Subject: Corporate Finance
Module 01

Chapter 01

Overview of Financial Management

❖ LEARNING OBJECTIVES

- Explain the nature of finance and its interaction with other management functions
- Review the changing role of the finance manager and his/her position in the management hierarchy
- Focus on the Shareholders' Wealth Maximization (SWM) principle as an operationally desirable finance decision criterion
- Discuss agency problems arising from the relationship between shareholders and managers
- Illustrate the organization of finance function

❖ Introduction

- Financial management is that managerial activity which is concerned with the planning and controlling of the firm's financial resources.
- It was a branch of economics till 1890, and as a separate discipline, it is of recent origin. Still, it has no unique body of knowledge of its own, and draws heavily on economics for its theoretical concepts even today.

- The subject of financial management is of immense interest to both academicians and practicing managers. It is of great interest to academicians because the subject is still developing, and there are still certain areas where controversies exist for which no unanimous solutions have been reached as yet.
- Practicing managers are interested in this subject because among the most crucial decisions of the firm are those which relate to finance, and an understanding of the theory of financial management provides them with conceptual and analytical insights to make those decisions skillfully.

❖ Scope of Finance

- What is finance? What are a firm's financial activities? How are they related to the firm's other activities? Firms create manufacturing capacities for production of goods; some provide services to customers. They sell their goods or services to earn profit. They raise funds to acquire manufacturing and other facilities. Thus, the three most important activities of a business firm are:
  - production
  - marketing
  - finance
- A firm secures the required capital and employs it (finance activity) in activities, which generate returns on invested capital (production and marketing activities).

❖ Finance Functions

- It may be difficult to separate the finance functions from production, marketing and other functions, but the functions themselves can be readily identified. The functions of raising funds, investing them in assets and distributing returns earned

from assets to shareholders are respectively known as financing decision, investment decision and dividend decision.

- A firm attempts to balance cash inflows and outflows while performing these functions. This is called liquidity decision, and we may add it to the list of important finance decisions or functions.
- Thus, finance functions or decisions are divided into long-term and short-term decisions and include:

1) Long-term Financial Decisions

- The long-term finance functions or decisions have a longer time horizon, generally greater than a year. They may affect the firm's performance and value in the long run. They also relate to the firm's strategy and generally involve senior management in taking the final decision.

a) Long-term asset-mix or investment decision or capital budgeting decisions.

- A firm's investment decisions involve capital expenditures. They are, therefore, referred as capital budgeting decisions.
- A capital budgeting decision involves the decision of allocation of capital or commitment of funds to long-term assets that would yield benefits (cash flows) in the future.
- Two important aspects of investment decisions are (a) the evaluation of the prospective profitability of new investments, and (b) the measurement of a cut-off rate against which the prospective return of new investments could be compared.
- Future benefits of investments are difficult to measure and cannot be predicted with certainty.
- Risk in investment arises because of the uncertain returns.

- Investment proposals should, therefore, be evaluated in terms of both expected return and risk.
- Besides the decision to commit funds in new investment proposals, capital budgeting also involves replacement decisions, that is, decision of recommitting funds when an asset becomes less productive or non-profitable.

- There is a broad agreement that the correct cut-off rate or the required rate of return on investments is the opportunity cost of capital.
- The opportunity cost of capital is the expected rate of return that an investor could earn by investing his or her money in financial assets of equivalent risk.
- However, there are problems in computing the opportunity cost of capital in practice from the available data and information. A decision maker should be aware of these problems.

b) Capital-mix or financing decision or capital structure and leverage decisions.

- A financing decision is the second important function to be performed by the financial manager.
- Broadly, he or she must decide when, where from and how to acquire funds to meet the firm's investment needs.
- The central issue before him or her is to determine the appropriate proportion of equity and debt. The mix of debt and equity is known as the firm's capital structure.
- The financial manager must strive to obtain the best financing mix or the optimum capital structure for his or her firm.
- The firm's capital structure is considered optimum when the market value of shares is maximized.
- In the absence of debt, the shareholders' return is equal to the firm's return. The use of debt affects the return and risk of shareholders; it may increase the return on equity funds, but it always increases risk as well.

- The change in the shareholders' return caused by the change in the profits is called the financial leverage.
- A proper balance will have to be struck between return and risk.
- When the shareholders' return is maximized with given risk, the market value per share will be maximized and the firm's capital structure would be considered optimum.
- Once the financial manager is able to determine the best combination of debt and equity, he or she must raise the appropriate amount through the best available sources. In practice, a firm considers many other factors such as control, flexibility, loan covenants, legal aspects etc. in deciding its capital structure.

c) Profit allocation or dividend decision

- A dividend decision is the third major financial decision.
- The financial manager must decide whether the firm should distribute all profits, or retain them, or distribute a portion and retain the balance.
- The proportion of profits distributed as dividends is called the dividend-payout ratio and the retained portion of profits is known as the retention ratio.
- Like the debt policy, the dividend policy should be determined in terms of its impact on the shareholders' value.
- The optimum dividend policy is one that maximizes the market value of the firm's shares.
- Thus, if shareholders are not indifferent to the firm's dividend policy, the financial manager must determine the optimum dividend-payout ratio.
- Dividends are generally paid in cash. But a firm may issue bonus shares. Bonus shares are shares issued to the existing shareholders without any charge.
- The financial manager should consider the questions of dividend stability, bonus shares and cash dividends in practice.

2) Short-term Financial Decisions

- Short-term finance functions or decisions involve a period of less than one year. These decisions are needed for managing the firm's day-to-day fund requirements.
- Generally, they relate to the management of current assets and current liabilities, short-term borrowings and investment of surplus cash for short periods.

a) Short-term asset-mix or liquidity decision or working capital management.

- Investment in current assets affects the firm's profitability and liquidity.
- Management of current assets that affects a firm's liquidity is yet another important finance function.
- Current assets should be managed efficiently for safeguarding the firm against the risk of illiquidity.
- Lack of liquidity (or illiquidity) in extreme situations can lead to the firm's insolvency.
- A conflict exists between profitability and liquidity while managing current assets. If the firm does not invest sufficient funds in current assets, it may become illiquid and therefore, risky.
- It would lose profitability, as idle current assets would not earn anything. Thus, a proper trade-off must be achieved between profitability and liquidity.
- The profitability-liquidity trade-off requires that the financial manager should develop sound techniques of managing current assets.
- He or she should estimate the firm's needs for current assets and make sure that funds would be made available when needed.

❖ Financial Procedures and Systems

- For the effective execution of the finance functions, certain other functions have to be routinely performed. They concern procedures and systems and involve a lot of paper work and time. They do not require specialized skills of finance. Some of the important routine finance functions are:
  - Supervision receipts and payments and safeguarding of cash balances
  - Custody and safeguarding of securities, insurance policies and other valuable papers
  - Taking care of the mechanical details of new outside financing
  - Record keeping and reporting
- The finance manager in the modern enterprises is mainly involved in the managerial finance functions; executives at lower levels carry out the routine finance functions.
- Financial manager's involvement in the routine functions is confined to setting up of rules of procedures, selecting forms to be used, establishing standards for the employment of competent personnel and to check up the performance to see that the rules are observed and that the forms are properly used.
- The involvement of the financial manager in the managerial financial functions is recent. About three decades ago, the scope of finance functions or the role of the financial manager was limited to routine activities.
- How the scope of finance function has widened or the role of the finance manager has changed is discussed in the following section.

❖ Finance Manager's Role

- Who is a financial manager?3 What is his or her role? A financial manager is a person who is responsible, in a significant way, to carry out the finance functions.
- It should be noted that, in a modern enterprise, the financial manager occupies a key position. He or she is one of the members of the top management team, and

his or her role, day-by-day, is becoming more pervasive, intensive and significant in solving the complex funds management problems.

- Now his or her function is not confined to that of a scorekeeper maintaining records, preparing reports and raising funds when needed, nor is he or she a staff officer in a passive role of an adviser.
- The finance manager is now responsible for shaping the fortunes of the firm, and is involved in the most vital decision of the allocation of capital.
- In the new role, he or she needs to have a broader and far-sighted outlook, and must ensure that the funds of the firm are utilised in the most efficient manner.
- He or she must realize that his or her actions have far-reaching consequences for the firm because they influence the size, profitability, growth, risk and survival of the firm, and as a consequence, affect the overall value of the firm.
- The financial manager, therefore, must have a clear understanding and a strong grasp of the nature and scope of the finance functions as follows:

    - Raising of Funds
    - Allocation of Funds
    - Profit Planning
    - Understanding Capital Markets

❖ Financial Goals

- The firm's investment and financing decisions are unavoidable and continuous. In order to make them rationally, the firm must have a goal.
- It is generally agreed in theory that the financial goal of the firm should be Shareholder Wealth Maximization (SWM), as reflected in the market value of the firm's shares.

- In this section, we show that the Shareholder Wealth Maximization is theoretically logical and operationally feasible normative goal for guiding the financial decision-making.

1) Profit maximization (profit after tax)
2) Maximizing earnings per share
3) Wealth maximization

1) Profit Maximization

- Firms, producing goods and services, may function in a market or government-controlled economy.
- In a market economy, prices of goods and services are determined in competitive markets.
- Firms in the market economy are expected to produce goods and services desired by society as efficiently as possible.
- Price system is the most important organ of a market economy indicating what goods and services society wants.
- Goods and services in great demand command higher prices. This results in higher profit for firms; more of such goods and services are produced.
- Higher profit opportunities attract other firms to produce such goods and services.
- Ultimately, with intensifying competition, an equilibrium price is reached at which demand and supply match.
- In the case of goods and services, which are not required by society, their prices and profits fall.
- Producers drop such goods and services in favor of more profitable opportunities.
- Price system directs managerial efforts towards more profitable goods or services.

- Prices are determined by the demand and supply conditions as well as the competitive forces, and they guide the allocation of resources for various productive activities.

- In the economic theory, the behavior of a firm is analyzed in terms of profit maximization.
- Profit maximization implies that a firm either produces maximum output for a given amount of input, or uses minimum input for producing a given output.
- The underlying logic of profit maximization is efficiency.
- It is assumed that profit maximization causes the efficient allocation of resources under the competitive market conditions, and profit is considered as the most appropriate measure of a firm's performance.

➢ Objections to Profit Maximization

- It is Vague
- It Ignores the Timing of Returns
- It Ignores Risk
- Assumes Perfect Competition
- In new business environment profit maximization is regarded as
    - Unrealistic
    - Difficult
    - Inappropriate
    - Immoral

2) Maximizing Profit after Taxes or EPS

- Let us put aside the first problem mentioned above, and assume that maximizing profit means maximizing profits after taxes, in the sense of net profit, as reported in the profit and loss account (income statement) of the firm.
- It can easily be realized that maximizing this figure will not maximize the economic welfare of the owners.
- It is possible for a firm to increase profit after taxes by selling additional equity shares and investing the proceeds in low-yielding assets, such as the government bonds.
- Profit after taxes would increase but earnings per share (EPS) would decrease.
- To illustrate, let us assume that a company has 10,000 shares outstanding, profit after taxes of Rs. 50,000 and earnings per share of Rs. 5. If the company sells 10,000 additional shares at Rs. 50 per share and invests the proceeds (Rs. 5,00,000) at 5 per cent after taxes, then the total profits after taxes will increase to Rs. 75,000. However, the earnings per share will fall to Rs. 3.75 (i.e., Rs. 75,000/20,000). This example clearly indicates that maximizing profits after taxes does not necessarily serve the best interests of owners.

➢ Maximizing EPS

- If we adopt maximizing EPS as the financial objective of the firm, this will also not ensure the maximization of owners' economic welfare.
- It also suffers from the flaws already mentioned, i.e., it ignores timing and risk of the expected benefits.
- Apart from these problems, maximization of EPS has certain deficiencies as a financial objective.
- It is, thus, clear that maximizing profits after taxes or EPS as the financial objective fails to maximize the economic welfare of owners.

- Both methods do not take account of the timing and uncertainty of the benefits.
- An alternative to profit maximization, which solves these problems, is the objective of wealth maximization.
- This objective is also considered consistent with the survival goal and with the personal objectives of managers such as recognition, power, status and personal wealth.

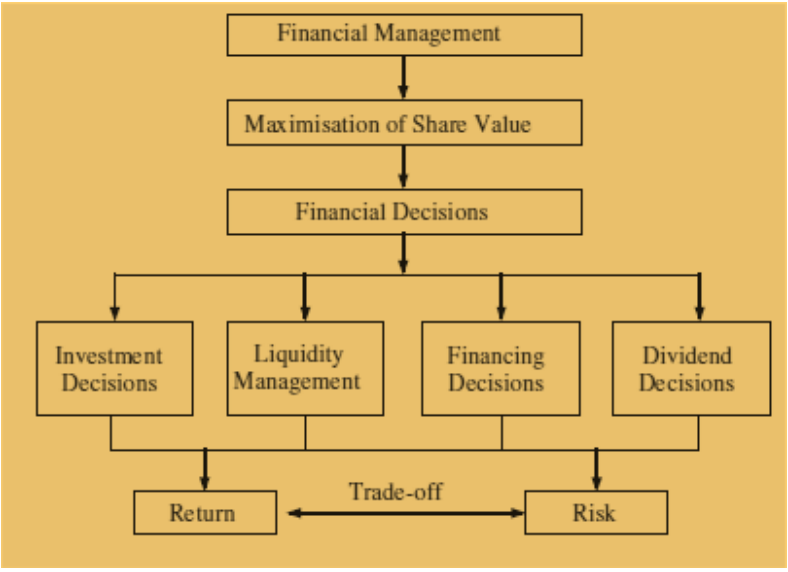
3) Shareholders' Wealth Maximization

- What is meant by Shareholder Wealth Maximization (SWM)? SWM means maximizing the net present value of a course of action to shareholders.
- Net present value (NPV) or wealth of a course of action is the difference between the present value of its benefits and the present value of its costs.
- A financial action that has a positive NPV creates wealth for shareholders and, therefore, is desirable.
- A financial action resulting in negative NPV should be rejected since it would destroy shareholders' wealth.
- Between mutually exclusive projects the one with the highest NPV should be adopted.
- NPVs of a firm's projects are additive in nature. That is

  NPV(A) + NPV(B) = NPV(A + B)
- This is referred to as the principle of value-additivity. Therefore, the wealth will be maximized if NPV criterion is followed in making financial decisions.
- The objective of SWM takes care of the questions of the timing and risk of the expected benefits.
- These problems are handled by selecting an appropriate rate (the shareholders' opportunity cost of capital) for discounting the expected flow of future benefits.

- It is important to emphasize that benefits are measured in terms of cash flows. In investment and financing decisions, it is the flow of cash that is important, not the accounting profits.
- Maximizing the shareholders' economic welfare is equivalent to maximizing the utility of their consumption over time.
- With their wealth maximized, shareholders can adjust their cash flows in such a way as to optimize their consumption.
- From the shareholders' point of view, the wealth created by a company through its actions is reflected in the market value of the company's shares.
- Therefore, the wealth maximization principle implies that the fundamental objective of a firm is to maximize the market value of its shares.
- The value of the company's shares is represented by their market price which in turn, is a reflection of shareholders' perception about quality of the firm's financial decisions.
- The market price serves as the firm's performance indicator.

❖ Overview of Financial Management

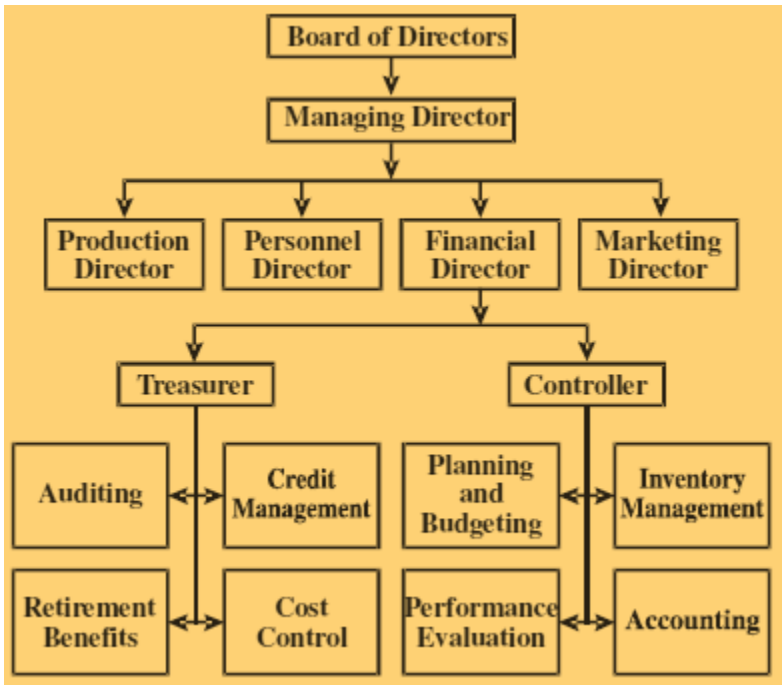


❖ Financial Goals and Firm's Mission and Objectives

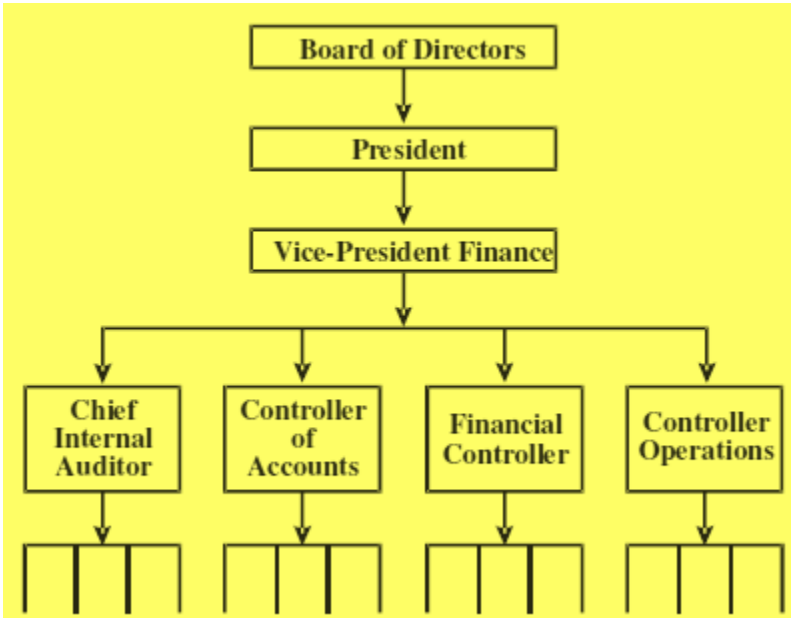
- Firms' primary objective is maximizing the welfare of owners, but, in operational terms, they focus on the satisfaction of its customers through the production of goods and services needed by them.
- Firms state their vision, mission and values in broad terms.
- Wealth maximization is more appropriately a decision criterion, rather than an objective or a goal.
- Goals or objectives are missions or basic purposes of a firm's existence.
- The shareholders' wealth maximization is the second-level criterion ensuring that the decision meets the minimum standard of the economic performance.
- In the final decision-making, the judgement of management plays the crucial role.
- The wealth maximization criterion would simply indicate whether an action is economically viable or not.

❖ Organization of the Finance Functions

- Reason for placing the finance functions in the hands of top management
  - Financial decisions are crucial for the survival of the firm.
  - The financial actions determine solvency of the firm
  - Centralization of the finance functions can result in a number of economies to the firm.



Organization for finance function



Organization for finance function in a multidivisional company

❖ Status and Duties of Finance Executives

- The exact organization structure for financial management will differ across firms.
- The financial officer may be known as the financial manager in some organizations, while in others as the vice-president of finance or the director of finance or the financial controller.

❖ Role of Treasurer and Controller

- Two officers—the treasurer and the controller—may be appointed under the direct supervision of CFO to assist him or her.
- The treasurer's function is to raise and manage company funds while the controller oversees whether funds are correctly applied.

Chapter 02

Time value of Money

❖ LEARNING OBJECTIVES

- Understand what gives money its time value.
- Explain the methods of calculating present and future values.
- Highlight the use of present value technique (discounting) in financial decisions.
- Introduce the concept of internal rate of return

❖ Time Preference for Money

- If an individual behaves rationally, he or she would not value the opportunity to receive a specific amount of money now, equally with the opportunity to have the same amount at some future date.
- Most individuals value the opportunity to receive money now higher than waiting for one or more periods to receive the same amount.
- Time preference for money or Time Value of Money (TVM) is an individual's preference for possession of a given amount of money now, rather than the same amount at some future time.
- Three reasons may be attributed to the individual's time preference for money:
    - risk
    - preference for consumption
    - investment opportunities

- We live under risk or uncertainty. As an individual is not certain about future cash receipts, he or she prefers receiving cash now.

- Most people have subjective preference for present consumption over future consumption of goods and services either because of the urgency of their present wants or because of the risk of not being in a position to enjoy future consumption that may be caused by illness or death, or because of inflation.
- As money is the means by which individuals acquire most goods and services, they may prefer to have money now.
- Further, most individuals prefer present cash to future cash because of the available investment opportunities to which they can put present cash to earn additional cash.
- For example, an individual who is offered Rs. 100 now or Rs. 100 one year from now would prefer Rs. 100 now as he could earn on it an interest of, say, Rs. 5 by putting it in the savings account in a bank for one year. His total cash inflow in one year from now will be Rs. 105. Thus, if he wishes to increase his cash resources, the opportunity to earn interest would lead him to prefer Rs. 100 now, not Rs. 100 after one year.

❖ Required Rate of Return

- The time preference for money is generally expressed by an interest rate. This rate will be positive even in the absence of any risk. It may therefore be called the risk-free rate.
- For instance, if time preference rate is 5 per cent, it implies that an investor can forego the opportunity of receiving Rs. 100 if he is offered `105 after one year (i.e. Rs. 100 which he would have received now plus the interest which he could earn in a year by investing Rs. 100 at 5 per cent). Thus, the individual is indifferent between Rs. 100 and Rs. 105 a year from now as he considers these two amounts equivalent in value.

- In reality, an investor will be exposed to some degree of risk. Therefore, he would require a rate of return, called risk premium, from the investment, which compensates him for both time and risk.
- Thus, the required rate of return (RRR) will be calculated as:

Risk-free rate + Risk premium.

- The risk-free rate compensates for time while risk premium compensates for risk.
- The required rate of return is the opportunity cost of capital in comparable risk. It is called so because the investor could invest his money in assets or securities of equivalent risk.
- Like individuals, firms also have required rates of return and use them in evaluating the desirability of alternative financial decisions.
- The interest rates account for the time value of money, irrespective of an individual's preferences and attitudes.

❖ Time Value Adjustment

- Two most common methods of adjusting cash flows for time value of money:
  - **Compounding**—the process of calculating future values of cash flows and
  - **Discounting**—the process of calculating present values of cash flows.

❖ Future Value

- **Compounding** is the process of finding the future values of cash flows by applying the concept of compound interest.
- **Compound interest** is the interest that is received on the original amount (principal) as well as on any interest earned but not withdrawn during earlier periods.

- **Simple interest** is the interest that is calculated only on the original amount (principal), and thus, no compounding of interest takes place.

  - The general form of equation for calculating the future value of a lump sum after n periods may, therefore, be written as follows:

$$F_n = P(1+i)^n$$

  - The term $(1+i)^n$ is the **compound value factor** (CVF) of a lump sum of Re 1, and it always has a value greater than 1 for positive i, indicating that CVF increases as i and n increase.

$$F_n = P \times \text{CVF}_{n,i}$$

❖ Example

- If you deposited Rs 55,650 in a bank, which was paying a 15 per cent rate of interest on a ten-year time deposit, how much would the deposit grow at the end of ten years?

- First find out the compound value factor at 15 per cent for 10 years which is 4.046.
- Multiple 4.046 by Rs 55,650 to get the compound value:

$$FV = 55{,}650 \times CVF_{10,\,0.12} = 55{,}650 \times 4.046 = \text{Rs } 225{,}159.90$$

❖ Future Value of an Annuity

- **Annuity** is a fixed payment (or receipt) each year for a *specified* number of years.

$$F_n = A\left[\frac{(1+i)^n - 1}{i}\right]$$

- The term within brackets is the **compound value factor for an annuity** of Re 1, which we shall refer as *CVFA*.

$$F_n = A \times \text{CVFA}_{n,i}$$

❖ Example

- Suppose that a firm deposits Rs 5,000 at the end of each year for four years at 6 per cent rate of interest. How much would this annuity accumulate at the end of the fourth year?
- First find *CVFA* which is 4.3746.
- Multiple 4.375 by Rs 5,000 to obtain a compound value of Rs 21,875:

$$F_4 = 5{,}000(\text{CVFA}_{4,\,0.06}) = 5{,}000 \times 4.3746 = \text{Rs } 21{,}873$$

❖ Sinking Fund

- **Sinking fund** is a fund, which is created out of fixed payments each period to accumulate to a future sum after a specified period. For example, companies generally create sinking funds to retire bonds (debentures) on maturity.

- The factor used to calculate the annuity for a given future sum is called the *sinking fund factor* (*SFF*).

$$A = F_n\left[\frac{i}{(1+i)^n - 1}\right]$$

❖ Example

- Suppose a 20-year-old student wants to start saving for retirement. She plans to save Rs.3 a day. Every day, she puts Rs.3 in her drawer. At the end of the year, she invests the accumulated savings (Rs.1,095) in an online stock account. The stock account has an expected annual return of 12%.
  - → When she is 65 years old, she will get Rs. **1,487,261.89**

$$A = F_n\left[\frac{i}{(1+i)^n - 1}\right]$$

❖ Present Value

- Present value of a future cash flow (inflow or outflow) is the amount of current cash that is of equivalent value to the decision-maker.
- **Discounting** is the process of determining present value of a series of future cash flows.
- The interest rate used for discounting cash flows is also called the discount rate.

