (i) repayment of loan over a period of time; (ii) write-off of an expenditure (like issue cost of shares) over a period of time.

**Annual Percentage Rate (APR)** Annual interest rate calculated on the basis of *simple interest*.

**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.

**Annuity** A stream of uniform periodic cash flows.

**Annuity Due** An annuity whose first cash flow occurs at the present time.

**Appropriations** Appropriations refer to ways of using up the profit. Dividends and transfers to various reserves are examples of appropriation.

**Arbitrage** A simultaneous purchase and sale of a security (or currency) in different markets to derive benefit from price differential.

**Ask Price (Offer Price)** Price at which a dealer is willing to sell (*cf. bid price*).

**At-the-money** The state of an option when the exercise price equals the current price of the underlying security.

**Authorised Share Capital** The maximum share capital the company is authorised to issue as per its Memorandum of Association.

**Average Collection Period** The ratio of receivables to average credit sales per day. It reflects the average length of time it takes to collect cash after credit sales.

**Balance Sheet** A statement of the assets, liabilities, and owners' equity of a firm at a given point of time. It is also referred to as the statement of financial position.

**Balloon Payment** Large final payment of a loan.

**Banker's Acceptance** A written demand, which has been accepted by a bank, to pay a specified amount at a future date.

**Bankruptcy** A state in which a firm (or individual) is unable to meet its obligations and, hence, its assets are surrendered to a court for administration.

**Basis Point** One hundredth of one percent.

**Bear Market** A market dominated by bears. (A bear is an operator who has a pessimistic view of the future).

**Bearer Security** A security for which possession is the primary evidence of ownership.

**Benefit Cost Ratio** See profitability index.

**Beta** A risk measure based on how the returns on a given security vary with the market.

**Bid Price (Buy Price)** Price at which a dealer is ready to buy (cf. Ask Price)

**Bill of Exchange** A general term for a note demanding payment.

**Bill of Lading** A document which represents ownership of goods in transit.

**Binomial Option Pricing model** An option pricing model that assumes that in each period the underlying security can take two possible values.

**Black-Scholes Model** The most popular option pricing model – named after its developers, Fischer Black and Myron Scholes – that

assumes a lognormal distribution and continuous adjustment of the replicating portfolio.

**Blue Chip Company** A large, stable, well-established company.

**Bond** An instrument for long-term debt.

**Bonus Shares** Shares issued to existing shareholders as a result of capitalisation of reserves.

**Book Building** Book building involves inviting subscriptions to a public offer of securities through a process of tendering.

**Bulldog Bond** Foreign bond issue in the United Kingdom.

**Bullet Payment** Payment of a loan in one shot rather than in a series of installments.

**Capitalisation** Net worth plus long-term debt.

**CD** Certificate of deposit.

**CFO** Chief financial officer.

**CMOs** Collateralised mortgage obligations.

**Collar** The upper and lower limit on the interest rate on a floating rate note.

**Conglomerate Merger** Merger of companies in unrelated businesses.

**Contingent Claim** A claim whose value is derived from the value of another asset.

**Controller** Officer responsible for accounting, budgeting, taxation, and auditing in a firm (cf. *treasurer*).

**Covariance** A statistical measure which reflects the nature of relationship between two random variables.

**Covenant** A definite provision in a loan contract.

**Credit Period** The length of time customers are allowed for their credit purchases.

**Credit Policy** A firm's policy regarding its credit standards, cash discount, credit period, and collection procedures.

**Credit Risk** The risk that a party to a contract will default.

**Credit scoring** A procedure for assigning scores for reflecting the risk of default.

**Cum Dividend** With dividend.

**Cum Right** With rights

**Cumulative Dividends** A feature of preferred stock that requires all past dividends on preferred stock to be paid before any equity dividends are paid.

**Current Assets** Assets which normally get converted into cash during the operating cycle of the firm.

**Current Liabilities** Liabilities that are normally payable within a year.

**Current Ratio** A liquidity measure defined as current assets divided by current liabilities.

**Current Yield** Annual interest or dividend currently received divided by the current market price.

**Days' Sales Outstanding** The ratio of receivables outstanding to average daily sales.

**DCF** Discounted cash flow

**Debenture** An instrument for long-term debt. Debentures in India are typically secured.

**Debt Asset Ratio** A leverage ratio defined as total debt divided by total asset.

**Decision Tree Analysis** A method of analysing problems involving alternative sequential decisions with their possible outcomes.