❖ Present Value of a Single Cash Flow

- Formula to calculate the present value of a lump sum to be received after some future periods:

$$P = \frac{F_n}{(1+i)^n} = F_n\left[(1+i)^{-n}\right]$$

- The term in parentheses is the **discount factor** or **present value factor** (*PVF*), and it is always less than 1.0 for positive *i*, indicating that a future amount has a smaller present value.

$$PV = F_n \times \text{PVF}_{n,i}$$

- In MS Excel use pv function

PV(rate,nper,pmt,fv,type)

❖ Example

- Suppose that an investor wants to find out the present value of Rs 50,000 to be received after 15 years. Her interest rate is 9 per cent. First, we will find out the present value factor, which is 0.275. Multiplying 0.275 by Rs 50,000, we obtain Rs 13,750 as the present value:

$$\text{PV} = 50{,}000 \times \text{PVF}_{15,\,0.09} = 50{,}000 \times 0.275 = \text{Rs } 13{,}750$$

❖ Present Value of an Annuity

- The computation of the present value of an annuity can be written in the following general form:

$$P = A\left[\frac{1}{i} - \frac{1}{i(1+i)^n}\right]$$

- The term within parentheses is the **present value factor of an annuity** of Re 1, which we would call *PVFA*, and it is a sum of single-payment present value factors.

$$P = A \times \text{PVAF}_{n,i}$$

- In MS Excel use pmt function.

PMT(rate,nper,pv,fv,type)

❖ Example

- Suppose you have borrowed a 3-year loan of Rs 10,000 at 9 per cent from your employer to buy a motorcycle. If your employer requires three equal end-of-year repayments, then the annual instalment will be

$$10{,}000 = A \times \text{PVFA}_{3,0.09}$$

$$10{,}000 = A \times 2.531$$

$$A = \frac{10{,}000}{2.531} = \text{Rs}\,3{,}951$$

❖ Present Value of an Uneven Periodic Sum

- In most instances the firm receives a stream of uneven cash flows. Thus, the present value factors for an annuity cannot be used.
- The procedure is to calculate the present value of each cash flow and aggregate all present values.

- Example:

  - Consider that an investor has an opportunity of receiving Rs 1,000,Rs 1,500, Rs 800, Rs 1,100 and Rs 400 respectively at the end of one through five years. Find out the present value of this stream of uneven cash flows. The investor's required interest rate is 8 per cent? The present value is calculated as follows:

$$\text{Present value} = \frac{1000}{(1.08)} + \frac{1,500}{(1.08)^2} + \frac{800}{(1.08)^3} + \frac{1,100}{(1.08)^4} + \frac{400}{(1.08)^5} = Rs3,927.60$$

$$\begin{aligned} PV &= 1,000 \times \text{PVF}_{1,.08} + 1,500 \times \text{PVF}_{2,.08} + 800 \times \\ &= \text{PVF}_{3,.08} + 1,100 \times \text{PVF}_{4,.08} + 400 \times \text{PVF}_{5,.08} \\ &= 1,000 \times .926 + 1,500 \times .857 + 800 \times .794 + 1,100 \\ &\quad \times .735 + 400 \times .681 = \text{Rs } 3,927.60 \end{aligned}$$

❖ Present Value of Growing Annuities

- The present value of a constantly growing annuity is given below:

$$P = \frac{A}{i-g}\left[1 - \left(\frac{1+g}{1+i}\right)^n\right]$$

- Present value of a constantly growing perpetuity is given by a simple formula as follows:

$$P = \frac{A}{i-g}$$

❖ Example

Assume that you earn an annual salary of Rs 1,000 with the provision that you will get annual increment at the rate of 10 per cent. It means that you shall get the following amounts from year 1 through year 5.

End of Year	*Amount of Salary (Rs)*	
1	1,000 = 1,000 × 1.10^0	1,000
2	1,000 × 1.10 = 1,000 × 1.10^1	1,100
3	1,100 × 1.10 = 1,000 × 1.10^2	1,210
4	1,210 × 1.10 = 1,000 × 1.10^3	1,331
5	1,331 × 1.10 = 1,000 × 1.10^4	1,464

Present value of Salary at required rate of return of 12% is

$$P = \frac{1,000(1.10)^0}{(1.12)^1} + \frac{1,000(1.10)^1}{(1.12)^2} + \frac{1,000(1.10)^2}{(1.12)^3} + \frac{1,000(1.10)^3}{(1.12)^4} + \frac{1,000(1.10)^4}{(1.12)^5}$$

$$= 1,000 \times \frac{1}{(1.12)^1} + 1,100 \times \frac{1}{(1.12)^2} + 1,210 \times \frac{1}{(1.12)^3} + 1,331 \times \frac{1}{(1.12)^4} + 1,464 \times \frac{1}{(1.12)^5}$$

Year End	*Amount of Salary (Rs)*	*PVF @ 12%*	*PV of Salary (Rs)*
1	1,000	0.893	893
2	1,100	0.797	877
3	1,210	0.712	862
4	1,331	0.636	847
5	1,464	0.567	830
	6,105		4,309

❖ Value of an Annuity Due

- **Annuity due** is a series of fixed receipts or payments *starting at the beginning of each period* for a specified number of periods.
- **Future Value of an Annuity Due**

$$F_n = A \times \text{CVFA}_{n,i} \times (1+i)$$

- **Present Value of an Annuity Due**

$$P = A \times \text{PVFA}_{n,i} \times (1+i)$$

❖ Example

- When you deposit Re 1 at the end of each year, the compound value at the end of 4 years is Rs 4.375. However, Re 1 deposited in the beginning of each of year 1 through year 4 will earn interest respectively for 4 years, 3 years, 2 years and 1 year:

$$F = 1 \times 1.06^4 + 1 \times 1.06^3 + 1 \times 1.06^2 + 1 \times 1.06^1$$
$$= 1.262 + 1.191 + 1.124 + 1.06 = \text{Rs } 4.637$$

The present value of Re 1 paid at the beginning of each year for 4 years is $1 \times 3.170 \times 1.10 = \text{Rs } 3.487$

❖ Continuous Compounding

- The **continuous compounding** function takes the form of the following formula:

$$F_n = P \times e^{i \times n} = P \times e^x$$

- Present value under continuous compounding:

$$P = \frac{F_n}{e^{in}} = F_n \times e^{-i \times n}$$

❖ STUDENT'S ACTIVITIES

➢ PROBLEM 2.1

(i) Calculate the present value of Rs. 600 (a) received one year from now; (b) received at the end of five years; (c) received at the end of fifteen years. Assume a 5 per cent time preference rate.

(ii) Determine the present value of Rs. 700 each paid at the end of each of the next six years. Assume an 8 per cent of interest.

(iii) Assuming a 10 per cent discount rate, compute the present value of Rs. 1,100; Rs. 900; Rs. 1,500 and Rs. 700 received at the end of one through four years. For calculations, use the tables given at the end of the book.

➢ SOLUTION

Table C will be used to compute the present value.

i. Present value of Rs. 600:

(a) The present value factor at 5 per cent for one year is: 0.952. Therefore, the present value of Rs. 600 at the end of one year will be: Rs. 600 × 0.952 = Rs. 571.20.

(b) The present value factor at 5 per cent at the end of five years is: 0.784. Therefore, present value of Rs. 600 will be: Rs. 600 × 0.784 = Rs. 470.40.

(c) The present value factor at 5 per cent at the end of fifteen years is 0.481. Therefore, present value of Rs. 600 will be: Rs. 600 × 0.481 = Rs. 288.60.

ii. As the present value of an annuity of Rs. 700 has to be computed, Table D will be used. The present value factor of an annuity of Rs. 1 at 8 per cent for 6 years

is 4.623. Therefore, the present value of an annuity of Rs. 700 will be: 4.623 × Rs. 700 = Rs. 3,236.10.

iii. Table C will be used to compute the present value of the uneven series of cash flows. The computation is shown as follows:

P = Rs. 1,100 × 0.909 + Rs. 900 × 0.826 + Rs. 1,500 × 0.751+ Rs. 700 × 0.683

= Rs. 999.90 + Rs. 743.40 + Rs. 1,126.50 + Rs. 478.10

= Rs. 3, 347.90

- **PROBLEM 2.2**

Exactly ten years from now Sri Chand will start receiving a pension of Rs. 3,000 a year. The payment will continue for sixteen years. How much is the pension worth now, if Sri Chand's interest rate is 10 per cent?

- **SOLUTION**

Sri Chand will receive first payment at the end of 10th year, and last payment at the end of 25th year. That provides him 16 payments of pension money. This can be shown on time scale as follows:

Year end---------0----------10------------25

First payment Last payment

The discounted value of the annuity of Rs. 3,000 starting from the end of year 10 until the end of year 25 is the present value of pension received by Sri Chand. Assuming an annuity for 25 years, PVFA is 9.077. But we know that Sri Chand will not receive anything till the end of year 9. Therefore, if we subtract PVAF at ten per cent for 9 years, viz., 5.759 from PVFA at 10 percent for 25 years, 9.077, we shall be

left with 9.077 – 5.759 = 3.318, which is a PVAF for the annuity starting from the end of year 10 and ending at the end of year 25. Thus, the present value of pension will be equal to:

(9.077 – 5.759) × Rs. 3,000 = 3.318 × Rs. 3,000 = Rs. 9,954

Alternatively, the present value of the pension can be found in two steps. First, find out present value of the 16-year annuity at 10 per cent interest rate at the end of year 9.

P_9 = Rs. 3,000 × 7.824 = Rs. 23,472

Then find out present value now of the lump sum of Rs. 23,472:

P_0 = Rs. 23,472 × 0.424 = Rs. 9,954

- **PROBLEM 2.3**

Your father has promised to give you Rs. 100,000 in cash on your 25th birthday. Today is your 16th birthday. He wants to know two things:
(a) If he decides to make annual payments into a fund after one year, how much will each have to be if the fund pays 8 per cent?
(b) If he decides to invest a lump sum in the account after one year and let it compound annually, how much will the lump sum be?
(c) If in (a) the payments are made in the beginning of the year, how much will be the value of annuity? Assuming that interest is 8 per cent in each case.

➢ SOLUTION

(a) $₹100,000 = A(\text{CVFA}_{9,0.08}) = ₹100,000 = A(12.488)$

$$A = \frac{₹100,000}{12.488} = ₹8007.69$$

(b) $₹100,000 = P(\text{CVF}_{9,0.08}) = ₹100,000 = P(1.999)$

$$P = \frac{₹100,000}{1.999} = ₹50,025$$

(c) This is a problem of an annuity due since payment is made at the beginning of the year.

$$₹100,000 = A(\text{CVFA}_{9,0.08}(1.08))$$

$$₹1.00,000 = A(12.487)$$

$$A = \frac{₹100,000}{13.478} = ₹7,414.55$$

PROBLEM 2.4 *XYZ* Bank pays 12 per cent and compounds interest quarterly. If ₹1,000 is deposited initially, how much shall it grow at the end of 5 years?

SOLUTION: The quarterly interest rate will be 3 per cent and the number of periods for which it will be compounded will be 20 (i.e., 5 years × 4). Thus,

$$F_5 = P\left[1 + \frac{i}{m}\right]^{n \times m}$$

$$F_5 = ₹1,000\left[1 + \frac{0.12}{4}\right]^{5 \times 4}$$

$$= ₹1,000(1.03)^{20} = ₹1,000 \times 1.806 = ₹1,806$$

PROBLEM 2.5 How long will it take to double your money if it grows at 12 per cent annually?

SOLUTION:

$$F_n = P \times \text{CVF}_{n,i}$$
$$2 = 1 \times \text{CVF}_{n,0.12}$$
$$2 = \text{CVF}_{n.012}$$

From Table A, the factor nearest to 2.00 is $\text{CVF}_{6,0.12} = 1.974$. Therefore, $n = 6$ years.

PROBLEM 2.6 Mohan bought a share 15 years ago for ₹10. It is now selling for ₹27.60. What is the compound growth rate in the price of the share?

SOLUTION:

$$F_n = P(\text{CVF}_{n,i})$$
$$27.60 = 10(\text{CVF}_{15,i})$$
$$\text{CVF}_{15,i} = \frac{27.60}{10} = 2{,}760$$

From Table A, $i = 7\%$.

PROBLEM 2.7 Sadhulal Bhai is borrowing ₹50,000 to buy a low-income group house. If he pays equal instalments for 25 years and 4 per cent interest on outstanding balance, what is the amount of instalment? What shall be amount of instalment if quarterly payments are required to be made?

SOLUTION: Annual payment:

$$P = A(\text{PVFA}_{n,i})$$
$$₹50,000 = A(\text{PVFA}_{25,0.04})$$
$$₹50,000 = A(15.622)$$
$$A = \frac{₹50,00}{15.622} = ₹3,200.61$$

Quarterly payment: The quarterly interest rate will be $0.04/4 = 0.01$ and number of compounding periods will be $25 \times 4 = 100$.

$$₹50,000 = A(\text{PVFA}_{100,0.01})$$
$$₹50,000 = A(63.29)$$
$$A = \frac{₹50,000}{63.029} = ₹793.28$$

PROBLEM 2.8 A company has issued debentures of ₹50 lakh to be repaid after 7 years. How much should the company invest in a sinking fund earning 12 per cent in order to be able to repay debentures?

SOLUTION:
$$A\,(\text{CVFA}_{0.12,7}) = 50$$
$$A(10.089) = 50$$
$$A = \frac{50}{10.089} = ₹4.96 \text{ lakh}$$

PROBLEM 2.9 A bank has offered to you an annuity of ₹1,800 for 10 years if you invest ₹12,000 today. What rate of return would you earn?

SOLUTION:
$$12,000 = 1,800(\text{PVFA}_{r,10})$$
$$\text{PVFA}_{r,10} = \frac{12,000}{1,800} = 6.667$$

When you refer to Table D at the end of the book, you obtain a present value factor of an annuity of ₹1 equal to 6.710, at 8 per cent rate of interest for 10 years. At 9 per cent the factor is 6.418. Thus, the rate of return lies between 8–9 per cent. By interpolation, we can obtain the rate of return as follows:

$$\text{Rate of return} = 8\% + \left[\frac{6.710 - 6.667}{6.710 - 6.418}\right] = 8\% + \frac{0.043}{0.292}$$
$$= 8\% + 0.15\% = 8.15\%$$

Chapter 03

Sources of Long-Term Finance

❖ Introduction

- Two long-term securities that are available to a company for raising capital are shares and debentures.
- Shares include ordinary (common) shares and preference shares.
- Ordinary shares provide ownership rights to investors.
- Debentures or bonds provide loan capital to the company, and investors get the status of lenders.
- Loan capital is also directly available from the financial institutions to the companies.
- Financial Assets are also called securities, are financial papers or instruments such as shares and bonds or debentures.

❖ ORDINARY SHARES OR EQUITY

- Ordinary shares represent the ownership position in a company. The holders of ordinary shares or equity, called shareholders, are the legal owners of the company.
- Ordinary shares are the source of permanent capital since they do not have a maturity date.
- For the capital contributed by purchasing ordinary shares, the shareholders are entitled for dividends.
- The amount or rate of dividend is not fixed; the company's board of directors decides it.
- An ordinary share is, therefore, known as a variable income security.

- Being the owners of the company, shareholders bear the risk of ownership; they are entitled to dividends after the income claims of others have been satisfied.
- Similarly, when the company is wound up, they can exercise their claims on assets after the claims of other suppliers of capital have been met.

❖ RIGHTS ISSUE OF EQUITY SHARES

- A rights issue involves selling of ordinary shares to the existing shareholders of the company.
- The law in India requires that the new ordinary shares must be first issued to the existing shareholders on a pro rata basis.
- Shareholders through a special resolution can forfeit this pre-emptive right. Obviously, this will dilute their ownership.

❖ PREFERENCE SHARES

- Preference share is often considered to be a hybrid security since it has many features of both ordinary shares and debentures.
- It is similar to ordinary shares in that

  (a) the non-payment of dividends does not force the company to insolvency,

  (b) dividends are not deductible for tax purposes, and

  (c) in some cases, it has no fixed maturity date.
- On the other hand, it is similar to debentures in that

  (a) dividend rate is fixed,

  (b) preference shareholders do not share in the residual earnings,

  (c) preference shareholders have claims on income and assets prior to ordinary shareholders, and

  (d) they usually do not have voting rights.

- Preference shares may be issued in different forms.

  (a) Redeemable preference shares maturity value, while irredeemable preference share is perpetual without a maturity value.

  (b) Cumulative preference share accumulates outstanding dividend and to paid when the firm makes profit.
- On the other hand, non-cumulative preference share foregoes outstanding dividend.

  (c) Participative preference share gives voting right to the preference shareholders.
- Preference shareholders do not have voting rights on case of non-participative preference share.

  (d) Convertibles preference share entitles the preference shareholders to convert preference shares into ordinary shares.
- Non-convertible preference share cannot be converted into ordinary share.

  (e) Convertible cumulative preferences share combines two features: conversion into ordinary share and accumulation of dividend.

❖ DEBENTURES

- A debenture is a long-term promissory note for raising loan capital.
- The firm promises to pay interest and principal as stipulated.
- The purchasers of debentures are called debenture holders.
- An alternative form of debenture in India is a bond.
- Mostly public sector companies in India issue bonds. In USA, the term debenture is generally understood to mean unsecured bond.
- An example of debenture issue is that of Shriram Transport corporation that issued debentures of Rs. 500 crores in 2011. The issue was over-subscribed, and the company retained additional Rs. 500 crores.

➢ Types of Debentures

- Debentures may be straight debentures or convertible debentures.
- A convertible debenture (CD) is one which can be converted, fully or partly, into shares after a specified period of time.
- Thus, on the basis of convertibility, debentures may be classified into three categories.
    1. Non-convertible debentures (NCDs)
    2. Fully convertible debentures (FCDs)
    3. Partly convertible debentures (PCDs).

1. Non-convertible debentures (NCDs)

- NCDs are pure debentures without a feature of conversion. They are repayable on maturity. The investor is entitled for interest and repayment of principal.
- The erstwhile ICICI issued debentures for Rs. 200 crores fully non-convertible bonds of Rs. 1,000 each, at 16 per cent rate of interest, payable half-yearly. The maturity period was five years. However, the investors had the option to be repaid fully or partly, the principal after 3 years, after giving due notice to ICICI.

2. Fully convertible debentures (FCDs)

- FCDs are converted into shares as per the terms of the issue, with regard to the price and time of conversion.
- The pure FCDs carry interest rates, generally less than the interest rates on NCDs since they have the attraction feature of being converted into equity shares.
- Recently, companies in India are issuing FCDs with zero rate of interest.

- For example, Jindal Iron and Steel Company Limited raised FCDs at Rs. 111.2 each. After 12 months of allotment, each FCD was convertible into one share of Rs. 100—Rs. 90 being the premium.

3. Partly convertible debentures (PCDs)

- A number of debentures issued by companies in India have two parts: a convertible part and a non-convertible part. Such debentures are known as partly-convertible debentures (PCDs).
- The investor has the advantages of both convertible and non-convertible debentures blended into single debenture.
- For example, Proctor and Gamble Limited (P&G) issued 400,960 PCDs of Rs. 200 each to its existing shareholders, in July 1991. Each PCD had two parts: convertible portion of Rs. 65 each to be converted into one equity share of Rs. 10 each, at a premium of Rs. 55 per share, at the end of 18, months from the date of allotment and non-convertible portion of Rs. 135, payable in three equal instalments on the expiry of the 6th, 7^{th} and 8th years from the date of allotment.

❖ TERM LOANS

- Debt capital of a company may consist of either debentures or bonds which are issued to public for subscription, or term loans, which are obtained directly from the banks and financial institutions.
- Term loans are sources of long-term debt. In India, they are generally obtained for financing large expansion, modernization or diversification projects.
- Therefore, this method of financing is also called project financing

Chapter 04

Valuation of Bonds, Preference shares and Equity

❖ LEARNING OBJECTIVES

- Explain the fundamental characteristics of ordinary shares, preference shares and bonds (or debentures).
- Show the use of the present value concepts in the valuation of shares and bonds.
- Learn about the linkage between the share values, earnings and dividends and the required rate of return on the share.
- Focus on the uses and misuses of price-earnings (P/E) ratio.

❖ Introduction

- Assets can be real or financial; securities like shares and bonds are called **financial assets** while physical assets like plant and machinery are called **real assets**.
- The concepts of return and risk, as the determinants of value, are as fundamental and valid to the valuation of securities as to that of physical assets.
- **Efficient capital market** implies a well-informed, properly functioning capital market.

❖ Concept of Value

- **Book Value**- Book value per share is determined as net worth divided by the number of shares outstanding. Book value reflects historical cost, rather than value.

- **Replacement Value**- Replacement value is the amount that a company would be required to spend if it were to replace its existing assets in the current condition.
- **Liquidation Value**- Liquidation value is the amount that a company could realize if it sold its assets, after having terminated its business.
- **Going Concern Value**- Going concern value is the amount that a company could realize if it sold its business as an operating business.
- **Market Value**- Market value of an asset or security is the current price at which the asset or the security is being sold or bought in the market.

❖ Features of a Bond

The main features of a bond or debenture are discussed below:

- **Face value:** Face value is called par value. A bond (debenture) is generally issued at a par value of Rs. 100 or Rs. 1,000, and interest is paid on face value.
- **Interest rate:** Interest rate is fixed and known to bondholders (debenture-holders). Interest paid on a bond/debenture is tax deductible. The interest rate is also called coupon rate. Coupons are detachable certificates of interest.
- **Maturity:** A bond (debenture) is generally issued for a specified period of time. It is repaid on maturity.
- **Redemption value:** The value that a bondholder (debenture-holder) will get on maturity is called redemption, or maturity, value. A bond (debenture) may be redeemed at par or at a premium (more than par value) or at a discount (less than par value).
- **Market value:** A bond (debenture) may be traded in a stock exchange. The price at which it is currently sold or bought is called the market value of the bond (debenture). Market value may be different from par value or redemption value.

❖ Types of Bonds

Bonds maybe classified into three categories:

1) Bonds with maturity
2) Pure discount bonds -The bond discount is the difference between the par value and the selling price.
3) Perpetual bonds

1) Bond with Maturity

- The government and companies mostly issue bonds that specify the interest rate and the maturity period.
- The present value of a bond (debenture) is the discounted value of its cash flows; that is, the annual interest payments plus bond's terminal or maturity value.
- The discount rate is the interest rate that investors could earn on bonds with similar characteristics.
- By comparing the present value of a bond with its current market value, it can be determined whether the bond is overvalued or undervalued.

Bond value = Present value of interest + Present value of maturity value:

$$B_0 = \sum_{t=1}^{n} \frac{\text{INT}_t}{(1+k_d)^t} + \frac{B_n}{(1+k_d)^n}$$

❖ Example

- Suppose an investor is considering the purchase of a five-year, Rs 1,000 par value bond, bearing a nominal rate of interest of 7 per cent per annum. The investor's required rate of return is 8 per cent. What should he be willing to pay now to purchase the bond if it matures at par?
- The present value of the bond ($B0$) as follows:

$$B_0 = \frac{70}{(1.08)^1} + \frac{70}{(1.08)^2} + \frac{70}{(1.08)^3} + \frac{70}{(1.08)^4} + \frac{70}{(1.08)^5} + \frac{1000}{(1.08)^5}$$

$$B_0 = 70 \times 3.993 + 1{,}000 \times 0.681 = 279.51 + 681 = \text{Rs } 960.51$$

- This implies that Rs. 1,000 bond is worth Rs. 960.51 today if the required rate of return is 8 per cent.
- The investor would not be willing to pay more than Rs. 960.51 for bond today.
- Note that Rs. 960.51 is a composite of the present value of interest payments, Rs. 279.51 and the present value of the maturity value, Rs. 681.

❖ Yield to Maturity

- We can calculate a bond's yield or the rate of return when its current price and cash flows are known.
- The yield-to-maturity (YTM) is the measure of a bond's rate of return that considers both the interest income and any capital gain or loss. YTM is bond's internal rate of return.

A perpetual bond's yield-to-maturity:

$$B_0 = \sum_{t=1}^{n=\infty} \frac{\text{INT}}{(1+k_d)^t} = \frac{\text{INT}}{k_d}$$

❖ Current Yield

- Yield-to-maturity is not the same as the current yield.
- Current yield is the annual interest divided by the bond's current value.
- In the example, the annual interest is Rs. 60 on the current investment of Rs. 883.40. Therefore, the current rate of return or the current yield is: 60/883.40 = 6.8 per cent.
- Current yield considers only the annual interest (Rs. 60 in the example) and does not account for the capital gain or loss.
- On maturity, the bond price will increase to Rs. 1,000 and there would be a capital gain of Rs. 116.60 [Rs. 1,000 – Rs. 883.40].
- Thus, bond's overall rate of return over 5 years period would be more than the current yield.
- If the bond's current price were less than its maturity value, its overall rate of return would be less than the current yield.

❖ Yield to Call

- A number of companies issue bonds with buy back or call provision. Thus, a bond can be redeemed or called before maturity.
- What is the yield or the rate of return of a bond that may be redeemed before maturity? The procedure for calculating the yield-to-call is the same as for the yield-to-maturity.

- The call period would be different from the maturity period and the call (or redemption) value could be different from the maturity value. Consider an example.

  - **Example**: Suppose the 10% 10-year Rs 1,000 bond is redeemable (callable) in 5 years at a call price of Rs 1,050. The bond is currently selling for Rs 950. The bond's yield to call is 12.7%.

$$950 = \sum_{t=1}^{5} \frac{100}{(1+\text{YTC})^t} + \frac{1,050}{(1+\text{YTC})^5}$$

❖ Bond Value and Amortization of Principal

- A bond (debenture) may be amortized every year, i.e., repayment of principal every year rather at maturity.
- In that case, the principal will decline with annual payments and interest will be calculated on the outstanding amount. The cash flows of the bonds will be uneven.

  - The formula for determining the value of a bond or debenture that is amortised every year, can be written as follows:

$$B_0 = \sum_{t=1}^{n} \frac{CF_t}{(1+k_d)^t}$$

  - → Note: Cash flow, *CF*, includes both the interest and repayment of the principal.