**Defensive Security** A security which has a beta of less than one.

**Degree of Financial Leverage** The percentage change in earnings per share as a result of one percent change in earnings before interest and tax.

**Degree of Operating Leverage** The percentage change in earnings before interest and taxes as a result of one percent change in sales.

**Degree of Total Leverage** The percentage change in earnings per share as a result on one percent change in sales.

**Delta** Hedge ratio.

**Depreciation** A writeoff of a part of the cost of an asset annually. This is charged to the income statement.

**Derivatives** Instruments whose payoff are derived from the value of other assets.

**Devaluation** The reduction in the exchange value of a country's currency in terms of other currencies.

**Direct Quote** An exchange rate quote that reflects the number of units of domestic currency that are equal to a unit of foreign currency (cf. *indirect quote*).

**Discounting** The process of finding the present value of a future cash flow or a series of future cash flows.

**Diversifiable Risk** The portion of a security's risk that can be eliminated by diversification.

**Diversification** Investment in more than one risky asset with the primary objective of risk reduction.

**Dividend Discount Model** A model that calculates the value of an equity share as the present value of future dividends expected from it.

**Dividend Payment** Payment made by a company to its stockholders.

**Dividend Yield** Annual dividend stated as a percentage of a share's market price.

**Du Pont System** A system of financial analysis, pioneered by the Du Pont company, which helps in understanding profitability in terms of profit margin and asset turnover.

**Duration** A measure of the average life of an investment.

**EBIT** Abbreviation for earnings before interest and taxes.

**Economic Exposure** Risk arising from changes in real exchange rates (cf. *transaction exposure*, *translation exposure*).

**Economic Order Quantity (EOQ)** The quantity of goods ordered which minimises the sum of inventory ordering cost and inventory carrying cost.

**Economic Value Added (EVA)** A measure of residual income developed by the consulting firm Stern Stewart.

**Effective Rate of Interest** The percentage rate of return on an annual basis. It reflects the effect of intra-year compounding.

**Efficient Markets Hypothesis** The proposition that security prices reflect all publicly available information.

**Efficient Portfolio** A portfolio that has the lowest risk (standard deviation) for a given level of expected return.

**EPS** Earning per share.

**Equity** The net worth of a firm consisting of paid up equity capital plus reserves and surplus.

**ESOP** Employee stock ownership plan.

**Eurobond** Bond that is marketed globally.

**Eurodollar deposit** Dollar deposit with a bank outside the US.

**European Option** Option that can be exercised only on the expiration date.

**Exchange Rate** The rate at which one currency may be exchanged for another.

**Ex-dividend Date** The cutoff date for determining the eligibility to receive dividend payment.

**Exercise Price (Striking Price)** Price at which the call option or put option is exercisable.

**Expiration Date** The last date by which an option can be exercised.

**Face Value** The amount the firm promises to pay the bondholder or preference stockholder at the time of maturity. It is also referred to as the par value or principal value.

**Factoring** Arrangement whereby a financial institution provides services relating to management and financing of debts arising from credit sales.

**Financial Asset** A piece of paper representing claim on real assets.

**Financial Engineering** Creation of new financial instruments by combining or dividing existing instruments.

**Financial Intermediaries** Financial institutions that serve as an intermediary between savers of funds and users of funds (commercial banks, development banks, mutual funds, etc).

**Financial Lease** A long-term or intermediate-term, non-cancellable lease arrangement which is fully amortised.

**Financial Risk** The risk which arises from the use of debt capital.

**Financial System** A set of markets and institutions to facilitate the exchange of assets and risks.

**First In First Out (FIFO)** A method of inventory pricing which assumes that the order in which materials are received in the stores is the order in which materials are issued from the stores.

**Fixed Charge** A payment by a firm which is required under a contract. Example: interest on debt.

**Fixed Costs** Costs that remain invariant with changes in output. Examples: rent, depreciation, and managerial salaries.

**Flexible Budget** A budget that is geared to the level of sales.

**Float** Funds represented by cheques which have been issued but which have not been collected.

**Floating Lien** A general lien against a company's assets.

**Forward Contract** An agreement between two parties to exchange an asset for cash at a predetermined future date for a price that is specified today.

**Forward Cover** Purchase or sale of forward foreign currency to offset an anticipated future cash flow.

**Forward Rate** Exchange rate applicable to a transaction which will occur at a specified point of time in future.

**Forward Rate Agreement** An agreement to borrow or lend at a pre-determined future date at an interest rate that is specified today.

**Free Cash Flow** Surplus cash generated by a firm after meeting its investment requirement.

**Funded Debt** Debt that matures after one year (cf. *unfunded debt*).

**Futures Contract** A standardised forward contract is a futures contract.

**GAAP** Generally accepted accounting principles.

**Golden Parachute** A large payment to incumbent management in the event of a takeover.

**Goodwill** Intangible assets represented by the excess of purchase price over book value.

**Greenshoe Option** Option allowing a company issuing securities to retain excess subscription upto a certain extent.

**Hedge Ratio (Delta, Option Delta)** Number of shares to be bought for each *option* sold to create a riskless position.

**Hedging** A method of risk transfer in which an action taken to shield against possible losses also eliminates possible gains.

**Holding Company** A company which holds a controlling interest in one or more other companies which are referred to as subsidiaries.

**Horizontal Merger** A merger between two or more firms engaged in the same line of activity.

**Hurdle Rate** In investment decision making, the minimum acceptable rate of return on a project.

**Incremental Analysis** Analysis of the additional costs or benefits of one alternative vis-a-vis another.

**Indenture** A formal agreement between the issuer and purchaser of a bond.

**Indexed Bond** A bond whose payments are linked to an index such as Sensex or Wholesale Price Index.

**Indirect Quote** An exchange rate quote that reflects the number of units of foreign currency that are equal to a unit of domestic currency (cf. *direct quote*).

**Inflation Premium** A premium for anticipated inflation that investors require in addition to the pure rate of interest.

**Initial Public Offering** The first public issue of a company's equity.

**Insolvency** The inability of a firm to meet its debt obligations.

**Intangible Assets** Non-physical but valuable resources like goodwill, patents, and copyrights owned by the firm.

**Interest Rate Parity** The hypothesis that the difference between the interest rates in two countries is equal to the difference between the forward and spot rate of their respective currencies.

**Internal Financing** Funds generated internally. Internal financing consists of retained earnings plus depreciation and other non-cash charges.

**Internal Growth Rate** The maximum rate of growth that a firm can achieve without resorting to external finance.

**Internal Rate of Return** The rate of discount at which the net present value of an investment is zero.

**In-the-money** The state of the option when the exercise price is less than the current price of the underlying security.

**Intrinsic Value** The intrinsic value of an asset is the present value of the stream of benefits expected from it. It is also referred to as the fair value or reasonable value or investment value.

**Inventory Turnover** The ratio of net sales to inventory.

**Investment Opportunity Schedule** A listing or graphical representation of a firm's investment opportunities arranged in the order of its projects' internal rate of return.

**IPO** Initial public offering.

**IRR** Internal rate of return.

**Junior Debt** Subordinated debt.

**Last In First Out (LIFO)** A method of pricing inventory issues which assumes that the material which is acquired last is issued first.

**LBO** Leveraged buyout.

**Lease** A contractual arrangement whereby the lessor grants the lessee the right to use an asset in return for periodic lease rental payments.

**Least Squares Method** A statistical method for establishing the relationship between the variables.

**Lessee** User of a leased asset (cf. *lessor*).

**Lessor** Owner of a leased asset (cf. *lessee*).

**Letter of Credit** A formal document issued by a bank on behalf of customer, stating the conditions under which the bank will honour the commitments of the customer.

**Leveraged Buyout (LBO)** An acquisition that is largely financed by debt.

**Leveraged Lease** A lease arrangement under which the lessor borrows a substantial portion of the purchase price from a lender,

usually a commercial bank.