❖ Example

- Suppose the government is proposing to sell a 5-year bond of Rs 1,000 at 8 per cent rate of interest per annum. The bond amount will be amortized (repaid) equally over its life. If an investor has a minimum required rate of return of 7 per cent, what is the bond's present value for him?

- The outflows every year will consist of interest payment and repayment of principal for Year 1 through 5: Rs 200 + Rs 80 = Rs 280; Rs 200 + Rs 64 = Rs 264; Rs 200 + Rs 48 = Rs 248; Rs 200 + Rs 32 = Rs 232; and Rs 200 + Rs 16 = Rs 216 and the PV of bond is

$$
\begin{aligned}
B_0 &= \frac{280}{(1.07)^1} + \frac{264}{(1.07)^2} + \frac{248}{(1.07)^3} + \frac{232}{(1.07)^4} + \frac{216}{(1.07)^5} \\
&= 280 \times 0.935 + 264 \times 0.873 + 248 \times 0.816 + \\
&\quad 232 \times 0.763 + 216 \times 0.713 \\
&= 261.80 + 230.47 + 202.37 + 177.02 + 154.00 \\
&= \text{Rs } 1025.66
\end{aligned}
$$

❖ Bond Values and Semi-annual Interest Payments

- It is a practice of many companies in India to pay interest on bonds (or debentures) semi-annually.
- The formula for bond valuation can be modified in terms of half-yearly interest payments and compounding periods as given below:

$$B_0 = \sum_{t=1}^{2\times n} \frac{1/2(\text{INT}_t)}{(1+k_d/2)^t} + \frac{B_n}{(1+k_d/2)^{2\times n}}$$

❖ Example

- Suppose, a 10-year bond of Rs 1,000 has an annual rate of interest of 12 per cent. The interest is paid half-yearly. What is the value of the bond if the required rate of return is 12 per cent?

$$= \sum_{t=1}^{2\times10} \frac{1/2(120)}{(1+.12/2)^t} + \frac{1,000}{(1+.12/2)^{2\times10}}$$

$$= \sum_{t=1}^{20} \frac{60}{(1.06)^t} + \frac{1,000}{(1.06)^{20}}$$

$$= 60 \times \text{Annuity factor } (6\%, 20) + 1,000 \times PV \text{ factor } (6\%, 20)$$

$$= 60 \times 11.4699 + 1,000 \times 0.3118 = 688.20 + 311.80$$

$$= \text{Rs } 1,000$$

2) Pure Discount Bonds

- Pure discount bonds do not carry an explicit rate of interest.
- They provide for the payment of a lump sum amount at a future date in exchange for the current price of the bonds.
- The difference between the face value of the bond and its purchase price gives the return or YTM to the investor.

- **Example:** A company may issue a pure discount bond of Rs 1,000 face value for Rs 520 today for a period of five years. The rate of interest can be calculated as follows:

$$520 = \frac{1,000}{(1+\text{YTM})^5}$$

$$(1+\text{YTM})^5 = \frac{1,000}{520} = 1.9231$$

$$i = 1.9231^{1/5} - 1 = 0.14 \text{ or } 14\%$$

- Pure discount bonds are called **deep-discount bonds** or **zero-interest bonds** or **zero-coupon bonds.**
- The **market interest rate**, also called the **market yield**, is used as the discount rate.
- Value of a pure discount bond = PV of the amount on maturity:

$$B_0 = \frac{M_n}{(1+k_d)^n}$$

- Consider the IDBI bond with a face value of Rs 500,000 with a maturity of 30 years. Suppose the current market yield on similar bonds is 9 per cent. The value of the IDBI pure-discount bond today is as follows:

$$B_0 = \frac{500,000}{(1.09)^{30}} = \text{Rs } 37,685.57$$

3) Perpetual Bonds

- Perpetual bonds, also called consols, has an indefinite life and therefore, it has no maturity value. Perpetual bonds or debentures are rarely found in practice. Example:

  - Suppose that a 10 per cent Rs 1,000 bond will pay Rs 100 annual interest into perpetuity. What would be its value of the bond if the market yield or interest rate were 15 per cent?
  - The value of the bond is determined as follows:

$$B_0 = \frac{\text{INT}}{k_d} = \frac{100}{0.15} = \text{Rs } 667$$

❖ VALUATION OF PREFERENCE SHARES

- Preference shares have preference over ordinary shares in terms of payment of dividend and repayment of capital if the company is wound up. They may be issued with or without a maturity period.
- Redeemable preference shares are shares with maturity.
- Irredeemable preference shares are shares without any maturity.
- The holders of preference shares get dividends at a fixed rate.
- With regard to dividends, preference shares may be issued with or without cumulative features.
- In the case of cumulative preference shares unpaid dividends accumulate and are payable in the future.
- Dividends in arrears do not accumulate in the case of non-cumulative preference shares.

➢ Features of Preference and Ordinary Shares

The following are the features of preference and ordinary shares:

- **Claims:** Preference shareholders have a claim on assets and incomes prior to ordinary shareholders. Equity (ordinary) shareholders have a residual claim on a company's incomes and assets. The Equity shareholders are the legal owners of the company.
- **Dividend:** The dividend rate is fixed in the case of preference shares. Preference shares may be issued with cumulative rights, i.e., dividend will accumulate until paid-off. In the case of equity shares neither the dividend rate is known, nor does dividend accumulate. Dividends paid on preference and equity shares are not tax deductible.

- **Redemption:** Both redeemable and irredeemable preference shares can be issued in India. Redeemable preference shares have a maturity date while irredeemable preference shares are perpetual. Equity shares have no maturity date.
- **Conversion:** A company can issue convertible preference shares. That is, after a stated period, such shares can be converted into ordinary shares.

❖ Valuation of Preference Shares

- The value of the preference share would be the sum of the present values of dividends and the redemption value.
- A formula similar to the valuation of bond can be used to value preference shares with a maturity period:

$$P_0 = \sum_{t=1}^{n} \frac{\text{PDIV}_1}{(1+k_p)^t} + \frac{P_n}{(1+k_p)^n}$$

- Suppose an investor is considering the purchase of a 12-year, 10 per cent Rs. 100 par value preference shares. The redemption value of the preference share on maturity is Rs. 120. The investor's required rate of return is 10.5 per cent. What should she be willing to pay for the share now?
- The investor would expect to receive Rs. 10 as preference dividend each year for 12 years and Rs. 110 on maturity (i.e., at the end of 12 years). We can use the present value annuity factor to value the constant stream of preference dividends and the present value factor to value the redemption payment.

$$P_0 = 10 \times \frac{1}{0.105} - \frac{1}{0.105 \times (1.105)^{12}} + \frac{120}{(1.105)^{12}}$$

$$= 10 \times 6.506 + 120 \times 0.302 = 65.06 + 36.24 = \text{Rs } 101.30$$

❖ VALUATION OF ORDINARY SHARES

- The valuation of ordinary or equity shares is relatively more difficult. The difficulty arises because of two factors:
- First, the rate of dividend on equity shares is not known; also, the payment of equity dividend is discretionary, i.e., dependent on the company's discretion.
- Thus, the estimates of the amount and timing of the cash flows expected by equity shareholders are more uncertain.
- In the case of debentures and preference shares, the rate of interest and dividend, respectively, are known with certainty.
- It is, therefore, easy to make the forecasts of cash flows associated with them.
- Second, the earnings and dividends on equity shares are generally expected to grow, unlike the interest on bonds and preference dividend.
- This feature of variable dividend on equity shares makes the calculation of share value difficult.

❖ Dividend Discount Model (DDM)

- The general principle of valuation applies to the share valuation.
- The value of a share today depends on cash inflows expected by investors and the risks associated with those cash inflows.
- Cash inflows expected from an equity share consist of dividends that the owner expects to receive while holding the share and the price, which he expects to obtain when the share is sold.
- The price, which the owner is expected to receive when he sells the share, will include the original investment plus a capital gain (or minus a capital loss).
- The value of an ordinary share is determined by capitalizing the future dividend stream at the opportunity cost of capital.

❖ Single Period Valuation

- Single Period Valuation: $P_0 = \frac{DIV_1 + P_1}{1 + k_e}$
  - If the share price is expected to grow at g per cent, then P_1:
    $$P_1 = P_0(1+g)$$
  - We obtain a simple formula for the share valuation as follows:
    $$P_0 = \frac{DIV_1}{k_e - g}$$

- Let us assume that an investor intends to buy a share and will hold it for one year. Suppose he expects the share to pay a dividend of Rs 2 next year, and would sell the share at an expected price of Rs 21 at the end of the year. If the investor's opportunity cost of capital or the required rate of return (ke) is 15 per cent, how much should he pay for the share today?

$$P_0 = \frac{DIV_1 + P_1}{1 + k_e}$$

$$P_0 = \frac{2 + 21}{1.15} = \text{Rs } 20$$

- An under-valued share has a market price less than the share's present value.
- An over-valued share has a market price higher than the share's present value.

❖ Multi-period Valuation

□ The following is the general formula for calculating the value of a share:

$$P_0 = \sum_{t=1}^{n} \frac{DIV_t}{(1+k_e)^t} + \frac{P_n}{(1+k_e)^n}$$

Growth in Dividends

→ Normal Growth

$$\text{Growth} = \text{Retention ratio} \times \text{Return on equity}$$

$$g = b \times ROE$$

→ Super-normal Growth

$$P_0 = \frac{DIV_1}{k_e - g}$$

Share value = PV of dividends during finite super-normal growth period
+ PV of dividends during indefinite normal growth period

- Suppose that the price of a share today ($P0$) is Rs 20 and it is expected to increase at an annual rate of 5 per cent and it is also expected to grow at a rate of 5 per cent per annum.
- The price would equal the present value of dividends for 5 years plus the present value of the share price at the end of 5 years. That is:

$$P_0 = \left[\frac{2.00}{(1.15)} + \frac{2.10}{(1.15)^2} + \frac{2.21}{(1.15)^3} + \frac{2.32}{(1.15)^4} + \frac{2.43}{(1.15)^5}\right] + \frac{25.53}{(1.15)^5}$$

$$= 7.31 + 12.69 = \text{Rs } 20$$

The present value of the stream of dividends is Rs 7.31 and of the share price at the and of five years is Rs 12.69. The total present value of the share is Rs 20.

❖ Dividend Growth Model (DGM)

- Dividends do not remain constant. Earnings and dividends of most companies grow over time, at least, because of their retention policies.
- Historical evidence indicates that most companies have been retaining a substantial portion of their earnings (about 50 per cent) for reinvestment in the business.
- This policy would increase the ordinary shareholder's equity as well as the firm's future earnings.
- If the number of shares does not change, this policy should tend to increase the earnings per share, and consequently, it should produce an expanding stream of dividends per share.

❖ Normal Growth

- If a totally equity financed firm retains a constant proportion of its annual earnings (b) and reinvests it at its internal rate of return, which is its return on equity (ROE), then it can be shown that the dividends will grow at a constant rate equal to the product of retention ratio and return on equity; that is,

$$g = b \times ROE$$

Suppose the book value of a firm's equity per share today is Rs 100, and its return on equity (ROE) is 10 per cent. He firm's retention ratio is 60 per cent (which implies a payout ratio of 40 per cent). It is expected that the firm will also earn 10 per cent on its retained earnings. Let us also assume that the firm has no debt. The firm's earnings per share after one year will be: EPS_1 = Rs 100 × 0.10 = Rs 10. The firm will retain Rs 6 and distribute Rs 4 as dividends. The book value of equity per share in the beginning of second year will be: BV_1 = Rs 100 + Rs 6 =Rs 106. The firm's EPS in second year will be: EPS_2 = Rs 106 × 0.10 = Rs 10.6. Again, it will retain 60 per cent of the earnings, *viz. Rs 6.36 and distribute 40 per cent, viz.* Rs 4.24. The growth in dividend per share will be

$$\text{Growth in dividends} = \frac{DIV_2 - DIV_1}{DIV_1} = \frac{6.36 - 6}{6}$$
$$= 0.06 \text{ or } 6 \text{ per cent}$$

❖ **Perpetual Growth Model**

The present value of a share is equal to the dividend after a year, DIV_1, divided by the difference of the capitalization rate (k_e) and the growth rate (g); that is, $(k_e - g)$.

$$P_0 = \frac{DIV_1}{k_e - g}$$

It is based on the following assumptions:

- The capitalization rate or the opportunity cost of capital must be greater than the growth rate, (ke >g), otherwise absurd results will be attained. If ke= g, the equation will yield an infinite price, and if ke < g, the result will be a negative price.
- The initial dividend per share, DIV1, must be greater than zero (i.e., DIV1 > 0).
- The relationship between ke and g is assumed to remain constant and perpetual.

❖ Example

A company paid a dividend of Rs 3.70 in the previous year. The dividends in the future are expected to grow perpetually at a rate of 8 per cent. Find out the share's price today if the market capitalises dividend at 12 per cent?

$$P_0 = \frac{DIV_0(1+g)}{k_e - g} = \frac{DIV_1}{k_e - g}$$
$$= \frac{3.70(108)}{0.12 - 0.08} = \frac{4}{0.04} = \text{Rs } 100$$

❖ Earnings Capitalization

- Under two cases, the value of the share can be determined by capitalizing the expected earnings:
  - When the firm pays out 100 per cent dividends; that is, it does not retain any earnings.
  - When the firm's return on equity (ROE) is equal to its opportunity cost of capital.

❖ Equity Capitalization Rate

- For firms for which dividends are expected to grow at a constant rate indefinitely and the current market price is given

$$k_e = \frac{DIV_1}{P_0} + g$$

- In a well-functioning capital market, the market price is the fair price of a share. Therefore, the shareholders expect the share to earn a minimum return that keeps the current share price intact.
- For firms for which dividends are expected to grow at a constant rate indefinitely and the current market price is given, the capitalization or the required rate of return of the share can be estimated through:

$$k_e = \frac{DIV_1}{P_0} + g$$

❖ Example

- A company's share is currently selling for Rs 50 per share. It is expected that a dividend of Rs 3 per share after one year will grow at 8 per cent indefinitely. What is the equity capitalization rate? The equity capitalization rate is given as follows:

$$k_e = \frac{DIV_1}{P_0} + g = \frac{3}{50} + 0.08$$

$$= 0.14 \text{ or } 14 \text{ per cent}$$

❖ STUDENT'S ACTIVITIES

PROBLEM 3.1 (*a*) A ₹100 perpetual bond is currently selling for ₹95. The coupon rate of interest is 13.5 per cent and the appropriate discount rate is 15 per cent. Calculate the value of the bond. Should it be bought? What is its yield at maturity?

(*b*) A company proposes to sell ten-year debentures of ₹10,000 each. The company would repay ₹1,000 at the end of every year and will pay interest annually at 15 per cent on the outstanding amount. Determine the present value of the debenture issue if the capitalization rate is 16 per cent.

SOLUTION: (*a*) $$\text{Value of bond} = \frac{\text{INT}}{k_d} = \frac{13.5}{0.15} = ₹90$$

At ₹95, the bond is overvalued; therefore, it should not be bought.

$$\text{Yield at maturity} = \frac{\text{Interest}}{\text{Current value of bond}} = \frac{13.5}{95}$$

$$= 0.142 \text{ or } 14.2 \text{ per cent}$$

(*b*) The cash flow of the company every year will be ₹1,000 plus interest on outstanding amount. The present value is determined as follows:

Year (1)	*Interest* (₹) (2)	*Repayment* (₹) (3)	*Cash flow* (₹) (4)=(2)+(3)	*PV factor 16%* (5)	*Present value 16%* (6)=(4)×(5)
1	1,500	1,000	2,500	0.862	2,155.00
2	1,350	1,000	2,350	0.743	1,746.05
3	1,200	1,000	2,200	0.641	1,410.20
4	1,050	1,000	2,050	0.552	1,131.60
5	900	1,000	1,900	0.476	904.40
6	750	1,000	1,750	0.410	717.50
7	600	1,000	1,600	0.354	566.40
8	450	1,000	1,450	0.305	442.25
9	300	1,000	1,300	0.263	341.90
10	150	1,000	1,150	0.227	261.05
			Present value of debenture		9,676.35

PROBLEM 3.2 The managing director of a company decides that his company will not pay any dividends till he survives. His current life expectancy is 20 years. After that time it is expected that the company could pay dividends of ₹30 per share indefinitely. At present the firm could afford to pay ₹5 per share forever. The required rate of this company's shareholders is 10 per cent. What is the current value of the share? What is the cost to each shareholder of the managing director's policy?

SOLUTION: The value of the share at the end of 20 years is

$$P_{20} = \frac{30}{0.10} = ₹300$$

The value today will be

$$P_0 = \frac{300}{(1.1)^{20}} = 300(0.1486) = ₹44.58$$

If the company could pay dividends of ₹5 per share forever from the beginning, the price would be

$$P_0 = \frac{5}{0.10} = ₹50$$

Thus, the cost to each shareholder is the loss of the difference of two prices:

₹50 – ₹44.58 = ₹5.42 per share

PROBLEM 3.3 A company is currently paying a dividend of ₹2.00 per share. The dividend is expected to grow at a 15 per cent annual rate for three years, then at 10 per cent rate for the next three years, after which it is expected to grow at a 5 per cent rate forever. (*a*) What is the present value of the share if the capitalization rate is 9 per cent? (*b*) If the share is held for three years, what shall be its present value?

SOLUTION: (*a*) PV during super-normal growth period:

Year	*Dividend (₹)*	*PVF at 9% (₹)*	*PVF Dividends (₹)*
1	$2.00\ (1.15)^1 = 2.30$	0.917	2.11
2	$2.00\ (1.15)^2 = 2.64$	0.842	2.22
3	$2.00\ (1.15)^3 = 3.04$	0.772	2.35
4	$3.04\ (1.10)^1 = 3.35$	0.708	2.37
5	$3.04\ (1.10)^2 = 3.68$	0.650	2.39
6	$3.04\ (1.10)^3 = 4.05$	0.596	2.41
			13.85

$$\text{PV at the end of year 6} = \frac{\text{DIV}_1}{k_e - g} = \frac{4.05(1.05)}{0.09 - 0.05}$$

$$= \frac{4.25}{0.04} = ₹106.25$$

PV of ₹106.25 today at 9 per cent discount rate = ₹106.25 (0.596) = ₹63.33

PV of the share today = ₹13.85 + 63.33 = ₹77.18

(*b*) Present value of the share at the end of year 3 will be equal to the discounted value of dividends expected after three years. Thus,

P_3 = ₹2.37 + ₹2.39 + ₹2.41 + ₹63.33 = ₹70.50

Present value of dividends expected at the end of years 1, 2 and 3

= ₹2.11 + ₹2.22 + ₹2.35 = ₹6.68

The present value of share today, i.e., P_0 = ₹70.50 + ₹6.68 = ₹77.18. Thus, the value is the same if the share is held for three years, instead of indefinitely.

Subject: Corporate Finance
Module 02

Chapter 01

Understanding Investment Decisions (Capital Budgeting Decisions)

❖ LEARNING OBJECTIVES

- Understand the nature and importance of investment decisions
- Explain the methods of calculating NPV and internal rate of return (IRR)
- Show the implications of net present value (NPV) and internal rate of return (IRR)
- Describe the non-DCF evaluation criteria: payback and accounting rate of return
- Illustrate the computation of the discounted payback
- Compare and contrast NPV and IRR and emphasize the superiority of NPV rule

❖ Introduction

- An efficient allocation of capital is the most important finance function in the modern times. It involves decisions to commit the firm's funds to the long-term assets.
- Capital budgeting or investment decisions are of considerable importance to the firm, since they tend to determine its value by influencing its growth, profitability and risk.
- In this chapter we focus on the nature and evaluation of capital budgeting decisions.

❖ Nature of Investment Decisions

- The investment decisions of a firm are generally known as the capital budgeting, or capital expenditure decisions.
- The firm's investment decisions would generally include expansion, acquisition, modernization and replacement of the long-term assets. Sale of a division or business (divestment) is also as an investment decision.
- Decisions like the change in the methods of sales distribution, or an advertisement campaign or a research and development programme have long-term implications for the firm's expenditures and benefits, and therefore, they should also be evaluated as investment decisions.

❖ Features of Investment Decisions

- The exchange of current funds for future benefits.
- The funds are invested in long-term assets.
- The future benefits will occur to the firm over a series of years.

❖ Importance of Investment Decisions

➢ Growth:

- The effects of investment decisions extend into the future and have to be endured for a longer period than the consequences of the current operating expenditure.
- A firm's decision to invest in long-term assets has a decisive influence on the rate and direction of its growth.

- A wrong decision can prove disastrous for the continued survival of the firm; unwanted or unprofitable expansion of assets will result in heavy operating costs to the firm.
- On the other hand, inadequate investment in assets would make it difficult for the firm to compete successfully and maintain its market share.

➢ **Risk:**

- A long-term commitment of funds may also change the risk complexity of the firm. If the adoption of an investment increases average gain but causes frequent fluctuations in its earnings, the firm will become riskier.
- Thus, investment decisions shape the basic character of a firm.

➢ **Funding:**

- Investment decisions generally involve large amount of funds, which make it imperative for the firm to plan its investment programmes very carefully and make an advance arrangement for procuring finances internally or externally.

➢ **Irreversibility:**

- Most investment decisions are irreversible. It is difficult to find a market for such capital items once they have been acquired. The firm will incur heavy losses if such assets are scrapped.

➢ Complexity:

- Investment decisions are among the firm's most difficult decisions.
- They are an assessment of future events, which are difficult to predict.
- It is really a complex problem to correctly estimate the future cash flows of an investment.
- Economic, political, social and technological forces cause the uncertainty in cash flow estimation.

❖ Types of Investment Decisions

A. One classification is as follows:
   1) Expansion of existing business
   2) Expansion of new business
   3) Replacement and modernization

B. Yet another useful way to classify investments is as follows:
   4) Mutually exclusive investments
   5) Independent investments
   6) Contingent investments

1) Expansion and Diversification

- A company may add capacity to its existing product lines to expand existing operations.
- For example, the Gujarat State Fertiliser Company (GSFC) may increase its plant capacity to manufacture more urea. It is an example of related diversification.
- A firm may expand its activities in a new business.

- Expansion of a new business requires investment in new products and a new kind of production activity within the firm.
- If a packaging manufacturing company invests in a new plant and machinery to produce ball bearings, which the firm has not manufactured before, this represents expansion of new business or unrelated diversification.
- Sometimes a company acquires existing firms to expand its business. In either case, the firm makes investment in the expectation of additional revenue.
- Investments in existing or new products may also be called as revenue-expansion investments.

2) Replacement and Modernization

- The main objective of modernization and replacement is to improve operating efficiency and reduce costs.
- Cost savings will reflect in the increased profits, but the firm's revenue may remain unchanged.
- Assets become outdated and obsolete with technological changes. The firm must decide to replace those assets with new assets that operate more economically.
- If a cement company changes from semi-automatic drying equipment to fully automatic drying equipment, it is an example of modernization and replacement.
- Replacement decisions help to introduce more efficient and economical assets and therefore, are also called cost-reduction investments.
- However, replacement decisions that involve substantial modernization and technological improvements expand revenues as well as reduce costs.

3) Mutually Exclusive Investments

- Mutually exclusive investments serve the same purpose and compete with each other. If one investment is undertaken, others will have to be excluded.
- A company may, for example, either use a more labour-intensive, semi-automatic machine, or employ a more capital-intensive, highly automatic machine for production.
- Choosing the semi-automatic machine precludes the acceptance of the highly automatic machine.

4) Independent Investments

- Independent investments serve different purposes and do not compete with each other.
- For example, a heavy engineering company may be considering expansion of its plant capacity to manufacture additional excavators and addition of new production facilities to manufacture a new product—light commercial vehicles.
- Depending on their profitability and availability of funds, the company can undertake both investments.

5) Contingent Investments

- Contingent investments are dependent projects; the choice of one investment necessitates undertaking one or more other investments.
- For example, if a company decides to build a factory in a remote, backward area, it may have to invest in houses, roads, hospitals, schools, etc., for the employees to attract the work force.
- Thus, building of factory also requires investment in facilities for employees. The total expenditure will be treated as one single investment.

❖ Investment Decision Rule

- It should maximize the shareholders' wealth.
- It should consider all cash flows to determine the true profitability of the project.
- It should provide for an objective and unambiguous way of separating good projects from bad projects.
- It should help ranking of projects according to their true profitability.
- It should recognize the fact that bigger cash flows are preferable to smaller ones and early cash flows are preferable to later ones.
- It should help to choose among mutually exclusive projects that project which maximizes the shareholders' wealth.
- It should be a criterion which is applicable to any conceivable investment project independent of others.

❖ Evaluation Criteria

1) Discounted Cash Flow (DCF) Criteria
   a. Net Present Value (NPV)
   b. Internal Rate of Return (IRR)
   c. Modified Internal Rate of Return (MIRR)
   d. Profitability Index (PI)
   e. Discounted payback period (DPB)

2) Non-discounted Cash Flow Criteria
   a. Payback Period (PB)
   b. Accounting Rate of Return (ARR)

❖ NET PRESENT VALUE METHOD (NPV)

- Cash flows of the investment project should be forecasted based on realistic assumptions.
- Appropriate discount rate should be identified to discount the forecasted cash flows.
- Present value of cash flows should be calculated using the opportunity cost of capital as the discount rate.
- Net present value should be found out by subtracting present value of cash outflows from present value of cash inflows. The project should be accepted if NPV is positive (i.e., NPV > 0).
- The formula for the net present value can be written as follows:

$$NPV = \left[\frac{C_1}{(1+k)} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} + \cdots + \frac{C_n}{(1+k)^n}\right] - C_0$$

$$NPV = \sum_{t=1}^{n} \frac{C_t}{(1+k)^t} - C_0$$

❖ Example

Assume that Project X costs Rs 2,500 now and is expected to generate year-end cash inflows of Rs 900, Rs 800, Rs 700, Rs 600 and Rs 500 in years 1 through 5. The opportunity cost of the capital may be assumed to be 10 per cent.

$$NPV = \frac{\text{Rs } 900}{(1+0.10)^1} + \frac{\text{Rs } 800}{(1+0.10)^2} + \frac{\text{Rs } 700}{(1+0.10)^3} + \frac{\text{Rs } 600}{(1+0.10)^4} + \frac{\text{Rs } 500}{(1+0.10)^5} - \text{Rs } 2{,}500$$

$$= [\text{Rs } 900(PVF_{1,\,0.10}) + \text{Rs } 800(PVF_{2,\,0.10}) + \text{Rs } 700(PVF_{3,\,0.10}) + \text{Rs } 600(PVF_{4,\,0.10}) + \text{Rs } 500(PVF_{5,\,0.10})] - \text{Rs } 2{,}500$$

$$= [\text{Rs } 900 \times 0.909 + \text{Rs } 800 \times 0.826 + \text{Rs } 700 \times 0.751 + \text{Rs } 600 \times 0.683 + \text{Rs } 500 \times 0.620] - \text{Rs } 2{,}500$$

$$= \text{Rs } 2{,}725 - \text{Rs } 2{,}500 = +\text{Rs } 225$$

❖ Why is NPV Important?