**Liability** A claim on the assets of a business.

**LIBOR** The London inter bank offering rate.

**Lien** A lender's claim on assets offered as security for a loan.

**Limited Liability** Limitation of shareholders' liability to the extent of their share capital subscription.

**Line of Credit** An agreement under which a financial institution agrees to provide credit up to a specified limit during a given period.

**Linear Programming** A mathematical method useful for optimising (maximising or minimising) a linear objective function subject to linear constraints.

**Liquidity** A firm's liquidity refers to its ability to meet its obligations in the short run (defined usually as a period of one year). An asset's liquidity refers to how quickly it can be sold at a reasonable price.

**Listing** Means for admitting a security to the trading privileges of a stock exchange.

**Majority Rule Voting** A system of voting under which a group which holds a majority of shares has the power of electing the entire board of directors.

**Marginal Tax Rate** The tax rate applicable to income at the margin.

**Market Risk** See non-diversifiable risk.

**Marking-to-Market** An arrangement wherein profits or losses on a futures contract are settled every day.

**Master Budget** A budget covering all aspects of a firm's working. It is also referred to as a comprehensive budget.

**Merger** A combination of two or more firms into one firm. A merger may involve absorption or consolidation. In an absorption, one firm acquires one or more other firms. In a consolidation, two or

more firms combine to form a new entity. We use the terms merger and amalgamation interchangeably.

**MIBOR** Mumbai inter bank offering rate.

**Money Market** The financial market for short term funds.

**Moral Hazard** The risk that a contract will induce change in the behaviour of one or both the contracting parties. For example, an insured party may become careless.

**Mortgage** A pledge of specific property offered as security for a loan.

**Multinational Company** A company which has direct investment in two or more countries.

**Multiple Discriminant Analysis** A statistical technique for determining a discriminant function which provides a reasonable basis for classifying an item into various categories (for example debtors may be classified into good debtors and bad debtors) based on certain observable quantifiable characteristics.

**Net Present Value (NPV)** A method for evaluating investment proposals. NPV is defined as present value of benefits minus present value of costs.

**Net Working Capital** See working capital.

**Net Worth** See equity.

**Nominal Interest Rate** Interest rate expressed in money terms.

**Non-diversifiable Risk** The part of total risk which cannot be eliminated by diversification. It is also referred to as market risk or systematic risk.

**Normal Distribution** Symmetric, bell-shaped probability distribution that is completely defined by its mean and standard deviation.

**Note Issuance Facility** A facility that gives the firm the right to borrow from a group of banks up to a certain amount.

**Note Lending System** Under this arrangement, the borrower takes a loan, usually of 90 days duration, against a promissory note.

**Off Balance Sheet Financing** Financing that does not figure on the balance sheet of the firm.

**Operating Cycle** The operating cycle of a firm begins with the acquisition of raw materials and ends with the collection of receivables.

**Operating Lease** A short-term cancellable lease arrangement which is not fully amortised.

**Operating Leverage** The leverage arising from fixed operating costs.

**Opportunity Cost** The rate of return that can be earned on the best alternative investment.

**Option** The right to buy or sell something on or before a given date at a predetermined price.

**Overdraft System** Under this arrangement, the borrower is allowed to overdraw on his current account with the banker upto a certain limit during a given period.

**P/E ratio** The ratio of share price to earnings per share.

**Paid-up Capital** Share capital which has been paid up.

**Par Value** See face value.

**Partnership** A business owned by two or more owners (partners) who agree on how the profits (losses) and obligations of the business will be shared.

**Pass Through Certificates** Debt instruments backed by a portfolio of assets.

**Payback Period** The length of time required for an asset to generate cash flows just enough to cover the initial outlay.

**Payment Float** The amount of cheques issued by the firm but not paid for by the bank.

**Payout Ratio** The proportion of earnings paid out by way of dividends.

**Perpetuity** A perpetual annuity.

**Pooling of Interest** A method of accounting for mergers in which there is a line by line addition of the balance sheets of the merging entities.

**Portfolio** A combination of assets.

**Portfolio Effect** The extent to which the variability of the returns on a portfolio is less than the sum of the variability of the individual assets in the portfolio.

**PBIT** An abbreviation for profit before interest and taxes.

**Portfolio Theory** A theory concerned with the delineation of efficient portfolios and selection of optimal portfolios.

**Post-audit** A comparison of the actual results and expected results of an investment project.

**Preemptive Right** Equity shareholders right to subscribe to further issues of a company.

**Present Value of Growth Opportunities (PVGO)** Net present value of future investments the firm is expected to make.

**Primary Market** The market in which new securities are issued.

**Private Company** A corporate entity which (i) limits the number of its members to 50, (ii) does not invite public to subscribe to its capital, and (iii) restricts the members' right to transfer shares.

**Probability** The likelihood of the occurrence of an event.

**Profit Margin** The ratio of profit to sales. Several profit margin ratios are used. The two most commonly used are: gross profit margin (gross profit divided by sales) and net profit margin (net profit divided by sales).

**Proforma** Projected.

**Project Finance** Project finance is the principal arrangement for private sector participation in infrastructure projects which depend

heavily on debt.

**Proportional Rule Voting** Voting system under which a shareholder can distribute his votes over one or more candidates for the board of directors.

**Proprietorship** A business firm owned by a single individual.

**Prospectus** A document issued to describe a new security issue.

**Proxy** The authorisation given by one person to another to vote on his behalf in the stockholders' meeting.

**Public Company** A corporate body, other than a private company. In a public company, there is no upper limit on the number of shareholders and no restriction on transfer of shares.

**Public Deposit** Unsecured deposit obtained by a company from the public at large.

**Purchasing Power Parity Hypothesis** The price of each product should be the same in each country, after making appropriate currency conversions.

**Put Option** An option that gives its holder the right to sell an asset at a fixed price during a certain period.

**Put-call Parity Relation** A relation between the price of the put, the price of the call, the price of the underlying security, and the present value of the exercise price.

**QIBs** Qualified institutional buyers.

**Quick Ratio** See *acid test ratio*.

**R squared ( $R^2$ )** The proportion of the variance of a dependent variable explained by the regression relation. It equals the square of the correlation coefficient.

**Real Interest Rate** Nominal interest rate adjusted for inflation.

**Red Herring** A preliminary prospectus.

**Refunding** The issuance of new securities to retire outstanding securities.

**Regression Analysis** A statistical technique for determining the line of the best fit.

**Reinvestment Rate** The rate of return at which the intermediate cash inflows of a project may be reinvested.

**Required Rate of Return** Rate of return required by investors on their investment.

**Reserve** A reserve is an amount set aside out of the profits, primarily to ensure that the amount is not distributed by way of dividend.

**Reserve Bank of India (RBI)** The central banking authority in India.

**Residual Income (RI)** Net profit less a charge for capital employed.

**Retained Earnings** The portion of equity earnings to net worth.

**Return of Equity** The ratio of equity earnings to net worth.

**Risk** Risk refers to variability. It is measured in financial analysis generally by standard deviation or by beta coefficient.

**Risk Adjusted Discount Rate** The discount rate applicable to a risky investment. It is equal to the risk-free rate of return plus a risk premium reflecting the risk characterising the investment.

**Risk Aversion** A dislike for risk. Generally, investors are risk-averse. Their required rate of return varies with the level of risk – the higher the level of risk, the higher the required rate of return.

**ROI** Return on investment

**Rule 144A** SEC (Securities Exchange Commission of the US) rule that allows qualified institutional investors to buy and trade unregistered securities.

**Safety Stock** Inventories carried to protect against variations in sales rate, production rate, and procurement time.

**Sale and Leaseback** A special lease arrangement under which a firm sells an asset to another firm and simultaneously leases it

back.

**Salvage Value** The value realised from the disposal of an asset.

**SEBI** Securities and Exchange Board of India.

**Secondary Market** The market for outstanding securities.

**Securitisation** Packaging loans, receivables and so on into a pool and issuing tradable securities backed by this pool of assets.

**Semistrong-form Efficiency** Stock prices reflect all publicly available information.

**Sensitivity Analysis** A technique of risk analysis which studies the responsiveness of a criterion of merit like net present value or internal rate of return to variations in underlying factors like selling price, quantity sold, etc.