- Positive net present value of an investment represents the maximum amount a firm would be ready to pay for purchasing the opportunity of making investment, or the amount at which the firm would be willing to sell the right to invest without being financially worse-off.
- The net present value can also be interpreted to represent the amount the firm could raise at the required rate of return, in addition to the initial cash outlay, to distribute immediately to its shareholders and by the end of the projects' life, to have paid off all the capital raised and return on it.

❖ Acceptance Rule

- Accept the project when NPV is positive
  NPV > 0
- Reject the project when NPV is negative
  NPV < 0
- May accept the project when NPV is zero
  NPV = 0

(Note: The NPV method can be used to select between mutually exclusive projects; the one with the higher NPV should be selected.)

❖ Limitations:

- Involved cash flow estimation
- Discount rate difficult to determine
- Mutually exclusive projects
- Ranking of projects

❖ INTERNAL RATE OF RETURN METHOD (IRR)

- The internal rate of return (IRR) method is another discounted cash flow technique, which takes account of the magnitude and timing of cash flows.
- Other terms used to describe the IRR method are yield on an investment, marginal efficiency of capital, rate of return over cost, time-adjusted rate of internal return and so on.
- The concept of internal rate of return is quite simple to understand in the case of a one-period project.
- Assume that you deposit Rs. 10,000 with a bank and would get back Rs. 10,800 after one year. The true rate of return on your investment would be:

Rate of Return = 10,800-10,000/10,000 = 8%

- The internal rate of return (IRR) is the rate that equates the investment outlay with the present value of cash inflow received after one period. This also implies that the rate of return is the discount rate which makes NPV = 0.

$$C_0 = \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \cdots + \frac{C_n}{(1+r)^n}$$

$$C_0 = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}$$

$$\sum_{t=1}^{n} \frac{C_t}{(1+r)^t} - C_0 = 0$$

❖ Calculation of IRR

- **Uneven Cash Flows:** Calculating IRR by Trial and Error
  - The approach is to select any discount rate to compute the present value of cash inflows. If the calculated present value of the expected cash inflow is lower than the present value of cash outflows, a lower rate should be tried.
  - On the other hand, a higher value should be tried if the present value of inflows is higher than the present value of outflows.
  - This process will be repeated unless the net present value becomes zero.

- **Level Cash Flows**
  - Let us assume that an investment would cost Rs 20,000 and provide annual cash inflow of Rs 5,430 for 6 years
  - The IRR of the investment can be found out as follows:

$$\text{NPV} = -\text{Rs } 20{,}000 + \text{Rs } 5{,}430(\text{PVAF}_{6,r}) = 0$$

$$\text{Rs } 20{,}000 = \text{Rs } 5{,}430(\text{PVAF}_{6,r})$$

$$\text{PVAF}_{6,r} = \frac{\text{Rs } 20{,}000}{\text{Rs } 5{,}430} = 3.683$$

❖ Acceptance Rule

- Accept the project when r > k
- Reject the project when r < k
- May accept the project when r = k
- In case of independent projects, IRR and NPV rules will give the same results if the firm has no shortage of funds.

❖ PROFITABILITY INDEX (PI)

- Profitability index is the ratio of the present value of cash inflows, at the required rate of return, to the initial cash outflow of the investment.
- The formula for calculating benefit-cost ratio or profitability index is as follows:

$$\text{PI} = \frac{\text{PV of cash inflows}}{\text{Initial cash outlay}} = \frac{\text{PV}(C_t)}{C_0}$$
$$= \sum_{t=1}^{n} \frac{C_t}{(1+k)^t} \div C_0$$

- The initial cash outlay of a project is Rs 100,000 and it can generate cash inflow of Rs 40,000, Rs 30,000, Rs 50,000 and Rs 20,000 in year 1 through 4. Assume a 10 percent rate of discount. The PV of cash inflows at 10 percent discount rate is:

$$\begin{aligned}
\text{PV} &= \text{Rs } 40{,}000(\text{PVF}_{1,0.10}) + \text{Rs } 30{,}000(\text{PVF}_{2,0.10}) \\
&\quad + \text{Rs } 50{,}000(\text{PVF}_{3,0.10}) + \text{Rs } 20{,}000(\text{PVF}_{4,0.10}) \\
&= \text{Rs } 40{,}000 \times 0.909 + \text{Rs } 30{,}000 \times 0.826 \\
&\quad + \text{Rs } 50{,}000 \times 0.751 + \text{Rs } 20{,}000 \times 0.68 \\
\text{NPV} &= \text{Rs } 112{,}350 - \text{Rs } 100{,}000 = \text{Rs } 12{,}350 \\
\text{PI} &= \frac{\text{Rs } 112{,}350}{\text{Rs } 100{,}000} = 1.1235.
\end{aligned}$$

❖ Acceptance Rule

- The following are the PI acceptance rules:
  - Accept the project when PI is greater than one. PI > 1
  - Reject the project when PI is less than one. PI < 1
  - May accept the project when PI is equal to one. PI = 1

- The project with positive NPV will have PI greater than one. PI less than means that the project's NPV is negative.

❖ PAYBACK

- Payback is the number of years required to recover the original cash outlay invested in a project.
- If the project generates constant annual cash inflows, the payback period can be computed by dividing cash outlay by the annual cash inflow. That is:

$$Payback = \frac{Initial\ Investment}{Annual\ Cash\ Flow} = \frac{C_0}{C}$$

- Assume that a project requires an outlay of Rs 50,000 and yields annual cash inflow of Rs 12,500 for 7 years. The payback period for the project is:
  - $Payback = \frac{50000}{12000} = 4\ years$
- **Unequal cash flows:** In case of unequal cash inflows, the payback period can be found out by adding up the cash inflows until the total is equal to the initial cash outlay.
- Suppose that a project requires a cash outlay of Rs 20,000, and generates cash inflows of Rs 8,000; Rs 7,000; Rs 4,000; and Rs 3,000 during the next 4 years. What is the project's payback?

  3 years + 12 × (1,000/3,000) months = 3 years + 4 months

❖ Acceptance Rule

- The project would be accepted if its payback period is less than the maximum or standard payback period set by management.
- As a ranking method, it gives highest ranking to the project, which has the shortest payback period and lowest ranking to the project with highest payback period.

❖ DISCOUNTED PAYBACK PERIOD

- The discounted payback period is the number of periods taken in recovering the investment outlay on the present value basis.
- The discounted payback period still fails to consider the cash flows occurring after the payback period.

	Cash Flows (Rs)					Simple PB	Discounted PB	NPV at 10%
	C_0	C_1	C_2	C_3	C_4			
P	– 4,000	3,000	1,000	1,000	1,000	2 yrs	—	—
PV of cash flows	– 4,000	2,727	826	751	683	—	2.6 yrs	987
Q	– 4,000	0	4,000	1,000	2,000	2 yrs	—	—
PV of cash flows	– 4,000	0	3,304	751	1,366	—	2.9 yrs	1,421

❖ ACCOUNTING RATE OF RETURN METHOD (ARR)

- The accounting rate of return is the ratio of the average after-tax profit divided by the average investment. The average investment would be equal to half of the original investment if it were depreciated constantly.

$$ARR = \frac{\text{Average income}}{\text{Average investment}}$$

OR

$$ARR = \frac{\left[\sum_{t=1}^{n} EBIT_t (1-T)\right]/n}{(I_0 + I_n)/2}$$

- A variation of the ARR method is to divide average earnings after taxes by the original cost of the project instead of the average cost.

❖ Example

- A project will cost Rs 40,000. Its stream of earnings before depreciation, interest and taxes (EBDIT) during first year through five years is expected to be Rs 10,000,

Rs 12,000, Rs 14,000, Rs 16,000 and Rs 20,000. Assume a 50 per cent tax rate and depreciation on straight-line basis.

$$\text{Accounting Rate of Return} = \frac{3,200}{20,000} \times 100 = 16 \text{ per cent}$$

❖ Calculation of ARR

Period	*1*	*2*	*3*	*4*	*5*	*Average*
Earnings before depreciation, interest and taxes (EBDIT)	10,000	12,000	14,000	16,000	20,000	14,400
Depreciation	8,000	8,000	8,000	8,000	8,000	8,000
Earnings before interest and taxes (EBIT)	2,000	4,000	6,000	8,000	12,000	6,400
Taxes at 50%	1,000	2,000	3,000	4,000	6,000	3,200
Earnings before interest and after taxes [EBIT (1– *T*)]	1,000	2,000	3,000	4,000	6,000	3,200
Book value of investment:						
Beginning	40,000	32,000	24,000	16,000	8,000	
Ending	32,000	24,000	16,000	8,000	—	
Average	36,000	28,000	20,000	12,000	4,000	20,000

❖ Acceptance Rule

- This method will accept all those projects whose ARR is higher than the minimum rate established by the management and reject those projects which have ARR less than the minimum rate.
- This method would rank a project as number one if it has highest ARR and lowest rank would be assigned to the project with lowest ARR.

❖ MODIFIED INTERNAL RATE OF RETURN (MIRR)

- The modified internal rate of return (MIRR) is the compound average annual rate that is calculated with a reinvestment rate different than the project's IRR.

❖ CAPITAL RATIONING

- Capital rationing refers to a situation where the firm is constrained for external, or self-imposed, reasons to obtain necessary funds to invest in all investment projects with positive NPV.
- Under capital rationing, the management has to decide to obtain that combination of the profitable projects which yields highest NPV within the available funds.

- There are two types of capital rationing:
  a) External capital rationing: imposed by capital markets
  b) Internal capital rationing: self-imposed by the company internally

- Capital rationing presents a situation of maximizing NPV of several projects subject to funds constraint. Hence, it can be used for decision making.

  - Linear Programming (LP)
  - Integer Programming (IP)
  - Dual variable

❖ Example

- Let us consider four projects – L, M, N and O, given earlier. The company has budget constraint of Rs 50 each in year 0 and year 1.
- We need to maximize NPV subject to budget constraints. Since investments will be positive, we will put as constraints.

- Maximize NPV

  $NPV = 12.94 X_L + 8.12 X_M + 7.75 X_N + 6.88 X_O$

  Subject to:

$$50X_L + 25X_M + 25X_N + 0X_O \leq 50$$
$$-30X_L - 10X_M - 10X_N + 80X_O \leq 50$$

$$0 \leq X_L \leq 1$$
$$0 \leq X_M \leq 1$$
$$0 \leq X_N \leq 1$$
$$0 \leq X_O \leq 1$$

$$12.94 \times 0 + 8.12 \times 1 + 7.75 \times 1 + 6.88 \times 0.875$$
$$= 21.89 \text{ or } \text{Rs } 21,890$$

❖ Integer Programming

- A large number of projects in practice are indivisible. When projects are not divisible, we can use integer programming (IP) by limiting the X's to be integers of either 0 to 1.
- Integer programmes are difficult to solve. It may take unwieldy number of iterations for the model to converge on a solution. Also, other restrictions may prove to be redundant on account of integer restriction.

❖ Dual Variable

- Dual variables for the budget constraints may be interpreted as 'opportunity costs' or 'shadow prices.' In the earlier example, dual variables for the budget constraints in periods 0 and 1 respectively, are 0.344, and 0.086.
- The dual variables of 0.344 for period 0 imply that NPV can be increased by Rs 0.344 if the budget in period 0 is increased by Re 1. In other words, the opportunity cost of the budget constraint for period 0 is 34.4 per cent, and for period 1 it is 8.6 per cent. Dual variables provide information for deciding the shifting of funds from one period to another.

❖ STUDENT'S ACTIVITIES

PROBLEM 8.1 A company is considering the following investment projects:

Projects	Cash Flows (₹)			
	C_0	C_1	C_2	C_3
A	−10,000	+10,000		
B	−10,000	+17,500	+7,500	
C	−10,000	+12,000	+4,000	+12,000
D	−10,000	+10,000	+3,000	+13,000

(*a*) Rank the project according to each of the following methods: (*i*) Payback, (*ii*) ARR, (*iii*) IRR and (*iv*) NPV; assuming discount rates of 10 and 30 per cent.

(*b*) Assuming the projects are independent, which one should be accepted? If the projects are mutually exclusive, which project is the best?

SOLUTION:

(*a*) (*i*) **Payback**

Project A : 10,000/10,000 = 1 yr.

Project B : 10,000/7,500 = $1^1/_3$ yrs.

Project C : $2 \text{ yrs} + \frac{10,000 - 6,000}{12,000}$

$= 2\frac{1}{3}$ yrs.

Project D : 1 yr.

(*ii*) **ARR**

$$\textit{Project A} \quad : \quad \frac{(10{,}000 - 10{,}000)1/2}{(10{,}000)1/2} = 0$$

$$\textit{Project B} \quad : \quad \frac{(15{,}000 - 10{,}000)1/2}{(10{,}000)1/2}$$

$$= \frac{2{,}500}{5{,}000} = 50\%$$

$$\textit{Project C} \quad : \quad \frac{(18{,}000 - 10{,}000)1/3}{(10{,}000)1/2}$$

$$= \frac{2{,}667}{5{,}000} = 53\%$$

$$\textit{Project D} \quad : \quad \frac{(16{,}000 - 10{,}000)1/3}{(10{,}000)1/2}$$

$$= \frac{2{,}000}{5{,}000} = 40\%$$

Note: The net cash proceeds include recovery of investment also. Therefore, net cash earnings are found by deducting initial investment.

(*iii*) **IRR**

Project A : The net cash proceeds in year 1 are just equal to investment. Therefore, $r = 0\%$.

Project B : This project produces an annuity of ₹7,500 for two years. Therefore, the required PVAF is: 10,000/7,500 = 1.33. Looking in Table D across year 2 row, this factor is found under 32% column. Therefore, $r = 32\%$.

Project C : Since cash flows are uneven, the trial and error method will have to be followed. Let us try 20% rate of discount. The NPV is +₹1,389. A higher rate should be tried. At 30% rate of discount, the NPV is –₹633. The true rate of return should be less than 30%. At 27% rate of discount we find that the NPV is –₹86 and at 26% + ₹105. Through interpolation, we find r = 26.5%.

Project D : In this case also we use the trial and error method, and find that at 37.6% rate of discount NPV becomes almost zero. Therefore, r = 37.6%.

(*iv*) **NPV**

Project A :

at 10% $-10,000 + 10,000 \times 0.909 = -910$

at 30% $-10,000 + 10,000 \times 0.769 = -2,310$

Project B :

at 10% $-10,000 + 7,500\ (0.909 + 0.826) = +3,013$

at 30% $-10,000 + 7,500\ (0.769 + 0.592) = +208$

Project C :

at 10% $-10,000 + 2,000 \times 0.909 + 4,000 \times 0.826 + 12,000 \times 0.751 = +4,134$

at 30% $-10,000 + 2,000 \times 0.769 + 4,000 \times 0.592 + 12,000 \times 0.455 = -633$

Project D :

at 10% $-10,000 + 10,000 \times 0.909 + 3,000 \times (0.826 + 0.751) = +3,821$

at 30% $-10,000 + 10,000 \times 0.769 + 3,000 \times (0.592 + 0.4555) = +831$

Chapter 02

Understanding Dividend Decision

❖ Introduction

- Dividend decision of the firm is yet another crucial area of financial management.
- The important aspect of dividend policy is to determine the amount of earnings to be distributed to shareholders and the amount to be retained in the firm.
- Retained earnings are the most significant internal sources of financing the growth of the firm.
- On the other hand, dividends may be considered desirable from shareholders' point of view as they tend to increase their current return.
- Dividends, however, constitute the use of the firm's funds.
- Dividend policy involves the balancing of the shareholders' desire for current dividends and the firm's needs for funds for growth.

❖ DIVIDEND RELEVANCE: WALTER'S MODEL

- Professor James E. Walter argues that the choice of dividend policies almost always affects the value of the firm.
- His model, one of the earlier theoretical works, shows the importance of the relationship between the firm's rate of return, r, and its cost of capital, k, in determining the dividend policy that will maximize the wealth of shareholders.
- Walter's model is based on the following assumptions:
    - **Internal financing:** The firm finances all investment through retained earnings; that is, debt or new equity is not issued.

- **Constant return and cost of capital:** The firm's rate of return, r, and its cost of capital, k, are constant.
- **100 per cent payout or retention:** All earnings are either distributed as dividends or reinvested internally immediately.
- **Constant EPS and DIV:** Beginning earnings and dividends never change. The values of the earnings per share, EPS, and the dividend per share, DIV, may be changed in the model to determine results, but any given values of EPS or DIV are assumed to remain constant forever in determining a given value.
- **Infinite time:** The firm has a very long or infinite life.

❖ Walter's formula to determine the market price per share:

$$P = \frac{\text{DIV} + (r/k)(\text{EPS} - \text{DIV})}{k}$$

where P = market price per share
DIV = dividend per share
EPS = earnings per share
r = firm's rate of return (average)
k = firm's cost of capital or capitalization rate

❖ Optimum Payout Ratio

- Growth Firms – Retain all earnings
- Normal Firms – Distribute all earnings
- Declining Firms – No effect

❖ Example: Dividend Policy: Application of Walter's Model

- To illustrate the effect of different dividend policies on the value of share respectively for the growth firm, normal firm and declining firm, below Table is constructed.
- It shows that, in Walter's model, the optimum dividend policy depends on the relationship between the firm's rate of return, r and its cost of capital, k.
- Walter's view on the optimum dividend–payout ratio is explained in the next section.

➢ Growth Firm: Internal Rate More than Opportunity Cost of Capital (r > k)

- Growth firms are those firms which expand rapidly because of ample investment opportunities yielding returns higher than the opportunity cost of capital (r > k).
- These firms are able to reinvest earnings at a rate (r) which is higher than the rate expected by shareholders (k).
- They will maximize the value per share if they follow a policy of retaining all earnings for internal investment.
- It can be seen from Table that the market value per share for the growth firm is maximum (i.e., Rs. 150) when it retains 100 per cent earnings and minimum (i.e., Rs. 100) if it distributes all earnings.
- Thus, the optimum payout ratio for a growth firm is zero. The market value per share P, increases as payout ratio declines when r > k.

➢ Normal Firms: Internal Rate Equals Opportunity Cost of Capital (r = k)

- Most of the firms do not have unlimited surplus-generating investment opportunities.

- After exhausting super profitable opportunities, normal firms earn on their investments rate of return equal to the cost of capital, r = k.
- For normal firms with r = k, the dividend policy has no effect on the market value per share in Walter's model.
- It can be noticed from Table that the market value per share for the normal firm is same (i.e., Rs. 100) for different dividend-payout ratios.
- Thus, there is no unique optimum payout ratio for a normal firm. One dividend policy is as good as the other. The market value per share is not affected by the payout ratio when r = k.

➢ Declining Firms: Internal Rate Less than Opportunity Cost of Capital (r < k)

- Declining firms do not have any profitable investment opportunities to invest the earnings.
- These firms would earn on their investments rates of return less than the minimum rate required (r < k) by investors.
- Investors of such firm would like earnings to be distributed to them so that they may either spend it or invest elsewhere to get a rate higher than earned by the declining firms.
- The market value per share of a declining firm with r < k will be maximum when it does not retain earnings at all.
- It can be observed from Table that, when the declining firm's payout ratio is 100 per cent (i.e., zero retained earnings) the market value per share is Rs. 100 and it is Rs. 80 when payout ratio is zero.
- Thus, the optimum payout ratio for a declining firm is 100 per cent. The market value per share, P, increases as payout ratio increases when r < k.

Growth Firm, r > k	*Normal Firm, r = k*	*Declining Firm, r < k*
	Basic Data	
$r = 0.15$ $k = 0.10$ EPS = Rs 10	$r = 0.10$ $k = 0.10$ EPS = Rs 10	$r = 0.08$ $k = 0.10$ EPS = Rs 10
Payout Ratio 0%		
DIV = Re 0 P = 0 + (0.15/0.10) (10 – 0)/0.10 = Rs 150	DIV = Re 0 P = 0 + [(0.10/0.10) (10 – 0)]/0.10 = Rs 100	DIV = Re 0 P = 0 +[(0.08/0.10) (10 – 0)]/0.10 = Rs 80
Payout Ratio 40%		
DIV = Rs 4 P = [4 + (0.15/0.10) (10 – 4)]/0.10 = Rs 130	DIV = Rs 4 P = [4 + (0.10/0.10) (10 – 4)]/0.10 = Rs 100	DIV = Rs 4 P = [4 + (0.08/0.10) (10 – 4)]/0.10 = Rs 88
Payout Ratio 80%		
DIV = Rs 8 P = [8 + (0.15/0.10) (10 – 8)]/0.10 = Rs 110	DIV = Rs 8 P = [8 + (0.10/0.10) (10 – 8)]/0.10 = Rs 100	DIV = Rs 8 P = [8 + (0.08/0.10) (10 – 8)]/0.10 = Rs 96
Payout Ratio 100%		
DIV = Rs 10 P = [10 +(0.15/0.10)(10 – 10)]/0.10 = Rs 100	DIV = Rs 10 P = [10 +(0.10/0.10)(10 – 10)]/0.10 = Rs 100	DIV = Rs 10 P = [10 +(0.08/0.10)(10 – 10)]/0.10 = Rs 100

- Thus, in Walter's model, the dividend policy of the firm depends on the availability of investment opportunities and the relationship between the firm's internal rate of return, r and its cost of capital, k. Thus:
  - Retain all earnings when r > k
  - Distribute all earnings when r < k
  - Dividend (or retention) policy has no effect when r = k.
- Thus, dividend policy in Walter 's model is a financing decision.
- When dividend policy is treated as a financing decision, the payment of cash dividends is a passive residual.

❖ Criticism of Walter's Model

- No external financing
- Constant return, r
- Constant opportunity cost of capital, k

❖ DIVIDEND RELEVANCE: GORDON'S MODEL

- Myron Gordon develops one very popular model explicitly relating the market value of the firm to dividend policy.
- Gordon's model is based on the following assumptions:
  - **All-equity firm:** The firm is an all-equity firm, and it has no debt.
  - **No external financing:** No external financing is available. Consequently, retained earnings would be used to finance any expansion. Thus, just as Walter's model, Gordon's model too confounds dividend and investment policies.
  - **Constant return:** The internal rate of return, r, of the firm is constant. This ignores the diminishing marginal efficiency of investment as represented in Table.
  - **Constant cost of capital:** The appropriate discount rate, k for the firm remains constant. Thus, Gordon's model also ignores the effect of a change in the firm's risk class and its effect on k.
  - **Perpetual earnings:** The firm and its stream of earnings are perpetual.
  - **No taxes:** Corporate taxes do not exist.
  - **Constant retention:** The retention ratio, b, once decided upon, is constant. Thus, the growth rate, g = br, is constant forever.
  - **Cost of capital greater than growth rate:** The discount rate is greater than growth rate, k = g. If this condition is not fulfilled, we cannot get a meaningful value for the share.

- According to Gordon's dividend-capitalization model, the market value of a share is equal to the present value of an infinite stream of dividends to be received by shareholders.

$$P_0 = \frac{EPS_1(1-b)}{k-br}$$

❖ Example: Application of Gordon's Dividend Model

- Let us consider the data in Table. The implications of dividend policy, according to Gordon's model, are shown respectively for the growth, the normal and the declining firms.

Basic Data		
Growth Firm, $r > k$ $r = 0.15$ $k = 0.10$ EPS_1 = Rs 10	*Normal Firm, $r = k$* $r = 0.10$ $k = 0.10$ EPS_1 = Rs 10	*Declining Firm, $r < k$* $r = 0.08$ $k = 0.10$ EPS_1 = Rs 10
Payout Ratio 40%		
$g = br = 0.6 \times 0.15 = 0.09$ $P = \frac{10(1-0.6)}{0.10-0.09}$ $= \frac{4}{0.01} =$ Rs 400	$g = br = 0.6 \times 0.10 = 0.06$ $P = \frac{10(1-0.6)}{0.10-0.06}$ $= \frac{4}{0.04} =$ Rs 100	$g = br = 0.6 \times 0.08 = 0.048$ $P = \frac{10(1-0.6)}{0.10-0.048}$ $= \frac{4}{0.052} =$ Rs 77
Payout Ratio 60%		
$g = br = 0.4 \times 0.15 = 0.06$ $P = \frac{10(1-0.4)}{0.10-0.06}$ $= \frac{6}{0.04} =$ Rs 150	$g = br = 0.4 \times 0.10 = 0.04$ $P = \frac{10(1-0.4)}{0.10-0.04}$ $= \frac{6}{0.06} =$ Rs 100	$g = br = 0.4 \times 0.08 = 0.032$ $P = \frac{10(1-0.4)}{0.10-0.032}$ $= \frac{6}{0.068} =$ Rs 88
Payout Ratio 90%		
$g = br = 0.10 \times 0.15 = 0.015$ $P = \frac{10(1-0.1)}{0.10-0.015}$ $= \frac{9}{0.085} =$ Rs 106	$g = br = 0.10 \times 0.10 = 0.01$ $P = \frac{10(1-0.1)}{0.10-0.01}$ $= \frac{9}{0.09} =$ Rs 100	$g = br = 0.10 \times 0.08 = 0.008$ $P = \frac{10(1-0.1)}{0.10-0.008}$ $= \frac{9}{0.092} =$ Rs 98

- **It is revealed that under Gordon's model:**
  - The market value of the share, P_0, increases with the retention ratio, b, for firms with growth opportunities, i.e., when r > k.
  - The market value of the share, P_0, increases with the payout ratio, (1 – b), for declining firms with r < k.
  - The market value of the share is not affected by dividend policy when r = k.

- Gordon's model's conclusions about dividend policy are similar to that of Walter's model. This similarity is due to the resemblance of assumptions that underlie both the models.
- Thus, the Gordon model suffers from the same limitations as the Walter model.

❖ DIVIDEND IRRELEVANCE: THE MILLER–MODIGLIANI (MM) HYPOTHESIS

- According to M-M, under a perfect market situation, the dividend policy of a firm is irrelevant as it does not affect the value of the firm.
- They argue that the value of the firm depends on firm earnings which results from its investment policy.
- Thus, when investment decision of the firm is given, dividend decision is of no significance. It is based on the following assumptions:
  - **Perfect capital markets:** The firm operates in perfect capital markets where investors behave rationally, information is freely available to all, and transactions and flotation costs do not exist. Perfect capital markets also imply that no investor is large enough to affect the market price of a share.
  - **No taxes:** Taxes do not exist; or there are no differences in the tax rates applicable to capital gains and dividends. This means that investors value a rupee of dividend as much as a rupee of capital gains.
  - **Investment policy:** The firm has a fixed investment policy.

- **No risk:** Risk of uncertainty does not exist. That is, investors are able to forecast future prices and dividends with certainty, and one discount rate is appropriate for all securities and all time periods. Thus, r = k = kt for all t.

$$r = \frac{Dividends \ + \ Capital \ gains \ (or \ loss)}{Share \ price}$$

$$r = \frac{DIV \ + \ (P_1 \ - \ P_0)}{P_0}$$

$$\boldsymbol{P_0 = \frac{DIV_1 + P_1}{1 + k}}$$

$$\boldsymbol{P_1 = P_0 \ (1 \ + \ k \ ) - DIV_1}$$

- where P_0 is the market or purchase price per share at time 0, P_1 is the market price per share at time 1 and DIV_1 is dividend per share at time 1.

➢ Example:

The Vikas Engineering Co. Ltd., currently has one lakh outstanding shares selling at Rs. 100 each. The firm has net profits of Rs. 10 lakh and wants to make new investments of Rs. 20 lakh during the period. The firm is also thinking of declaring a dividend of Rs. 5 per share at the end of the current fiscal year. The firm's opportunity cost of capital is 10 per cent. What will be the price of the share at the end of the year if (i) a dividend is not declared; (ii) a dividend is declared. (iii) How many new shares must be issued?

The price of the share at the end of the current fiscal year is determined as follows:

$$P_0 = \frac{DIV_1 + P_1}{1 + k}$$

$$P_1 = P_0 (1 + k) - DIV_1$$

The value of P_1 when dividend is not paid is:

P_1 = Rs. 100(1.10) – 0 = Rs. 110

The value of P_1 when dividend is paid is:

P_1 = Rs. 100(1.10) – Rs. 5 = Rs. 105

It can be observed that whether dividend is paid or not the wealth of shareholders remains the same. When the dividend is not paid the shareholder will get Rs. 110 by way of the price per share at the end of the current fiscal year.

On the other hand, when dividend is paid, the shareholder will realize Rs. 105 by way of the price per share at the end of the current fiscal year plus Rs. 5 as dividend.

The number of new shares to be issued by the company to finance its investments is determined as follows:

$$m\,P_1 = I - (X - nDIV_1)$$

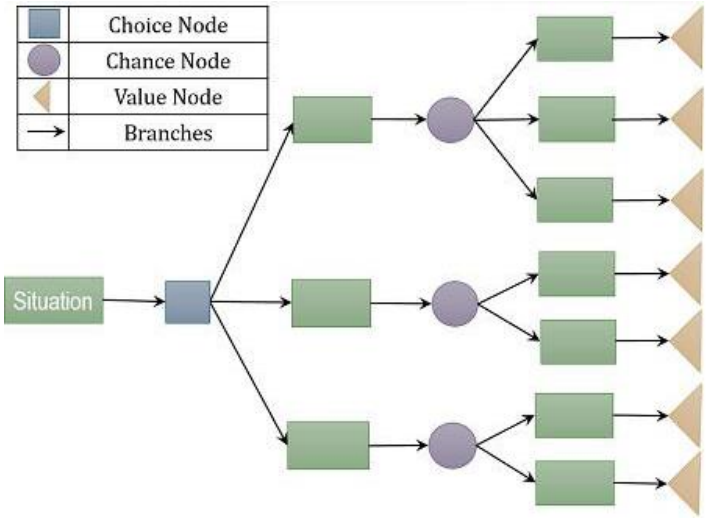
105m = 2,000,000 – (1,000,000 – 500,000)

105m = 1,500,000

m = 1,500,000 / 105 = 14,285 shares.

❖ Basics of Decision Tree Analysis (1-level and 2-level) (theory only)

- A decision tree is the graphical depiction of all the possibilities or outcomes to solve a specific issue or avail a potential opportunity.
- It is a useful financial tool which visually facilitates the classification of all the probable results in a given situation.



➢ Terminologies Used

- Root Node: A root node compiles the whole sample; it is then divided into multiple sets which comprise of homogeneous variables.

- Decision Node: That sub-node which diverges into further possibilities, can be denoted as a decision node.

- Terminal Node: The final node showing the outcome which cannot be categorized any further, is termed as a value or terminal node.

- Branch: A branch denotes the various alternatives available with the decision tree maker.

- Splitting: The division of the available option (depicted by a node or sub-node) into multiple sub-nodes is termed as splitting.

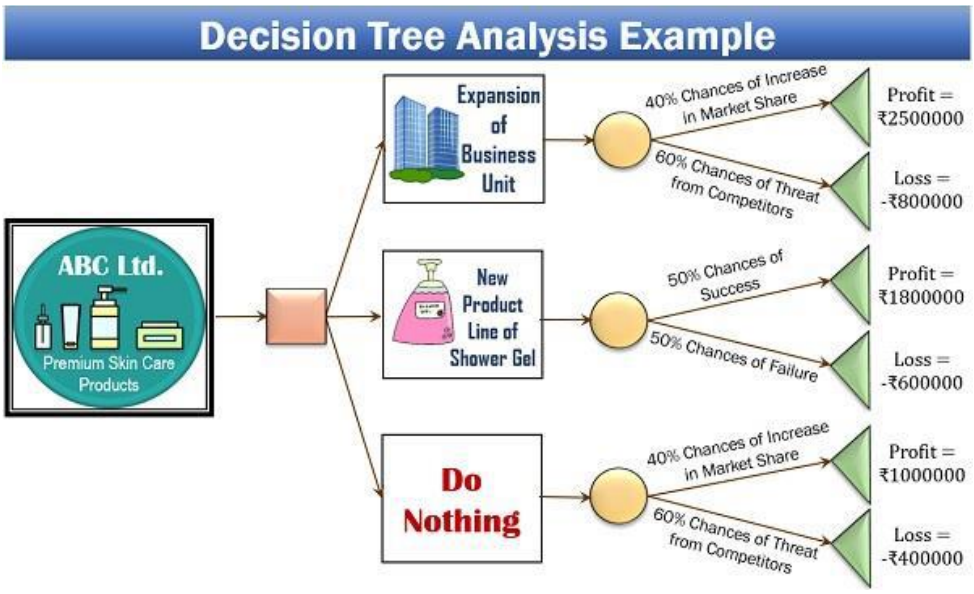
- Pruning: It is just the reverse of splitting, where the decision tree maker can eliminate one or more sub-nodes from a particular decision node.

1. The first step is understanding and specifying the problem area for which decision making is required.
2. The second step is interpreting and chalking out all possible solutions to the particular issue as well as their consequences.
3. The third step is presenting the variables on a decision tree along with its respective probability values.
4. The fourth step is finding out the outcomes of all the variables and specifying it in the decision tree.
5. The last step is highly crucial and backs the overall analysis of this process. It involves calculating the EMV values for all the chance nodes or options, to figure out the solution which provides the highest expected value.

➢ **Example**

- To enlighten upon the decision tree analysis, let us illustrate a business situation. ABC Ltd. is a company manufacturing skincare product. It was found that the

business is at the maturity stage, demanding some change. After rigorous research, management came up with the following decision tree:



- In the above decision tree, we can easily make out that the company can expand its existing unit or innovate a new product, i.e., shower gel or make no changes.

❖ STUDENT'S ACTIVITIES

PROBLEM 17.1 The earnings per share of a company are ₹10. It has an internal rate of return of 15 per cent and the capitalization rate of its risk class is 12.5 per cent. If Walter's model is used: (*i*) What should be the optimum payout ratio of the firm? (*ii*) What would be the price of the share at this payout? (*iii*) How shall the price of the share be affected if a different payout were employed?

SOLUTION: Walter's model to determine share value is:

$$P = \frac{\text{DIV} + (r/k)(\text{EPS} - \text{DIV})}{k}$$

(*i*) If $r/k > 1$, the value of the share will increase as EPS has increased. The price of the share would be maximum when the firm retains all the earnings. Thus, the optimum payout ratio in this case is zero.

(*ii*) When the optimum payout is zero, the price of the share is:

$$P = \frac{0 + (0.15/0.125)(10 - 0)}{0.125} = \frac{12}{0.125} = ₹96$$

(*iii*) If the firm, under the condition of $r/k > 1$, chooses a payout other than zero, the price of the share will fall. Suppose the firm has a payout of 20 per cent, the price of the share will be:

$$P = \frac{2 + (0.15/0.125)(10 - 2)}{0.125} = \frac{11.60}{0.125} = ₹92.80$$

PROBLEM 17.2 A company has a total investment of ₹500,000 in assets, and 50,000 outstanding ordinary shares at ₹10 per share (par value). It earns a rate of 15 per cent on its investment, and has a policy of retaining

50 per cent of the earnings. If the appropriate discount rate of the firm is 10 per cent, determine the price of its share using Gordon's model. What shall happen to the price of the share if the company has a payout of 80 per cent or 20 per cent?

SOLUTION: The share valuation model of Gordon is:

$$P_0 = \frac{\text{DIV}_1}{k-g} = \frac{(1-b)\text{EPS}_1}{k-br} = \frac{(1-b)rA}{k-br}$$

where A represents investment per share, which is ₹10 in this case.

(*i*) At a payout of 50 per cent, the price of the share is:

$$P_0 = \frac{(1-0.5)0.15\times10}{0.10-0.15\times0.5} = \frac{0.75}{0.025} = ₹30$$

(*ii*) At a payout of 80 per cent, the price of the share is:

$$P_0 = \frac{(1-0.2)0.15\times10}{0.10-0.15\times0.2} = \frac{1.20}{0.07} = ₹17$$

(*iii*) When the payout is 20 per cent, the price of the share is determined as follows:

$$P_0 = \frac{(1-0.8)0.15\times10}{0.10-0.15\times0.8} = \frac{0.30}{(-)0.02} = ₹15$$

The price is negative. This is an absurd result and is due to some simplifying assumptions of Gordon's model. For example, it is assumed that k and r constant and do not change with retention and uncertainty. If these factors are allowed in the model, we will not get negative price of the share.

Subject: Corporate Finance
Module 03

Chapter 01

Cost of Capital

❖ Introduction

- The project's cost of capital is the minimum required rate of return on funds committed to the project, which depends on the riskiness of its cash flows.
- The firm's cost of capital will be the overall, or average, required rate of return on the aggregate of investment projects

❖ Significance

- We should recognize that the cost of capital is one of the most difficult and disputed topics in the finance theory.
- Financial experts express conflicting opinions as to the correct way in which the cost of capital can be measured.
- Irrespective of the measurement problems, it is a concept of vital importance in the financial decision-making. It is useful as a standard for:

i. Evaluating investment decisions
ii. Designing a firm's debt policy
iii. Appraising the financial performance of top management

i. Investment Evaluation

- The primary purpose of measuring the cost of capital is its use as a financial standard for evaluating the investment projects.
- In the NPV method, an investment project is accepted if it has a positive NPV. The project's NPV is calculated by discounting its cash flows by the cost of capital.
- In this sense, the cost of capital is the discount rate used for evaluating the desirability of an investment project.
- In the IRR method, the investment project is accepted if it has an internal rate of return greater than the cost of capital.
- In this context, the cost of capital is the minimum required rate of return on an investment project. It is also known as the cut-off rate or the hurdle rate.

- An investment project that provides a positive NPV when its cash flows are discounted by the cost of capital makes a net contribution to the wealth of shareholders.
- If the project has zero NPV, it means that its cash flows have yielded a return just equal to the cost of capital, and the acceptance or rejection of the project will not affect the wealth of shareholders.
- The cost of capital is the minimum required rate of return on the investment project that keeps the present wealth of shareholders unchanged.
- It may be, thus, noted that the cost of capital represents a financial standard for allocating the firm's funds, supplied by owners and creditors, to the various investment projects in the most efficient manner.

ii. Designing Debt Policy

- In practice, the debt policy of a firm is significantly influenced by the cost consideration.

- As we shall learn later on, debt helps to save taxes (interest tax shield), as interest on debt is a tax-deductible expense.
- The interest tax shield reduces the overall cost of capital, though debt also increases the financial risk of the firm.
- In designing the financing policy, that is, the proportion of debt and equity in the capital structure, the firm aims at maximizing the firm value by minimizing the overall cost of capital.

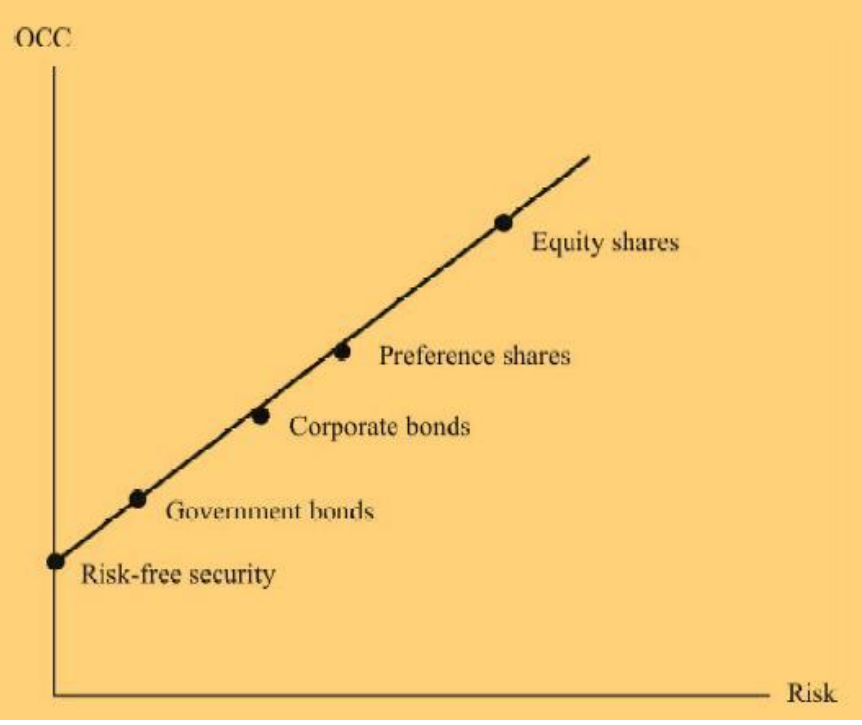
- The cost of capital can also be useful in deciding about the methods of financing at a point of time.
- For example, cost may be compared in choosing between leasing and borrowing. Of course, equally important considerations are control and risk.

iii. Performance Appraisal

- The cost of capital framework can be used to evaluate the financial performance of top management.
- Such an evaluation will involve a comparison of actual profitability of the investment projects undertaken by the firm with the projected overall cost of capital, and the appraisal of the actual costs incurred by management in raising the required funds.
- The cost of capital also plays a useful role in dividend decision and investment in current assets.
- The chapters dealing with these decisions show their linkages with the cost of capital.

❖ The Concept of The Opportunity Cost of Capital

- Decision-making is a process of choosing among alternatives. In the investment decisions, an individual or a manager encounters innumerable competing investment opportunities to choose from.
- For example, you may invest your savings of Rs. 1,000 either in 7 per cent, 3 year postal certificates or in 6.5 per cent, 3 year fixed deposit in a nationalized bank. In both the cases, the government assures the payment, so the investment opportunities reflect equivalent risk. You decide to deposit your savings in the bank. By this action, you have foregone the opportunity of investing in the postal certificates. You have, thus, incurred an opportunity cost equal to the return on the foregone investment opportunity. It is 7 per cent in case of your investment.
- The opportunity cost is the rate of return foregone on the next best alternative investment opportunity of comparable risk.
- Thus, the required rate of return on an investment project is an opportunity cost.



Risk-return relationships of various securities

❖ General Formula for the Opportunity Cost of Capital

- Opportunity cost of capital is given by the following formula:

$$I_0 = \frac{C_1}{(1+k)} + \frac{C_2}{(1+k)^2} + \cdots + \frac{C_n}{(1+k)^n}$$

- Where, *Io* is the capital supplied by investors in period 0 (it represents a net cash inflow to the firm), Ct are returns expected by investors (they represent cash outflows to the firm) and k is the required rate of return or the cost of capital.
- The opportunity cost of retained earnings is the rate of return, which the ordinary shareholders would have earned on these funds if they had been distributed as dividends to them.

❖ Cost of Capital

- Viewed from all investors' point of view, the firm's cost of capital is the rate of return required by them for supplying capital for financing the firm's investment projects by purchasing various securities.
- The rate of return required by all investors will be an overall rate of return — a weighted rate of return.

❖ Weighted Average Cost of Capital vs. Specific Costs of Capital

- The cost of capital of each source of capital is known as component, or specific, cost of capital.
- The overall cost is also called the weighted average cost of capital (WACC).
- Relevant cost in the investment decisions is the future cost or the marginal cost.

- Marginal cost is the new or the incremental cost that the firm incurs if it were to raise capital now, or in the near future.
- The historical cost that was incurred in the past in raising capital is not relevant in financial decision-making.

❖ Determining Component Costs of Capital

- Generally, the component cost of a specific source of capital is equal to the investors' required rate of return, and it can be determined by using

$$I_0 = \frac{C_1}{(1+k)} + \frac{C_2}{(1+k)^2} + \cdots + \frac{C_n}{(1+k)^n}$$

- But the investors' required rate of return should be adjusted for taxes in practice for calculating the cost of a specific source of capital to the firm

❖ COST OF DEBT

- A company may raise debt in a variety of ways. It may borrow funds from financial institutions or public either in the form of public deposits or debentures (bonds) for a specified period of time at a certain rate of interest.
- A debenture or bond may be issued at par or at a discount or premium as compared to its face value.
- The contractual rate of interest or the coupon rate forms the basis for calculating the cost of debt.

Debt Issued at Par

$$k_d = i = \frac{INT}{B_0}$$

Debt Issued at Discount or Premium

$$B_0 = \sum_{t=1}^{n} \frac{INT_t}{(1+k_d)^t} + \frac{B_n}{(1+k_d)^n}$$

Tax adjustment

$$\text{After-tax cost of debt} = k_d(1-T)$$

❖ Example

A 7 year, Rs 100 debenture of a firm can be sold for a net price of Rs 97.75. The rate of interest is 15 per cent per year, and bond will be redeemed at 5 per cent premium on maturity. The firm's tax rate is 35 per cent. Compute the after-tax cost of debenture.

The annual interest will be: $F \times i$ = Rs 100 × 0.15 = Rs 15, and maturity price will be: Rs 100 (1.05) = Rs 105.

$$97.75 = \sum_{t=1}^{n} \frac{15}{(1+k_d)} \quad \frac{105}{(1+k_d)^7}$$

By trial and error, we find:

$k_d = 16\%: \; 15(4.038) + 105(0.354) = 97.75$

The after-tax cost of debenture will be:

$k_d(1-T) = 0.16(1-0.35) = 0.104$ or 10.4%

❖ Cost of the Existing Debt

- Sometimes a firm may like to compute the "current" cost of its existing debt.
- In such a case, the cost of debt should be approximated by the current market yield of the debt.

❖ COST OF PREFERENCE CAPITAL

- The measurement of the cost of preference capital poses some conceptual difficulty.
- In the case of debt, there is a binding legal obligation on the firm to pay interest, and the interest constitutes the basis to calculate the cost of debt.
- However, in the case of preference capital, payment of dividends is not legally binding on the firm and even if the dividends are paid, it is not a charge on earnings; rather it is a distribution or appropriation of earnings to preference shareholders.
- One may, therefore, be tempted to conclude that the dividends on preference capital do not constitute cost. This is not true.
- The cost of preference capital is a function of the dividend expected by investors.
- Preference capital is never issued with an intention not to pay dividends.
- Although it is not legally binding upon the firm to pay dividends on preference capital, yet it is generally paid when the firm makes sufficient profits.
- The failure to pay dividends, although does not cause bankruptcy, yet it can be a serious matter from the ordinary shareholders' point of view.
- The non-payment of dividends on preference capital may result in voting rights and control to the preference shareholders.

Irredeemable Preference Share

$$k_p = \frac{PDIV}{P_0}$$

Redeemable Preference Share

$$P_0 = \sum_{t=1}^{n} \frac{PDIV_t}{(1+k_p)^t} + \frac{P_n}{(1+k_p)^n}$$

❖ Example

A company issues 10 per cent irredeemable preference shares. The face value per share is Rs 100, but the issue price is Rs 95. What is the cost of a preference share? What is the cost if the issue price is Rs 105?

We can compute cost of a preference share as follows:

Issue price Rs 95:

$$k_p = \frac{PDIV}{P_0} = \frac{10}{95} = 0.1053 \text{ or } 10.53\%$$

Issue price Rs 105:

$$k_p = \frac{PDIV}{P_0} = \frac{10}{105} = 0.0952 \text{ or } 9.52\%$$

❖ COST OF EQUITY CAPITAL

- Firms may use equity capital internally by retaining earnings. Let us call it internal equity.
- Alternatively, they could distribute the entire earnings to equity shareholders and raise equity capital externally by issuing new shares. We may call it external equity.

- In both cases, shareholders are providing funds to the firms to finance their capital expenditures.
- Therefore, the equity shareholders' required rate of return would be the same whether they supply funds by purchasing new shares or by foregoing dividends, which could have been distributed to them.
- There is, however, a difference between retained earnings and issue of equity shares from the firm's point of view.
- The firm may have to issue new shares at a price lower than the current market price.
- Also, it may have to incur flotation costs. Thus, external equity will cost more to the firm than the internal equity.

Is Equity Capital Free of Cost? No, it has an opportunity cost.

Cost of Internal Equity: The Dividend-Growth Model

Normal growth

$$P_0 = \frac{DIV_1}{(k_e - g)}$$

Supernormal growth

$$P_0 = \sum_{t=1}^{n} \frac{DIV_0(1+g_s)^t}{(1+k_e)^t} + \frac{DIV_{n+1}}{k_e - g_n} \times \frac{1}{(1+k_e)^n}$$

Zero-growth

$$k_e = \frac{DIV_1}{P_0} = \frac{EPS_1}{P_0} \quad (\text{since } g = 0)$$

Cost of External Equity: The Dividend Growth Model

$$k_e = \frac{DIV_1}{P_0} + g$$

Earnings–Price Ratio and the Cost of Equity

$$k_e = \frac{EPS_1(1-b)}{P_0} + br \qquad (g = br)$$

$$= \frac{EPS_1}{P_0} \qquad (b = 0)$$

❖ Example

The share of a company is currently selling for Rs 100. It wants to finance its capital expenditures of Rs 100 million either by retaining earnings or selling new shares. If the company sells new shares, the issue price will be Rs 95. The dividend per share next year, DIV_1, is Rs 4.75 and it is expected to grow at 6 per cent. Calculate (*i*) the cost of internal equity (retained earnings) and (*ii*) the cost of external equity (new issue of shares).

$$k_e = \frac{\text{Rs } 4.75}{\text{Rs } 100} + 0.06 = 0.0475 + 0.06 = 0.1075 \text{ or } 10.75\%$$

The cost of external equity can be calculated as follow:

$$k_e = \frac{\text{Rs } 4.75}{\text{Rs } 95} + 0.06 = 0.05 + 0.06 = 0.11 \text{ or } 11\%$$

❖ Example: EPS

- A firm is currently earning Rs 100,000 and its share is selling at a market price of Rs 80. The firm has 10,000 shares outstanding and has no debt. The earnings of the firm are expected to remain stable, and it has a payout ratio of 100 per cent. What is the cost of equity?
- We can use expected earnings-price ratio to compute the cost of equity. Thus:

$$k_e = \frac{\text{Rs } 10}{\text{Rs } 80} = 0.125 \text{ or } 12.5\%$$

❖ THE WEIGHTED AVERAGE COST OF CAPITAL (WACC)

- The following steps are involved for calculating the firm's WACC:
  - Calculate the cost of specific sources of funds
  - Multiply the cost of each source by its proportion in the capital structure.
  - Add the weighted component costs to get the WACC.

$$k_o = k_d(1-T)w_d + k_d w_e$$

$$k_o = k_d(1-T)\frac{D}{D+E} + k_e \frac{E}{D+E}$$

- WACC is in fact the weighted marginal cost of capital (WMCC); that is, the weighted average cost of new capital given the firm's target capital structure.

❖ Book Value Versus Market Value Weights

- Managers prefer the book value weights for calculating WACC

- Firms in practice set their target capital structure in terms of book values.
- The book value information can be easily derived from the published sources.
- The book value debt-equity ratios are analyzed by investors to evaluate the risk of the firms in practice.