**Simulation** A technique of risk analysis which seeks to develop the simulated probability distribution of a criterion of merit like net present value or internal rate of return on the basis of the relationship between the underlying factors like quantity, selling price, project life, and so on, and the criterion of merit.

**Sinking Fund** A fund to which a firm makes periodic contributions to facilitate retirement of debt.

**Specific Risk** Unique risk or diversifiable risk (cf. *systematic risk*) or market risk.

**Spinoff** Separating the division of a company into an independent company.

**Spot Rate** Exchange rate which applies to 'on the spot' delivery of the currency - in practice it means delivery two days after the day of trade.

**Standard Deviation** The square root of the average of the squared deviations from the expected value.

**Stock Split** In a stock split, the par value per share is reduced and the number of shares is increased proportionately.

**Straight-line Depreciation** Charging an equal amount of depreciation in each period.

**Strong-form Efficiency** Prices reflect all available information, public as well as private.

**Subscription Price** Price at which the issue of a security can be subscribed to by the investors.

**Sunk Costs** Costs which have already been incurred and which cannot be reversed.

**Sustainable Growth Rate** Growth rate that can be sustained with internal equity and a given debt-equity ratio.

**Swap Contract** A contract that involves an exchange of one set of financial flows for another.

**Synergy** Gain from combining two or more units. In a synergistic merger, the earnings of the combined entity are expected to exceed the sum of the earnings of the combining entities.

**Systematic Risk** Risk that cannot be diversified away. It is also referred to as market risk or non-diversifiable risk.

**T-bill** Treasury bill.

**Term Loan** A loan which is generally repayable in more than one year and less than ten years.

**Terminal Value** The value of an asset at some point of time in future.

**Time Line** A diagram specifying the timing of cash flows.

**Tombstone** An advertisement that announces a public offering.

**Total Asset Turnover Ratio** The ratio of net sales of total assets.

**Trade Credit** Inter-firm credit arising from credit sales. It is recorded as a trade receivable (debtor) by the seller and as a trade payable (creditor) by the buyer.

**Transaction Exposure** Risk to a firm with known foreign currency cash flows due to changes in exchange rates (cf. *economic*

*exposure, translation exposure).*

**Translation Exposure** Risk of unfavourable effects on a firm's statements that may arise from changes in exchange rates (cf. *economic exposure, transaction exposure*).

**Treasurer** Financial officer concerned mainly with the task of financing and activities related thereto.

**Turnover Ratios** Turnover ratios, also referred to as activity ratios or asset management ratios, measure how efficiently the assets are employed by the firm.

**Unfunded Debt** Debt that matures in less than one year (cf. *funded debt*).

**Unique Risk** (unsystematic risk, specific risk) Risk that cannot be diversified away.

**Unlisted Security** Security which is not listed on a recognised stock exchange.

**Unsystematic Risk** Risk that can be diversified away. It is also referred to as unique risk, specific risk, residual risk, or diversifiable risk.

**Utility Theory** A theory which deals with money, risk, and utility (index of satisfaction).

**Variance** A measure of dispersion defined as the mean squared deviation from the expected value.

**Vertical Merger** A merger between a supplier and its customer.

**WACC** Weighted average cost of capital.

**Warrant** Call option issued by a company.

**Weak-form Efficiency** Prices reflect all historical market related information.

**White Knight** A friendly suitor sought by a target company threatened by an unwelcome suitor.

**Winner's Curse** Uninformed bidders tend to over-bid and become winners.

**Working Capital** There are two measures of working capital: gross working capital and net working capital. Gross working capital is the total of current assets. Net working capital is the difference between the total of current assets and the total of current liabilities.

**Workout** An informal arrangement between a borrower and lenders.

**Written Down Value Method** A depreciation method according to which the depreciation charge is a percentage of the written down value of the asset.

**Yield Curve** A curve representing the promised yield to maturity of debt instruments of a given risk and the maturity of the instrument.

**Yield to Maturity** The rate of return earned on a security if it is held till maturity.

**Z Score** Measure of the probability of bankruptcy.

**Zero Coupon Bond** A bond that makes no coupon payments and is issued at a steep discount over its face value.

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