- The use of the book-value weights can be seriously questioned on theoretical grounds;
  - First, the component costs are opportunity rates and are determined in the capital markets. The weights should also be market-determined.
  - Second, the book-value weights are based on arbitrary accounting policies that are used to calculate retained earnings and value of assets. Thus, they do not reflect economic values

- Market-value weights are theoretically superior to book-value weights:
  - They reflect economic values and are not influenced by accounting policies.
  - They are also consistent with the market-determined component costs.
- The difficulty in using market-value weights:
  - The market prices of securities fluctuate widely and frequently.
  - A market value-based target capital structure means that the amounts of debt and equity are continuously adjusted as the value of the firm changes

❖ Firm's cost of capital

$$\begin{aligned}\text{Firm's asset beta} = {} & \text{beta of division 1} \\ & \times \text{weight of division 1} \\ & + \text{beta of division 2} \\ & \times \text{weight of division 2} + \cdots \\ & + \text{beta of division } n \times \\ & \text{weight of division } n\end{aligned}$$

➢ Example

Sinhgarh Engineering Company wants to diversify into fertilizer business and organise it as a new division. The company found a comparable fertilizer company of roughly the same characteristics as the proposed division. It has equity beta of 1.35, and debt ratio of 0.72. The corporate tax rate is 35 per cent. Sinhgarh will have a debt ratio of 0.50 for the proposed fertilizer business. The risk-free rate is 8 per cent and the risk premium is 10 per cent. Calculate the cost of equity for the proposed new division.

$$\beta_a = \beta_e \left(1 - \frac{D}{V}\right) = 1.35(1 - 0.72) = 0.38$$

$$\beta_a = \beta_e \frac{1}{1 - \frac{D}{V}} = 0.38 \frac{1}{1 - 0.50} = 0.38 \times 2.00 = 0.76$$

$$k_e = 0.08 + 0.10 \times 0.76 = 0.156 \text{ or } 15.6\%$$

For example, projects may be classified as:

- **Low risk projects**
  discount rate < the firm's WACC
- **Medium risk projects**
  discount rate = the firm's WACC
- **High risk projects**
  discount rate > the firm's WACC

❖ STUDENT'S ACTIVITIES

PROBLEM 9.1 Assuming that a firm pays tax at a 50 per cent rate, compute the after-tax cost of capital in the following cases:

(*i*) A 8.5 per cent preference share sold at par.

(*ii*) A perpetual bond sold at par, coupon rate of interest being 7 per cent.

(*iii*) A ten-year, 8 per cent, ₹1000 par bond sold at ₹950 less 4 per cent underwriting commission.

(*iv*) A preference share sold at ₹100 with a 9 per cent dividend and a redemption price of ₹110 if the company redeems it in five years.

(*v*) An ordinary share selling at a current market price of ₹120, and paying a current dividend of ₹9 per share, which is expected to grow at a rate of 8 per cent.

(*vi*) An ordinary share of a company, which engages no external financing, is selling for ₹50. The earnings per share are ₹7.50 of which sixty per cent is paid in dividends. The company reinvests retained earnings at a rate of 10 per cent.

SOLUTION:

(*i*) The after-tax cost of the preference issue will be 8.5 per cent.

(*ii*) The after-tax cost of bond is:

$$k_d(1 - T) = 0.07(1 - 0.5) = 0.035 \quad \text{or} \quad 3.5\%$$

(*iii*) The after-tax cost of bond is (using approximate method):

$$\frac{(1-T)[\text{INT}+\frac{1}{n}(F-B_0)]}{1/2(F+B_0)}$$

$$= \frac{(1 - 0.5)\ [₹80 + 1/10\ (₹1000 - ₹950)]}{1/2(₹1000 + ₹950)}$$

$$= \frac{(1-0.5)[₹80 + 1/10\ (₹50)]}{1/2(₹1950)}$$

$$= \frac{(1-0.5)(₹85)}{₹975} = 0.0436 \quad \text{or} \quad 4.36\%$$

$$(iv)\quad 100 = \sum_{t=1}^{5} \frac{9}{(1+k_p)^t} + \frac{110}{(1+k_p)^5}$$

By trial and error, we find k_p = 0.106 or 10.6%

$$(v)\quad k_e = \frac{\text{DIV}_1}{P_0} + g = \frac{₹9(1.08)}{₹120} + 0.08$$
$$= \frac{₹9.72}{₹120} + 0.08$$
$$= 0.081 + 0.08 = 0.161 \quad \text{or} \quad 16.1\%$$

$$(vi)\quad P_0 = \frac{\text{EPS}\ (1-b)}{k_e - br}$$
$$k_e = \frac{\text{EPS}\ (1-b)}{P_0} + br$$
$$= \frac{₹7.50\ (1-0.4)}{₹50} + 0.10 \times 0.4$$
$$= \frac{₹4.50}{₹50.00} + 0.04$$
$$= 0.09 + 0.04 = 0.13 \quad \text{or} \quad 13 \text{ per cent}$$

PROBLEM 9.2 A firm finances all its investments by 40 per cent debt and 60 per cent equity. The estimated required rate of return on equity is 20 per cent after-taxes and that of the debt is 8 per cent after-taxes. The firm is considering an investment proposal costing ₹40,000 with an expected return that will last forever. What amount (in rupees) must the proposal yield per year so that the market price of the share does not change? Show calculations to prove your point.

SOLUTION:

The minimum overall required rate of return is:

Debt	$0.40 \times 0.08 = 0.032$
Equity	$0.60 \times 0.20 = 0.120$
Weighted average	0.152

Thus, the investment proposal must earn $0.152 \times$ ₹40,000 = ₹6,080 per year.

Annual return before taxes	₹6,080
Less: interest $0.08 \times 0.40 \times$ ₹40,000	1,280
Return on equity	₹4,800

After-tax rate of return on equity:

₹4,800 ÷ (0.60 × ₹40,000)

₹4,800 ÷ ₹24,000 = 0.20

PROBLEM 9.3 The Kay Company has the following capital structure at 31 March 2014 which is considered to be optimum.

	₹
14% Debentures	300,000
11% Preference	100,000
Equity (1,00,000 shares)	1,600,000
	2,000,000

The company's share has a current market price of ₹23.60 per share. The expected dividend per share next year is 50 per cent of the 2014 EPS. The following are the earnings per share figure for the company during the preceding ten years. The past trends are expected to continue.

Year	*EPS (₹)*	*Year*	*EPS (₹)*
2005	1.00	2010	1.61
2006	1.10	2011	2000
2007	1.21	2012	1.95
2008	1.33	2013	2.15
2009	1.46	2014	2.36

The company can issue 16 per cent new debentures. The company's debenture is currently selling at ₹96. The new preference issue can be sold at a net price of ₹9.20, paying a dividend of ₹1.1 per share. The company's marginal tax rate is 50 per cent.

(*a*) Calculate the after-tax cost (*i*) of new debt, (*ii*) of new preference capital and (*iii*) of ordinary equity, assuming new equity comes from retained earnings.

(*b*) Find the marginal cost of capital, again assuming no new ordinary shares are sold.

(*c*) How much can be spent for capital investment before new ordinary shares must be sold? Assume that retained earnings available for next year's investment are 50 per cent of 2014 earnings.

(*d*) What is the marginal cost of capital (cost of funds raised in excess of the amount calculated in part (*c*), if the firm can sell new ordinary shares to net ₹20 a share? The cost of debt and of preference capital is constant.

SOLUTION:

The existing capital structure of the firm is assumed to be optimum. Thus, the optimum proportions are:

Type of Capital	*Amount (₹)*	*Proportions*
14% Debentures	300,000	0.15
11% Preference	100,000	0.05
Equity	1,600,000	0.80
	2,000,000	1.00

(*a*) (*i*) After-tax cost of debt:

$$k_d = \frac{₹16}{₹96} = 0.1667$$

$$k_d(1-T) = (1-0.5)(0.1667) = 0.0833$$

(*ii*) After-tax cost of preference capital:

$$k_p = \frac{₹1.1}{₹9.2} = 0.12$$

(*iii*) after-tax cost of retained earnings:

$$k_e = \frac{DIV_1}{P_0} + g = \frac{₹1.18}{₹23.60} + 0.10 = 0.05 + 0.10 = 0.15$$

DIV_1 = 50% of 2014 EPS

= 50% of ₹2.36 = ₹1.18

Calculation of g: It can be observed from the past trends of EPS that it is growing at an annual compound rate of 10 per cent. For example $E_t = E_0 (1 + g)^t$ = ₹2.36 = ₹1 $(1 + g)^9$. Using Table A at the end of the book, we find that the present value factor of 2.36 at the end of 9th year is obtained when the interest rate is 10 per cent. The growth rate is, therefore, 10 per cent.

Type of Capital (1)	*Proportion* (2)	*Specific Cost* (3)	*Product* 4 = (2) ×(3)
Debt	0.15	0.0833	0.0125
Preference	0.05	0.1200	0.0060
Equity	0.80	0.1500	0.1200
Marginal cost of capital			0.1385

(*b*) The marginal cost of capital (MCC) is the weighted average cost of new capital. The firm would maintain its existing capital structure. Therefore, new capital would be raised in proportion to the existing capital structure.

(*c*) The company can spend the following amount without increasing its MCC and without selling the new shares:

Retained arnings = (0.50) (₹2.36 × 100,000)

= ₹118,000;

The ordinary equity (retained earnings in this case) is 80 per cent of the total capital. Thus

Investment before issue of equity

$$= \frac{\text{Retained earnings}}{\text{Per cent equity}} = \frac{₹118{,}000}{0.80} = ₹147{,}500$$

(*d*) If the company spends more than ₹147,500, it will have to issue new shares. The cost of new issue of ordinary shares is:

$$k_e = \frac{₹1.18}{₹20} + 0.10 = 0.059 + 0.10 = 0.159$$

The marginal cost of capital in excess of ₹147,500 is:

Type of Capital	*Proportion*	*Specific Costs*	*Product*
Debt	0.15	0.0833	0.0125
Preference	0.05	0.1200	0.0060
Ordinary Equity (new)	0.80	0.1590	0.1272
			0.1457

Chapter 02

Leverage

❖ INTRODUCTION

- Given the capital budgeting decision of a firm, it has to decide the way in which the capital projects will be financed.
- Every time the firm makes an investment decision, it is at the same time making a financing decision also.
- For example, a decision to build a new plant or to buy a new machine implies specific way of financing that project.
- Should a firm employ equity or debt or both? What are implications of the debt-equity mix? What is an appropriate mix of debt and equity?

❖ While making the Financing Decision...

- How should the investment project be financed?
- Does the way in which the investment projects are financed matter?
- How does financing affect the shareholders' risk, return and value?
- Does there exist an optimum financing mix in terms of the maximum value to the firm's shareholders?
- Can the optimum financing mix be determined in practice for a company?
- What factors in practice should a company consider in designing its financing policy?

❖ FINANCIAL LEVERAGE

- As stated earlier, a company can finance its investments by debt and equity. The company may also use preference capital.
- The rate of interest on debt is fixed irrespective of the company's rate of return on assets. The company has a legal binding to pay interest on debt.
- The rate of preference dividend is also fixed; but preference dividends are paid when the company earns profits.
- The ordinary shareholders are entitled to the residual income. That is, earnings after interest and taxes (less preference dividends) belong to them.
- The rate of the equity dividend is not fixed and depends on the dividend policy of a company.
- The use of the fixed-charges sources of funds, such as debt and preference capital along with the owners' equity in the capital structure, is described as **financial leverage** or **gearing** or **trading on equity**.
- The financial leverage employed by a company is intended to earn more return on the fixed-charge funds than their costs. The surplus (or deficit) will increase (or decrease) the return on the owners' equity. The rate of return on the owners' equity is levered above or below the rate of return on total assets.

❖ Measures of Financial Leverage

The most commonly used measures of financial leverage are:

1. **Debt ratio**
2. **Debt–equity ratio**
3. **Interest coverage**

1. Debt ratio

- The ratio of debt to total capital, i.e.,

$$Debt\ ratio\ = \frac{D}{D+E} = \frac{D}{V}$$

- where D is value of debt, E is value of shareholders' equity and V is value of total capital (i.e., D + E). D and E may be measured in terms of book value. The book value of equity is called net worth. Shareholder's equity may be measured in terms of market value.

2. Debt–equity ratio

- The ratio of debt to equity, i.e.,

$$Debt\ equity\ ratio = \frac{D}{E}$$

3. Interest coverage

- The ratio of net operating income (or EBIT) to interest charges, i.e.,

$$Coverage = \frac{EBITDA}{Interest}$$

- The first two measures of financial leverage can be expressed either in terms of book values or market values. These two measures are also known as measures of **capital gearing**.
- The third measure of financial leverage, commonly known as **coverage ratio**. The reciprocal of interest coverage is a measure of the firm's **income gearing**.

❖ Financial Leverage and the Shareholders' Return

- The primary motive of a company in using financial leverage is to magnify the shareholders' return under favorable economic conditions. The role of financial leverage in magnifying the return of the shareholders' is based on the assumptions that the fixed-charges funds (such as the loan from financial institutions and banks or debentures) can be obtained at a cost lower than the firm's rate of return on net assets (RONA or ROI).
- EPS, ROE and ROI are the important figures for analyzing the impact of financial leverage.

❖ EPS and ROE Calculations

$$\text{Earnings per share} = \frac{\text{Profit after tax}}{\text{Number of shares}} \qquad \text{Return on equity} = \frac{\text{Profit after tax}}{\text{Value of equity}}$$

$$\text{EPS} = \frac{\text{PAT}}{N} = \frac{(\text{EBIT} - \text{INT})(1-T)}{N} \qquad \text{ROE} = \frac{(\text{EBIT} - \text{INT})(1-T)}{E}$$

- For calculating ROE either the book value or the market value equity may be used.

❖ Effect of Leverage on ROE and EPS

- ✓ Favorable ROI > i
- ✓ Unfavorable ROI < i
- ✓ Neutral ROI = i

❖ Calculation of Indifference Point

- The EPS formula under all-equity plan is

$$EPS = \frac{(1-T)\,EBIT}{N_1}$$

- The EPS formula under debt–equity plan is:

$$EPS = \frac{(1-T)\;(EBIT - INT)}{N_2}$$

- Setting the two formulae equal, we have:

$$\frac{(1-T)\;EBIT}{N_1} = \frac{(1-T)\;(EBIT - INT)}{N_2}$$

- Sometimes a firm may like to make a choice between two levels of debt. Then, the indifference point formula will be:

$$\frac{(1-T)\,(EBIT - INT_1)}{N_1} = \frac{(1-T)\,(EBIT - INT_2)}{N_2}$$

- The firm may compare between an all-equity plan and an equity-and-preference share plan. Then the indifference point formula will be:

$$\frac{(1-T)(EBIT)}{N_1} = \frac{(1-T)EBIT - PDIV}{N_2}$$

❖ OPERATING LEVERAGE

- Operating leverage affects a firm's operating profit (EBIT).
- The degree of operating leverage (DOL) is defined as the percentage change in the earnings before interest and taxes relative to a given percentage change in sales.

$$DOL = \frac{\%\ \text{Change in EBIT}}{\%\ \text{Change in Sales}}$$

$$DOL = \frac{\Delta\ \text{EBIT/EBIT}}{\Delta\ \text{Sales/Sales}}$$

❖ Degree of Financial Leverage

- The degree of financial leverage (DFL) is defined as the percentage change in EPS due to a given percentage change in EBIT:

$$DFL = \frac{\%\ \text{Change in EPS}}{\%\ \text{Change in EBIT}}$$

$$DFL = \frac{\Delta\ \text{EPS/EPS}}{\Delta\ \text{EBIT/EBIT}}$$

❖ Combining Financial and Operating Leverages

- Operating leverage affects a firm's operating profit (EBIT), while financial leverage affects profit after tax or the earnings per share.
- The degrees of operating and financial leverages are combined to see the effect of total leverage on EPS associated with a given change in sales.

- The **degree of combined leverage** (DCL) is given by the following equation:

$$= \frac{\%\text{ Change in EBIT}}{\%\text{ Change in Sales}} \times \frac{\%\text{ Change in EPS}}{\%\text{ Change in EBIT}} = \frac{\%\text{ Change in EPS}}{\%\text{ Change in Sales}}$$

- another way of expressing the degree of combined leverage is as follows:

$$\text{DCL} = \frac{Q(s-v)}{Q(s-v)-F} \times \frac{Q(s-v)-F}{Q(s-v)-F-\text{INT}} = \frac{Q(s-v)}{Q(s-v)-F-\text{INT}}$$

❖ Financial Leverage and the Shareholders' Risk

- The variability of EBIT and EPS distinguish between two types of risk—operating risk and financial risk.
- Operating risk can be defined as the variability of EBIT (or return on total assets). The environment—internal and external—in which a firm operates determines the variability of EBIT
- The variability of EBIT has two components:
  - variability of sales
  - variability of expenses
- The variability of EPS caused by the use of financial leverage is called financial risk. Financial risk is an avoidable risk if the firm decides not to use any debt in its capital structure.

❖ Operating Risk

- Operating risk can be defined as the variability of EBIT (or return on assets).

- The environment—internal and external—in which a firm operates, determines the variability of EBIT.
- So long as the environment is given to the firm, operating risk is an unavoidable risk.
- A firm is better placed to face such risk if it can predict it with a fair degree of accuracy.
- The variability of EBIT has two components:
  - variability of sales
  - variability of expenses

❖ Financial Risk

- For a given degree of variability of EBIT, the variability of EPS (and ROE) increases with more financial leverage.
- The variability of EPS caused by the use of financial leverage is called financial risk.
- Firms exposed to same degree of operating risk can differ with respect to financial risk when they finance their assets differently.
- A totally equity financed firm will have no financial risk. But when debt is used, the firm adds financial risk.
- Financial risk is thus an avoidable risk if the firm decides not to use any debt in its capital structure.

❖ Measuring Operating and Financial Risk

- We can use two measures of risk:
  - Standard deviation and
  - Coefficient of variation.

$$\sigma^2(\text{EPS}) = [\text{EPS}_1 - E(\text{EPS})]^2 P_1 + [\text{EPS}_2 - E(\text{EPS})]^2 P_2 + \cdots + [\text{EPS}_j - E(\text{EPS})]^2 P_j$$

$$= \sum_{j=1}^{n} [\text{EPS}_j - E(\text{EPS})]^2 P_j$$

$$E(\text{EPS}) = \text{EPS}_1 \times P_1 + \text{EPS}_2 \times P_2 + \cdots + \text{EPS}_j P_j = \sum_{j=1}^{n} \text{EPS}_j P_j$$

❖ Example of How to Use DFL

- Consider the following example to illustrate the concept. Assume hypothetical company BigBox Inc. has operating income or earnings before interest and taxes (EBIT) of $100 million in Year 1, with interest expense of $10 million, and has 100 million shares outstanding. (For the sake of clarity, let's ignore the effect of taxes for the moment.)

- EPS for BigBox in Year 1 would thus be:

$$\frac{\text{Operating Income of \$100 Million} - \text{\$10 Million Interest Expense}}{\text{100 Million Shares Outstanding}} = \$0.90$$

- The degree of financial leverage (DFL) is:

$$\frac{\$100 \text{ Million}}{\$100 \text{ Million} - \$10 \text{ Million}} = 1.11$$

- This means that for every 1% change in EBIT or operating income, EPS would change by 1.11%.
- Now assume that BigBox has a 20% increase in operating income in Year 2.
- Notably, interest expenses remain unchanged at $10 million in Year 2 as well.
- EPS for BigBox in Year 2 would thus be:

$$\frac{\text{Operating Income of \$120 Million} - \text{\$10 Million Interest Expense}}{\text{100 Million Shares Outstanding}} = \$1.10$$

- In this instance, EPS has increased from 90 cents in Year 1 to $1.10 in Year 2, which represents a change of 22.2%.
- This could also be obtained from the DFL number = 1.11 x 20% (EBIT change) = 22.2%.

❖ Degree of Combined Leverage Example

- As stated previously, the degree of combined leverage may be calculated by multiplying the degree of operating leverage by the degree of financial leverage.
- Assume hypothetical company SpaceRocket had an EBIT of $50 million for the current fiscal year and an EBIT of $40 million for the previous fiscal year, or a 25% increase year over year (YOY).
- SpaceRocket reported sales of $80 million for the current fiscal year and sales of $65 million for the previous fiscal year, a 23.08% increase.
- Additionally, SpaceRocket reported an EPS of $2.50 for the current fiscal year and an EPS of $2 for the previous fiscal year, a 25% increase.
- SpaceRocket thus had a degree of operating leverage of 1.08 and a degree of financial leverage of 1.
- Consequently, SpaceRocket had a degree of combined leverage of 1.08. For every 1% change in SpaceRocket's sales, its EPS would change by 1.08%.

❖ STUDENT'S ACTIVITIES

PROBLEM 14.1 *AB* Ltd needs ₹10 lakh (one million) for expansion. The expansion is expected to yield an annual EBIT of ₹160,000. In choosing a financial plan, *AB* Ltd has an objective of maximizing earnings per share. It is considering the possibility of issuing equity shares and raising debt of ₹100,000, or ₹400,000 or ₹600,000. The current market price per share is ₹25 and is expected to drop to ₹20 if the funds are borrowed in excess of ₹500,000. Funds can be borrowed at the rates indicated below: (*a*) up to ₹100,000 at 8%; (*b*) over ₹100,000 up to ₹500,000 at 12%; (*c*) over ₹500,000 at 18%.

Assume a tax rate of 50 per cent. Determine the EPS for the three financing alternatives.

SOLUTION:

The EPS is determined as follows:

	Alternatives		
	I (₹100,000 debt) ₹	*II* (₹400,000 debt) ₹	*III* (₹600,000 debt) ₹
EBIT	160,000	160,000	160,000
Interest	8,000	44,000	74,000
PBT	152,000	116,000	86,000
Taxes at 50%	76,000	58,000	43,000
PAT	76,000	58,000	43,000
No. of shares	36,000	24,000	20,000
EPS	2.11	2.42	2.15

- The second alternative maximizes EPS; therefore, it is the best financial alternative in the present case.
- The interest charges for alternatives II and III are calculated as follows:

Interest Calculation, Alternative II

₹	₹
100,000 @ 8%	8,000
300,000 @ 12%	36,000
Total	44,000

Interest Calculation, Alternative III

₹	₹
100,000 @ 8%	8,000
400,000 @ 12%	48,000
100,000 @ 18%	18,000
Total	74,000

The number of shares are found out by dividing the amount to be raised through equity issue by the market price per share. The market price per share is ₹25 in case of first two alternatives and ₹20 in case of the last alternative.

PROBLEM 14.2 A company needs ₹500,000 for construction of a new plant. The following three financial plans are feasible: (*i*) The company may issue 50,000 ordinary shares at ₹10 per share. (*ii*) The company may issue 25,000 ordinary shares at ₹10 per share and 2,500 debentures of ₹100 denominations bearing a 8 per cent rate of interest. (*iii*) The company may issue 25,000 ordinary shares at ₹10 per share and 2,500 preference shares at ₹100 per share bearing a 8 per cent rate of dividend.

If the company's earnings before interest and taxes are ₹10,000, ₹20,000 ₹40,000, ₹60,000 and ₹100,000, what are the earnings per share under each of the three financial plans? Which alternative would you recommend and why? Determine the indifference points by formulae and graphically. Assume a corporate tax rate of 50 per cent.

SOLUTION:

The earnings per share under the three financial plans are calculated as follows:

First Alternative:

	₹	₹	₹	₹	₹
EBIT	10,000	20,000	40,000	60,000	1,00,000
Interest	0	0	0	0	0
PBT	10,000	20,000	40,000	60,000	1,00,000
Taxes @ 50%	5,000	10,000	20,000	30,000	50,000
PAT	5,000	10,000	20,000	30,000	50,000
No. of shares	50,000	50,000	50,000	50,000	50,000
EPS	0.10	0.20	0.40	0.60	1.00

Second Alternative:

	₹	₹	₹	₹	₹
EBIT	10,000*	20,000	40,000	60,000	100,000
Interest	20,000*	20,000	20,000	20,000	20,000
PBT	(10,000)*	0	20,000	40,000	80,000
Taxes @ 50%	(5,000)*	0	10,000	20,000	40,000
PAT	(5,000)*	0	10,000	20,000	40,000
No. of shares	25,000*	25,000	25,000	25,000	25,000
EPS	(0.20)*	0.00	0.40	0.80	1.60

Third Alternative:

	₹	₹	₹	₹	₹
EBIT	10,000	20,000	40,000	60,000	100,000
Interest	0	0	0	0	0
PBT	10,000	20,000	40,000	60,000	100,000
Taxes @ 50%	5,000	10,000	20,000	30,000	50,000
PAT	5,000	10,000	20,000	30,000	50,000
Pref. Dividend	20,000	20,000	20,000	20,000	20,000
PAT for ordinary shareholders	(15,000)	(10,000)	0	10,000	30,000
No. of shares	25,000	25,000	25,000	25,000	25,000
EPS	(0.60)	(0.40)	0.00	0.40	1.20

The choice of the financial plan will depend on the state of economic conditions. If the company's sales are increasing, the earnings per share will be maximum under the second financial alternative. Under favorable conditions, debt financing gives more benefit than equity or preference financing. Debt capital is cheaper than preference capital because interest on debt is tax deductible while preference dividend is not.

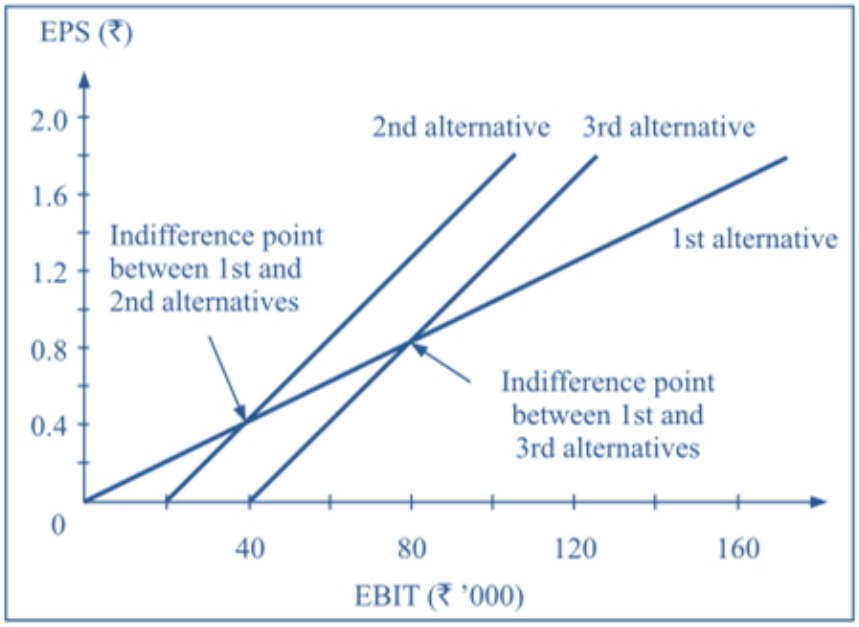


Figure 14.6: *EBIT–EPS chart*

The indifference points are determined by formula and graphically as follows:

(*i*) Indifference point between first and second alternatives:

$$\frac{(1-T)\text{EBIT}}{N_1} = \frac{(\text{EBIT}-\text{INT})(1-T)}{N_2}$$

$$\text{EBIT} = \frac{N_1}{N_1 - N_2} \times \text{INT}$$

$$= \frac{50,000}{50,000 - 25,000} \times 20,000$$

$$\text{EBIT} = 2 \times 20,000 = ₹40,000$$

(*ii*) Indifference point between first and third alternatives:

$$\frac{(1-T)\text{EBIT}}{N_1} = \frac{(1-T)\text{EBIT} - \text{PDIV}}{N_2}$$

$$\text{EBIT} = \frac{N_1}{N_1 - N_2} \times \frac{\text{PDIV}}{1-T}$$

$$= \frac{50,000}{50,000 - 25,000} \times \frac{20,000}{1-0.5}$$

$$\text{EBIT} = 2 \times 40,000 = ₹80,000$$

PROBLEM 14.3 Two firms *A* and *B* have the following information:

(₹ lakh)

	Sales	*Variable Costs*	*Fixed Costs*
Firm *A*	1,800	450	900
Firm *B*	1,500	750	375

You are required to calculate (*a*) profit to sales ratio, (*b*) break-even point, and (*c*) the degree of operating leverage for both firms.

Comment on the positions of the firms. If sales increase by 20 per cent what shall be the impact on the profitability of the two firms?

SOLUTION:

(*a*) (*i*) Contribution ratio: Contribution/Sales

$$\textit{Firm A:}\ \frac{1,800-450}{1,800}=\frac{1,350}{1,800}=0.75 \text{ or } 75\%$$

$$\textit{Firm B:}\ \frac{1,500-750}{1,500}=\frac{750}{1,500}=0.50 \text{ or } 50\%$$

(*ii*) Profit margin: Profit/Sales

$$\textit{Firm A:}\ \frac{1,350-900}{1,800}=\frac{450}{1,800}=0.25 \text{ or } 25\%$$

$$\textit{Firm B:}\ \frac{750-375}{1,500}=\frac{370}{1,500}=0.25 \text{ or } 25\%$$

(*b*) Break-even point

$$\textit{Firm A:}\ \frac{900}{0.75}=₹1,200$$

$$\textit{Firm B:}\ \frac{375}{0.50}=₹750$$

(*c*) Degree of operating leverage: Contribution/EBIT

$$\textit{Firm A:}\ \frac{1,350}{450}=3.0$$

$$\textit{Firm B:}\ \frac{750}{375}=2.0$$

Firm *A* has a higher contribution ratio as well as a higher operating leverage. Therefore, under favourable economic conditions, the firm's profit margin (EBIT/Sales ratio) will increase at a fast rate. Firm *B* has a lower contribution ratio but a lower break-even point and operating leverage as compared to Firm *A*. Its profits would grow relatively at a lower rate. At present, the profit margin for the two firms is same, but it would change with change in sales. If sales increase by 20 per cent, then profit margin would be as follows:

$$\textit{Firm } A: \frac{(1{,}800\times1.20)0.75-900}{1{,}800\times1.20}=\frac{720}{2{,}160}$$
$$=0.33 \text{ or } 33\%$$
$$\textit{Firm } B: \frac{(1{,}500\times1.20)0.50-375}{1{,}500\times1.20}=\frac{525}{1{,}800}$$
$$=0.29 \text{ or } 29\%$$

You may notice that 20 per cent increase in sales led to 60 per cent increase in profits (from ₹450 lakh to ₹720 lakh) for *A* and 40 per cent increase for *B* (for ₹375 lakh to ₹525 lakh). This has changed the profit margin for *A* higher than *B*.

PROBLEM 14.4 Consider the following information for Kaunark Enterprise:

	₹ *in lakh*
EBIT	1,120
PBT	320
Fixed cost	700

Calculate percentage change in earnings per share if sales increased by 5 per cent.

SOLUTION:

(*a*) Degree of operating leverage

$$\text{DOL}=\frac{\text{Contribution}}{\text{EBIT}}=\frac{\text{EBIT}+\text{Fixed Cost}}{\text{EBIT}}$$
$$=\frac{1{,}120+700}{1{,}120}=1.625$$

(*b*) Degree of financial leverage

$$\text{DFL}=\frac{\text{EBIT}}{\text{PBT}}=\frac{1{,}120}{320}=3.5$$

(*c*) Degree of combined leverage

$$\text{DCL}=\text{DOL}\times\text{DFL}=1.625\times3.5=5.6875$$

Change in EPS can be calculated as:

$$\text{DCL}=\frac{\%\text{ Change in EPS}}{\%\text{ Change in Sales}}$$

$$5.6875 = \frac{\%\ \text{Change in EPS}}{5}$$

$$\%\ \text{change in EPS} = 5 \times 5.6875 = 28.4375\%$$

Chapter 03

Understanding Financing Decisions (Capital Structure Decisions)

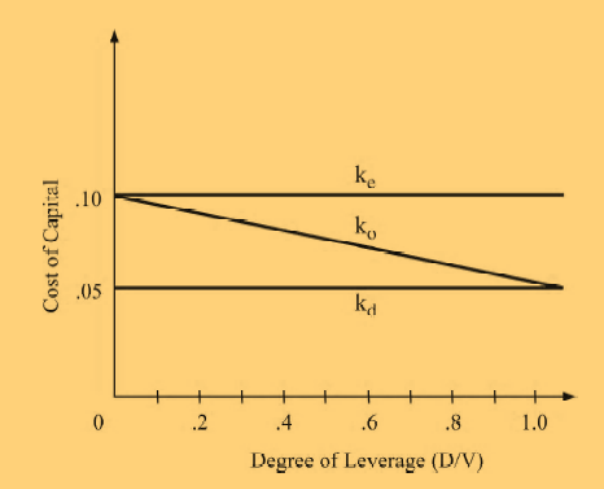
❖ Introduction

- The objective of a firm should be directed towards the maximization of the firm's value.
- The capital structure or financial leverage decision should be examined from the point of its impact on the value of the firm.

❖ NET INCOME (NI) APPROACH

- A firm that finances its assets by equity and debt is called a levered firm (geared firm).
- On the other hand, a firm that uses no debt and finances its assets entirely by equity is called an unlevered firm (ungeared firm).
- Suppose firm L is a levered firm and it has financed its assets by equity and debt. It has perpetual expected EBIT or net operating income (NOI) of Rs. 1,000 and the interest payment of Rs. 300. The firm's cost of equity (or equity capitalization rate), k_e, is 9.33 per cent and the cost of debt, k_d, is 6 per cent. What is the firm's value?
- The value of the firm is the sum of the values of all of its securities.
- In this case, firm L's securities include equity and debt; therefore, the sum of the values of equity and debt is the firm's value.
- The value of a firm's shares (equity), E, is the discounted value of shareholders' earnings, called net income (debt and equity), NI.
- Firm L's net income is: NOI – interest = 1,000 – 300 = Rs. 700, and the cost of equity is 9.33 per cent. Hence the value of L's equity is: 700/0.0933 = Rs. 7,500:

- According to NI approach both the cost of debt and the cost of equity are independent of the capital structure; they remain constant regardless of how much debt the firm uses.
- As a result, the overall cost of capital declines and the firm value increases with debt.
- This approach has no basis in reality; the optimum capital structure would be 100 per cent debt financing under NI approach.



❖ Traditional Approach

- The traditional view has emerged as a compromise to the extreme position taken by the NI approach.
- Like the NI approach, it does not assume constant cost of equity with financial leverage and continuously declining WACC.
- According to this view, a judicious mix of debt and equity capital can increase the value of the firm by reducing the weighted average cost of capital (WACC or k_0) up to certain level of debt.
- This approach very clearly implies that WACC decreases only within the reasonable limit of financial leverage and after reaching the minimum level, it starts increasing with financial leverage.
- Hence, a firm has an optimum capital structure that occurs when WACC is minimum, and thereby maximizing the value of the firm.
- Why does WACC decline?
- WACC declines with moderate level of leverage since low-cost debt is replaced for expensive equity capital. Financial leverage, resulting in risk to shareholders, will cause the cost of equity to increase.

- But the traditional theory assumes that at moderate level of leverage, the increase in the cost of equity is more than offset by the lower cost of debt.
- The assertion that debt funds are cheaper than equity funds carries the clear implication that the cost of debt plus the increased cost of equity, together on a weighted basis, will be less than the cost of equity that existed on the equity before debt financing.
- For example, suppose the cost of capital for a totally equity-financed firm is 12 per cent. Since the firm is financed only by equity, 12 per cent is also the firm's cost of equity (k_e). The firm replaces, say, 40 per cent equity by a debt bearing 8 per cent rate of interest (cost of debt, k_d).
- According to the traditional theory, the financial risk caused by the introduction of debt may increase the cost of equity slightly, but not so much that the advantage of cheaper debt is taken off totally.
- Assume that the cost of equity increases to 13 per cent. The firm's WACC will be:

  WACC = Cost of equity × Weight of equity + Cost of debt × Weight of debt

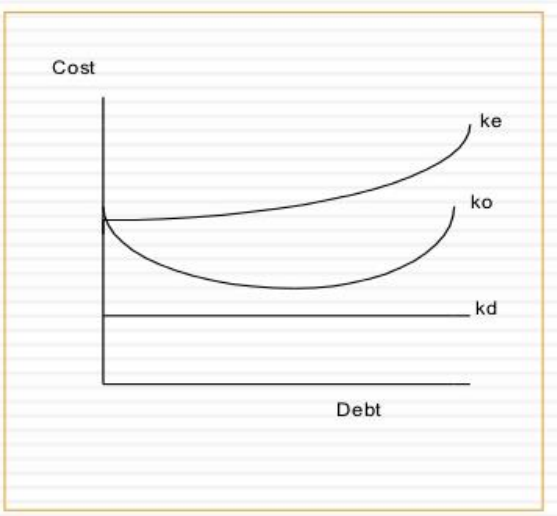
  $WACC = ko = k_e \times w_e + k_d \times w_d$

  $= 0.13 \times 0.6 + 0.08 \times 0.4 = 0.078 + 0.032$

  $= 0.11$ or 11%

- Thus, WACC will decrease with the use of debt.
- But as leverage increases further, shareholders start expecting higher risk premium in the form of increasing cost of equity until a point is reached at which the advantage of lower-cost debt is more than offset by more expensive equity.

- The traditional approach argues that moderate degree of debt can lower the firm's overall cost of capital and thereby, increase the firm value.
- The initial increase in the cost of equity is more than offset by the lower cost of debt. But as debt increases, shareholders perceive higher risk and the cost of equity rises until a point is reached at which the advantage of lower cost of debt is more than offset by more expensive equity.



❖ MM APPROACH WITHOUT TAX: Proposition I

- Modigliani and Miller (MM) do not agree with the traditional view.
- They argue that, in perfect capital markets without taxes and transaction costs, a firm's market value and the cost of capital remain invariant to the capital structure changes.
- The value of the firm depends on the earnings and risk of its assets (business risk) rather than the way in which assets have been financed.
- The MM hypothesis can be best explained in terms of their two propositions.

❖ Proposition I

- MM's Proposition I is that, for firms in the same risk class, the total market value is independent of the debt-equity mix and is given by capitalizing the expected net operating income by the capitalization rate (i.e., the opportunity cost of capital) appropriate to that risk class.

$$\text{Value of levered firm} = \text{Value of unleverd firm}$$

$$V_l = V_u$$

$$\text{Value of the firm} = \frac{\text{Net operating income}}{\text{Firm's opportunity cost of capital}}$$

$$V = V_l = V_u = \frac{NOI}{k_d}$$

❖ MM's Proposition I: Key Assumptions

MM's Proposition I is based on certain assumptions. These assumptions relate to the behavior of investors and capital markets, the actions of the firm and the tax environment.

- **Perfect capital markets:**
  Securities (shares and debt instruments) are traded in the perfect capital market situation. This specifically means that (a) investors are free to buy or sell securities; (b) they can borrow without restriction at the same terms as the firms do; and (c) they behave rationally. It is also implied that the transaction costs, i.e., the cost of buying and selling securities, do not exist. The assumption that firms and individual investors can borrow and lend at the same rate of interest is a very critical assumption for the validity of MM Proposition I. The homemade leverage will not be a substitute for the corporate leverage if the borrowing and lending rates for individual investors are different from firms.

- **Homogeneous risk classes:**
  Firms operate in similar business conditions and have similar operating risk. They are considered to have similar operating risk and belong to homogeneous risk classes when their expected earnings have identical risk characteristics. It is

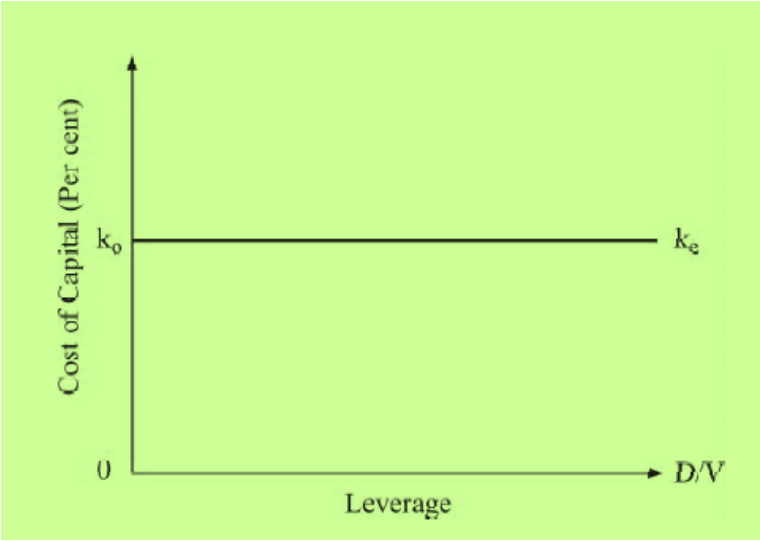
generally implied under the MM hypothesis that firms within same industry constitute a homogeneous class.

- **Risk:**
  The operating risk is defined in terms of the variability of the net operating income (NOI). The risk of investors depends on both the random fluctuations of the expected NOI and the possibility that the actual value of the variable may turn out to be different than their best estimate.

- **No taxes**
  There do not exist any corporate taxes. This implies that interest payable on debt do not save any taxes.

- **Full payout**
  Firms distribute all net earnings to shareholders. This means that firms follow a 100 per cent dividend payout.

❖ The cost of capital under MM proposition I



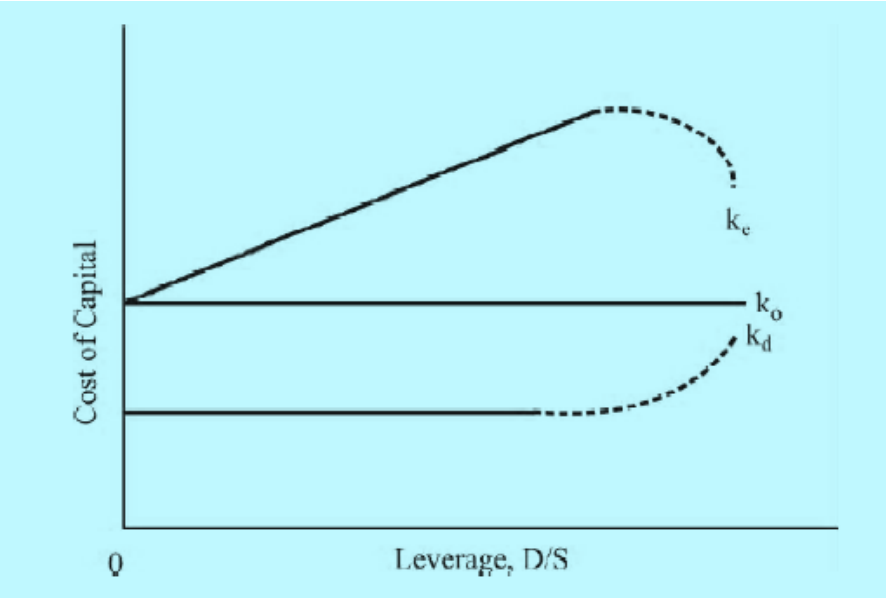
❖ NET OPERATING INCOME (NOI) APPROACH

- According to NOI approach the value of the firm and the weighted average cost of capital are independent of the firm's capital structure. In the absence of taxes, an individual holding all the debt and equity securities will receive the same cash flows regardless of the capital structure and therefore, value of the company is the same.
- MM's approach is a net operating income approach.

❖ MM's Proposition II

- Financial leverage causes two opposing effects: it increases the shareholders' return but it also increases their financial risk. Shareholders will increase the required rate of return (i.e., the cost of equity) on their investment to compensate for the financial risk. The higher the financial risk, the higher the shareholders' required rate of return or the cost of equity.
- The cost of equity for a levered firm should be higher than the opportunity cost of capital, ka; that is, the levered firm's ke > ka. It should be equal to constant ka, plus a financial risk premium.
- To determine the levered firm's cost of equity, ke:

$$k_e = k_a + (k_a - k_d)\ \frac{D}{E}$$



❖ MM APPROACH WITH TAX

- MM show that the value of the firm will increase with debt due to the deductibility of interest charges for tax computation, and the value of the levered firm will be higher than of the unlevered firm.

➢ Example: Debt Advantage: Interest Tax Shields

- Suppose two firms L and U are identical in all respects except that firm L is levered and firm U is unlevered. Firm U is an all-equity financed firm while firm L employs equity and Rs 5,000 debt at 10 per cent rate of interest. Both firms have an expected earnings before interest and taxes (or net operating income) of Rs 2,500, pay corporate tax at 50 per cent and distribute 100 per cent earnings as dividends to shareholders.

Income	*Firm U*	*Firm L*
Net operating income	2,500	2,500
Interest	0	500
Taxable income	2,500	2,000
Tax at 50%	1,250	1,000
Income after tax	1,250	1,000
Total income to investors after corporate tax:		
Dividends to shareholders	1,250	1,000
Interest to debt-holders	0	500
Total income to investors	1,250	1,500
Interest tax shield (tax advantage of debt)	0	250
Relative advantage of debt: 1,500/1,250		1.20

- You may notice that the total income after corporate tax is Rs 1,250 for the unlevered firm U and Rs 1,500 for the levered firm L. Thus, the levered firm L's investors are ahead of the unlevered firm U's investors by Rs 250.
- You may also note that the tax liability of the levered firm L is Rs 250 less than the tax liability of the unlevered firm U. For firm L the tax savings has occurred on account of payment of interest to debt holders. Hence, this amount is the interest tax shield or tax advantage of debt of firm L: 0.5 × (0.10 × 5,000) = 0.5 × 500 = Rs 250. Thus,

$$\text{Interst tax shield} = \text{corporate tax rate} \times \text{interest}$$

$$INTS = T \times INT = T \times k_d D$$

❖ Value of Interest Tax Shield

- Interest tax shield is a cash inflow to the firm and therefore, it is valuable.

- The cash flows arising on account of interest tax shield are less risky than the firm's operating income that is subject to business risk. Interest tax shield depends on the corporate tax rate and the firm's ability to earn enough profit to cover the interest payments.
- The corporate tax rates do not change very frequently.
- Under the assumption of permanent debt, the present value of the present value of interest tax shield can be determined as follows:

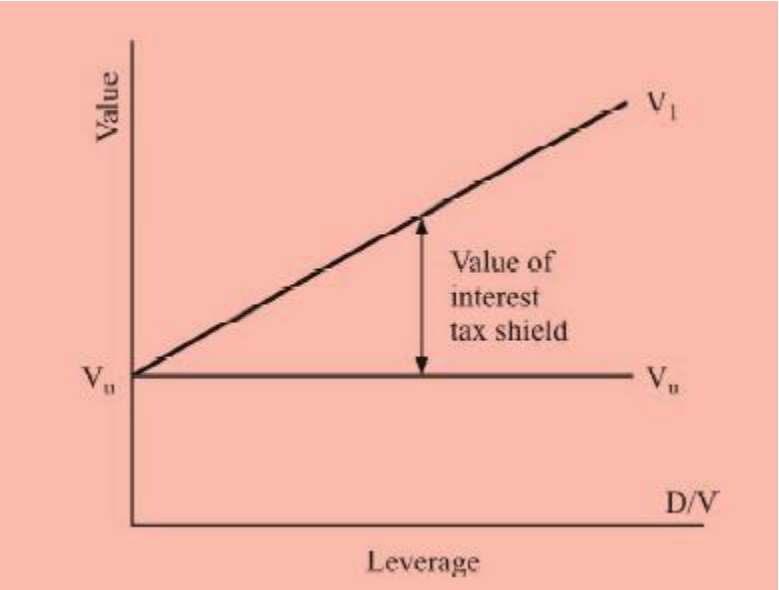
$$\text{PV of interest tax shield} = \frac{\text{Corporate tax rate} \times \text{interest}}{\text{Cost of debt}}$$

$$\text{PVINTS} = \frac{T \times k_d D}{k_d} = TD$$

❖ Value of the Levered Firm

$$\text{Value of the unlevered firm} = \frac{\text{After-tax net operating income}}{\text{Unlevered firm's cost of capital}} \qquad V_u = \frac{\text{NOI}(1-T)}{k_u}$$

Value of levered firm = Value of unlevered firm + PV of tax shield	$V_1 = V_u + TD$



❖ Implications of the MM Hypothesis with Corporate Taxes

- The MM's "tax-corrected" view suggests that, because of the tax deductibility of interest charges, a firm can increase its value with leverage. Thus, the optimum capital structure is reached when the firm employs almost 100 per cent debt.
- In practice, firms do not employ large amounts of debt, nor are lenders ready to lend beyond certain limits, which they decide.

❖ STUDENT'S ACTIVITIES

PROBLEM 15.1 Kelley Manufacturing Co. has a total capitalization of ₹1,000,000, and it normally earns ₹100,000 (before interest and taxes). The financial manager of the firm wants to take a decision regarding the capital structure. After a study of the capital market, he gathers the following data:

(*a*) What amount of debt should be employed by the firm if the traditional approach is held valid?

(*b*) If the Modigliani–Miller approach is followed, what should be the equity capitalization rate?

Assume that corporate taxes do not exist, and that the firm always maintains its capital structure at book values.

Amount of Debt ₹	*Interest Rate* %	*Equity Capitalization Rate % (at given level of debt)*
0	—	10.00
100,000	4.0	10.50
200,000	4.0	11.00
300,000	4.5	11.60
400,000	5.0	12.40
500,000	5.5	13.50
600,000	6.0	16.00
700,000	8.0	20.00

SOLUTION:

(a) As per the traditional approach, optimum capital structure exists when the weighted average cost of capital is minimum. The weighted average cost of capital calculations at book value weights are as follows:

The firm should employ debt of `400,000 as the weighted average cost of capital is minimum at this level of debt.

(b) According to the MM approach, the cost of capital is a constant, and the cost of equity increases linearly with debt. The equilibrium cost of capital is assumed to be equal to pure equity capitalization rate, which is 10 per cent in the present problem. The equity capitalization rate is given by the following approach:

k_e (1)	w_e (2)	k_d (3)	w_d (4)	$k_e\ w_e$ (5)	$k_d\ w_d$ (6)	k_o (7) = (5) + (6)
0.100	1.0	—	—	0.1000	—	0.1000
0.105	0.9	0.040	0.1	0.0945	0.0040	0.0985
0.110	0.8	0.040	0.2	0.0880	0.0080	0.0960
0.116	0.7	0.045	0.3	0.0812	0.0135	0.0947
0.124	0.6	0.050	0.4	0.0744	0.0200	0.0944
0.135	0.5	0.055	0.5	0.0675	0.0275	0.0950
0.160	0.4	0.060	0.6	0.0640	0.0360	0.1000
0.200	0.3	0.080	0.7	0.0600	0.0560	0.1160

The equity capitalization rates are shown in Table 15.12.

Table 15.12: Equity Capitalisation Rates

Debt (₹)	k_d	k_o		$(k_o - k_d)$	*Debt/Equity*		k_e
0	—	0.10	+	(0.10 – 0.000)	0	=	0.1000
100,000	0.040	0.10	+	(0.10 – 0.040)	100,000 / 900,000	=	0.1067
200,000	0.040	0.10	+	(0.10 – 0.040)	200,000 / 800,000	=	0.1150
300,000	0.040	0.10	+	(0.10 – 0.045)	300,000 / 700,000	=	0.1236
400,000	0.050	0.10	+	(0.10 – 0.050)	400,000 / 600,000	=	0.1333
500,000	0.050	0.10	+	(0.10 – 0.055)	500,000 / 500,000	=	0.1450
600,000	0.060	0.10	+	(0.10 – 0.060)	600,000 / 400,000	=	0.1600
700,000	0.080	0.10	+	(0.10 – 0.080)	700,000 / 300,000	=	0.1467

PROBLEM 15.2 The Levered Company and the Unlevered Company are identical in every respect except that the Levered Company has 6 per cent ₹200,000 debt outstanding. As per the NI approach, the valuation of the two firms is as follows:

	Unlevered Co. (₹)	*Levered Co. (₹)*
Net operating income $\bar{X}$	60,000	60,000
Total cost of debt, $k_d D$	0	12,000
Net earnings, *NI*	60,000	48,000
Equity capitalization rate, k_e	0.100	0.111
Market value of shares, *E*	600,000	432,000
Market value of debt, *D*	0	200,000
Total value of the firm, *V*	600,000	632,000

Mr *X* holds ₹2,000 worth of the Levered Company's shares. Is it possible for Mr *X* to reduce his outlay to earn same return through the use of arbitrage? Illustrate.

SOLUTION: Through arbitrage it is possible for Mr *X* to reduce his outlay and earn the same return.

1. Mr *X* would sell his shares in the Levered Company for ₹2,000.
2. He would create a personal leverage equal to his share of debt in the Levered Company by borrowing ₹926 = ₹2,000 × ₹200,000/₹432,000).
3. He would buy ₹2,778 = ₹600,000 × ₹2,000/ ₹432,000) of the Unlevered Company's shares.

His return is:

Return on the Unlevered Co.'s shares: ₹2,778 × 10%	₹277.80
Less: Interest, ₹926 × 6%	55.56
Net return	₹222.24

His return from the Levered Co. is Rs. 2,000 × 11.1% = Rs. 222.22, same as in the Unlevered Co. However, the funds involved in the Unlevered Co. are Rs. 2,778 – Rs. 926 = Rs. 1,852 which is less than Rs. 2,000 cash outlay involved in the Levered Company.

PROBLEM 15.3 Firms *A* and *B* are similar except that *A* is unlevered, while *B* has ₹200,000 of 5 per cent debentures outstanding. Assume that the tax rate is 40 per cent; NOI is ₹40,000 and the cost of equity is 10 per cent.

(*i*) Calculate the value of the firms, if the M-M assumptions are met. (*ii*) Suppose V_B = ₹360,000. According to MM, do these represent equilibrium values? How will equilibrium be set? Explain.

SOLUTION:

(*i*) The value of the unlevered firm is:

$$V_A = \frac{(1-T)\bar{X}}{k} = \frac{(1-0.4)\ ₹40,000}{0.10} = ₹240,000$$

The value of the levered firm is:

$$V_B = V_A + TD = ₹240,000 + 0.4 \text{ of } ₹200,000$$
$$= ₹240,000 + ₹80,000 = ₹320,000$$

(*ii*) These do not represent the equilibrium values. Firm *B* is overvalued by ₹40,000 (₹360,000 – ₹320,000). The arbitrage process with taxes will work as follows to restore equilibrium.

Assume an investor owns 10 per cent of *B* Co.'s shares. His investment is:

$$0.10 \times (₹360,000 - ₹200,000) = 0.10 \times ₹160,000$$
$$= ₹16,000$$

and return is

$$0.10 \times [(₹40,000 - ₹10,000)(1-0.4)]$$
$$= 0.10 \times ₹18,000 = ₹1,800$$

The investor can get the same income by shifting his investment to *A* Co. He would sell his holdings in *B* Co. for ₹16,000 and borrow on personal account ₹12,000, which is his percentage holdings in *B* Co.'s debt *i.e.*, 0.10 (1 – 0.4) 200,000 = ₹12,000. He would, then, purchase 10 per cent of *A* Co.'s shares: 0.10 × ₹2,40,000 = 24,000. His return and outlay would be

	₹
Return 0.10 [(1 – 0.4) ₹40,000]	2,400
Less: Cost of personal debt 0.05 × ₹12,000	600
Net return	1,800
Total funds available at his disposal:	
From sale of *B* Co.'s shares	16,000
Borrowed funds	12,000
	28,000
Total cash outlay in *A* Co.'s shares	24,000
Uncommitted funds	4,000

Through arbitrage and the substitution of personal for corporate leverage, the investor can switch from *B* Company to *A* Company, earn the same total return of ₹1,800, and have funds left over to invest elsewhere. This process would continue till the equilibrium is restored.

PROBLEM 15.4 The following are the costs and values for the firms *A* and *B* according to the traditional approach:

	A (₹)	*B* (₹)
Total value of firm, V	50,000	60,000
Market value of debt, D	0	30,000
Market value of equity, E	50,000	30,000
Expected net operating income	5,000	5,000
Cost of debt, INT = $k_d D$	0	1,800
Net income, NOI – $k_d D$	5,000	3,200
Cost of equity, $k_e = (\text{NOI} - k_d D)/E$	10.00%	10.70%
Debt-equity ratio, D/E	0	0.5
Average cost of capital, k_o	10.00%	8.33%

Compute the equilibrium value for Firms A and B in accordance with the MM thesis. Assume that (*i*) taxes do not exist and (*ii*) the equilibrium value of k_o is 9.09 per cent.

SOLUTION: The equilibrium values are shown below:

	A ₹	B ₹
Expected net operating income, $\bar{X}$	5,000	5,000
Total cost of debt, INT = $k_d D$	0	1,800
Net income, $\bar{X} - k_d D$	5,000	3,200
Average cost of capital, k_o	0.909	0.909
Total value of firm, $V = \bar{X}/k_o$	55,000	55,000
Market value of debt, D	0	30,000
Market value of shares, $S = V - D$	55,000	25,000
Cost of equity, $k_e = (\bar{X} - k_d D)/S$	0.909	0.128

Subject: Corporate Finance
Module 04

Chapter 01

Working Capital Management

❖ Introduction

- So far, we have discussed the management of fixed assets and long-term financing.
- In this part, issues relating to the management of current assets will be discussed.
- The management of current assets is similar to that of fixed assets in the sense that in both cases a firm analysis their effects on its return and risk.
- The management of fixed and current assets, however, differs in three important ways:
- First, in managing fixed assets, time is a very important factor; consequently, discounting and compounding techniques play a significant role in capital budgeting and a minor one in the management of current assets.
- Second, the large holding of current assets, especially cash, firm's liquidity position (and reduces riskiness), but also reduces the overall profitability. Thus, a risk-return trade-off is involved in holding current assets.
- Third, levels of fixed as well as current assets depend upon expected sales, but it is only the current assets which can be adjusted with sales fluctuations in the short run. Thus, the firm has a greater degree of flexibility in managing current assets.

❖ CONCEPTS OF WORKING CAPITAL

➢ Gross Working Capital (GWC):

- GWC refers to the firm's total investment in current assets.
- Current assets are the assets which can be converted into cash within an accounting year (or operating cycle) and include cash, short-term securities, debtors, (accounts receivable or book debts) bills receivable and stock (inventory).

➢ Net Working Capital (NWC)

- NWC refers to the difference between current assets and current liabilities.
- Current liabilities (CL) are those claims of outsiders which are expected to mature for payment within an accounting year and include creditors (accounts payable), bills payable, and outstanding expenses.
- NWC can be positive or negative.
    - Positive NWC = CA > CL
    - Negative NWC = CA < CL

- GWC focuses on
    - Optimisation of investment in current
    - Financing of current assets
- NWC focuses on
    - Liquidity position of the firm
    - Judicious mix of short-term and long-tern financing

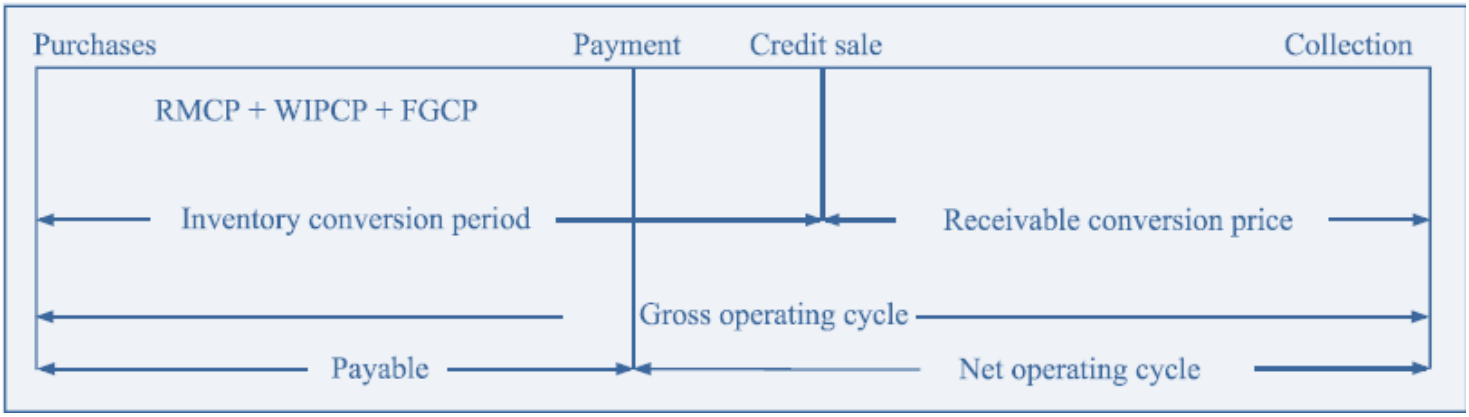
❖ OPERATING AND CASH CONVERSION CYCLE

- The need for working capital to run the day-to-day business activities cannot be overemphasized.
- We will hardly find a business firm which does not require any amount of working capital. Indeed, firms differ in the irrequirements of the working capital.
- We know that a firm should aim at maximizing the wealth of its shareholders.
- In its endeavour to do so, a firm should earn sufficient return from its operations.
- Earning a steady amount of profit requires successful sales activity. The firm has to invest enough funds in current assets for generating sales.
- Current assets are needed because sales do not convert into cash instantaneously.
- There is always an operating cycle involved in the conversion of sales into cash.

- There is a difference between current and fixed assets in terms of their liquidity.
- A firm requires many years to recover the initial investment in fixed assets such as plant and machinery or land and buildings.
- On the contrary, investment in current assets is turned over many times in a year.
- Investment in current assets such as inventories and debtors (accounts receivable) is realized during the firm's operating cycle that is usually less than a year.

- What is an operating cycle?
- Operating cycle is the time duration required to convert sales, after the conversion of resources into inventories, into cash. The operating cycle of a manufacturing company involves three phases:
    - Acquisition of resources such as raw material, labour, power and fuel etc.
    - Manufacture of the product which includes conversion of raw material into work-in-progress into finished goods.
    - Sale of the product either for cash or on credit. Credit sales create account receivable for collection.

- The length of the operating cycle of a manufacturing firm is the sum of:
  - Inventory conversion period (ICP).
  - Debtors (receivable) conversion period (DCP).



❖ Gross Operating Cycle (GOC)

- The firm's gross operating cycle (GOC) can be determined as inventory conversion period (ICP) plus debtors conversion period (DCP). Thus, GOC is given as follows:

$$\text{Gross operating cycle} = \text{Inventory conversion period} + \text{Debtors conversion period}$$

$$GOC = ICP + DCP \qquad (1)$$

➢ Inventory conversion period

- Inventory conversion period is the total time needed for producing and selling the product.
- Typically, it includes:
  - raw material conversion period (RMCP)
  - work-in-process conversion period (WIPCP)
  - finished goods conversion period (FGCP)

$$ICP = RMCP + WIPCP + FGCP$$

➢ Debtors (receivables) conversion period (DCP)

- Debtors conversion period (DCP) is the average time taken to convert debtors into cash. DCP represents the average collection period. It is calculated as follows:

$$\text{Debtors conversion period (DCP)} = \frac{\text{Debtors}}{\text{Credit sales}/360} = \frac{\text{Debtors} \times 360}{\text{Credit sales}}$$

➢ Creditors (payables) deferral period (CDP)

- Creditors(payables) deferral period (CDP) is the average time taken by the firm in paying its suppliers (creditors). CDP is given as follows:

$$\text{Creditors deferral period (CDP)} = \frac{\text{Creditors}}{\text{Credit purchases}/360} = \frac{\text{Creditors} \times 360}{\text{Credit purchases}}$$

❖ Cash Conversion or Net Operating Cycle

- Net operating cycle (NOC) is the difference between gross operating cycle and payables deferral period.

$$\text{Net operating cycle} = \text{Gross operating cycle} - \text{Creditors deferral period}$$

$$NOC = GOC - CDP$$

- Net operating cycle is also referred to as cash conversion cycle.

❖ DETERMINANTS OF WORKING CAPITAL

- There are no set rules or formulae to determine the working capital requirements of firms.
- A large number of factors, each having a different importance, influence working capital needs of firms.
- The importance of factors also changes for a firm over time. Therefore, an analysis of relevant factors should be made in order to determine total investment in working capital.
- The following is the description of factors which generally influence the working capital requirements of firms:

  - **Nature of business:** Working capital requirements of a firm are basically influenced by the nature of its business. Trading and financial firms have a very small investment in fixed assets, but require a large sum of money to be invested in working capital. Retail stores, for example, must carry large stocks of a variety of goods to satisfy varied and continuous demands of their customers. A large departmental store like Wal-Mart may carry, say, over 200,000 items. Some manufacturing businesses, such as tobacco manufacturers and construction firms, also have to invest substantially in working capital and a nominal amount in fixed assets. In contrast, public utilities may have limited need for working

capital and have to invest abundantly in fixed assets. Their working capital requirements are nominal because they may have only cash sales and supply services, not products.

- **Market and demand:** The working capital needs of a firm are related to its sales. However, it is difficult to precisely determine the relationship between volume of sales and working capital needs. In practice, current assets will have to be employed before growth takes place. It is, therefore, necessary to make advance planning of working capital for a growing firm on a continuous basis.

- **Technology and manufacturing policy:** The manufacturing cycle (or the inventory conversion cycle) comprises the purchase and use of raw materials and the production of finished goods. Longer the manufacturing cycle, larger will be the firm's working capital requirements. For example, the manufacturing cycle in the case of a boiler, depending on its size, may range between six to twenty-four months. On the other hand, the manufacturing cycle of products such as detergent powder, soaps, chocolate, etc., may be a few hours.

- **Credit policy:** The credit policy of the firm affects the working capital by influencing the level of debtors. The credit terms to be granted to customers may depend upon the norms of the industry to which the firm belongs. But a firm has the flexibility of shaping its credit policy within the constraint of the industry norms and practices. The firm should use discretion in granting credit terms to its customers. Depending upon the individual case, different terms may be given to different customers.

- **Supplies' credit:** The working capital requirements of a firm are also affected by credit terms granted by its suppliers. A firm will need less working capital if liberal credit terms are available to it from the suppliers. Suppliers' credit finances the

firm's inventories and reduces the cash conversion cycle. In the absence of suppliers' credit the firm will have to borrow funds from a bank. The availability of credit at reasonable cost from banks is crucial. It influences the working capital policy of a firm.

- **Operating efficiency:** The operating efficiency of the firm relates to the optimum utilization of all its resources at minimum costs. The efficiency in controlling operating costs and utilizing fixed and current assets leads to operating efficiency. The use of working capital is improved and pace of cash conversion cycle is accelerated with operating efficiency. Better utilization of resources improves profitability and, thus, helps in releasing the pressure on working capital. Although it may not be possible for a firm to control prices of materials or wages of labour, it can certainly ensure efficient and effective use of its, labour and other resources.

- **Inflation:** The increasing shifts in price level make the functions of financial manager difficult. She should anticipate the effect of price level changes on working capital requirements of the firm. Generally, rising price levels will require a firm to maintain higher amount of working capital. Same levels of current assets will need increased investment when prices are increasing.

❖ ESTIMATING WORKING CAPITAL

- The most appropriate method of calculating the working capital needs of a firm is the concept of operating cycle.
- However, a number of other methods may be used to determine working capital needs in practice.
- We shall illustrate here three approaches which have been successfully applied in practice:

- **Current assets holding period**
  - To estimate working capital requirements on the basis of average holding period of current assets and relating them to costs based on the company's experience in the previous years.
  - This method is essentially based on the operating cycle concept.

- **Ratio of sales**
  - To estimate working capital requirements as a ratio of sales on the assumption that current assets change with sales.

- **Ratio of fixed investment**
  - To estimate working capital requirements as a percentage of fixed investment.

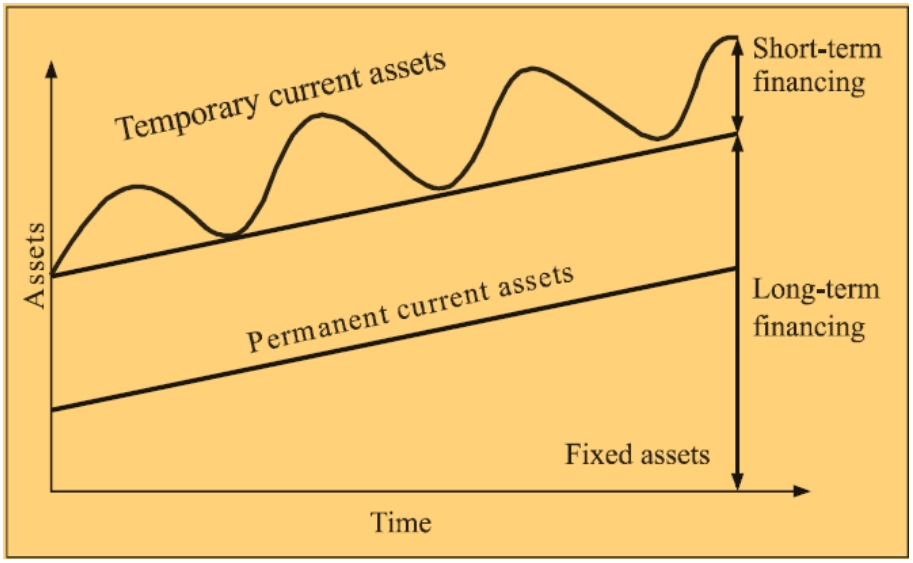
❖ WORKING CAPITAL FINANCE POLICIES

- Depending on the mix of short and long-term financing, the approach followed by a company may be referred to as:
  - Matching approach
  - Conservative approach
  - Aggressive approach

❖ Matching Approach

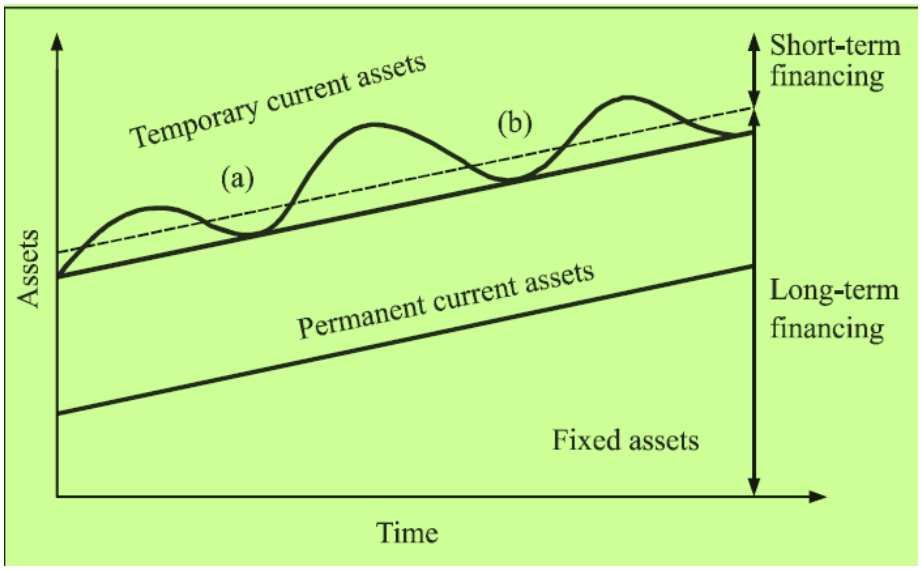
- The firm can adopt a financial plan which matches the expected life of assets with the expected life of the source of funds raised to finance assets.

- Thus, a ten-year loan may be raised to finance a plant with an expected life of ten years; stock of goods to be sold in thirty days may be financed with a thirty-day commercial paper or a bank loan.
- The justification for the exact matching is that, since the purpose of financing is to pay for assets, the source of financing and the asset should be relinquished simultaneously.
- Using long-term financing for short-term assets is expensive as funds will not be utilized for the full period.
- Similarly, financing long-term assets with short-term financing is costly as well as inconvenient, as arrangements for the new short-term financing will have to be made on a continuing basis.
- When the firm follows a matching approach (also known as hedging approach), long-term financing will be used to finance fixed assets and permanent current assets and short-term financing to finance temporary or variable current assets.
- However, it should be realized that exact matching is not possible because of the uncertainty about the expected lives of assets.



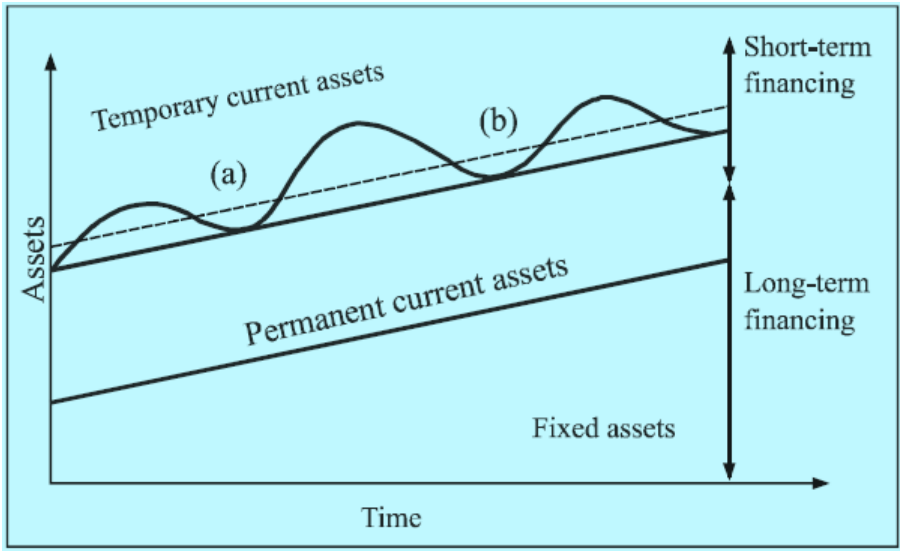
❖ Conservative Approach

- A firm in practice may adopt a conservative approach in financing its current and fixed assets.
- The financing policy of the firm is said to be conservative when it depends more on long-term funds for financing needs.
- Under a conservative plan, the firm finances its permanent assets and also a part of temporary current assets with long-term financing.
- In the periods when the firm has no need for temporary current assets, the idle long-term funds can be invested in the tradable securities to conserve liquidity.
- The conservative plan relies heavily on long-term financing and, therefore, the firm has less risk of facing the problem of shortage of funds.



❖ Aggressive Approach

- A firm may be aggressive in financing its assets.
- An aggressive policy is said to be followed by the firm when it uses more short-term financing than warranted by the matching plan.
- Under an aggressive policy, the firm finances a part of its permanent current assets with short-term financing.
- Some extremely aggressive firms may even finance a part of their fixed assets with short-term financing.
- The relatively large use of short-term financing makes the firm more risky.



❖ STUDENT'S ACTIVITIES

PROBLEM 27.1 A *pro forma* cost sheet of a company provides the following data:

	₹
Costs (per unit):	
Raw materials	52.0
Direct labour	19.5
Overheads	39.0
Total cost (per unit)	110.5
Profit	19.5
Selling price	130.0

The following is the additional information available:

Average raw material in stock: one month; average materials in process : half a month. Credit allowed by suppliers: one month; credit allowed to debtors: two months. Time lag in payment of wages: one and a half weeks. Overheads: one month. One-fourth of sales are on cash basis. Cash balance is expected to be ₹1,20,000.

You are required to prepare a statement showing the working capital needed to finance a level of activity of 70,000 units of output. You may assume that production is carried on evenly, throughout the year and wages and overheads accrue similarly.

SOLUTION:

Table 27.8: Calculation of Working Capital Needs

	₹
A. Investment in inventory	
1. Raw material inventory: one month (30 days) (RMC/360) × RMCP = {(70,000 × 52)/360} × 30	303,333.33

2. Work-in-process inventory: half-a-month (15 days) (COP/360) × WIPCP = {(70,000 × 110.5)/360} × 15	322,291.67
3. Finished goods inventory: one month (30 days) (COS/360) × FGCP = {(70,000 × 110.5)/360} × 30	644,583.33
	1,270,208.33

B. Investment in debtors: two months (60 days) (Credit sale (cost)/360) × BDCP = {(52,500 × 110.5)/360} × 60	966,875.00
C. Cash balance	120,000.00
D. Investment in current assets (*A* + *B* + *C*)	2,357,708.33
E. Current liabilities: deferred payment	
1. Creditors: one month (30 days) (Purchases of raw material/360) × PDP = {(70,000 × 52)/360} × 30	303,333.33
2. Deferred wages: 1 1/2 weeks (10 days) = {(70,000 × 19.5)/360} × 10	37,916.67
3. Deferred overheads: one month (30 days) = {(70,000 × 39)/360} × 30	227,500.00
F. Total deferred payment (spontaneous sources of working capital [*E* (1 + 2 + 3)]	568,750.00
G. Net working capital (*D* – *F*)	1,788,958.33

PROBLEM 27.2 A firm has applied for working capital finance from a commercial bank. You are requested by the bank to prepare an estimate of the working capital requirements of the firm. You may add 10 per cent to your estimated figure to account for exigencies. The following is the firm's projected profit and loss account:

	₹
1. Sales	2,247,000
2. Cost of goods sold	1,637,100
3. Gross profit (1 – 2)	609,900
4. Administrative expenses	149,800
5. Selling expenses	139,100
6. Profit before tax [3 – (4 + 5)]	321,000
7. Tax provision	107,000
8. Profit after tax (6 – 7)	214,000

The cost of goods sold (COGS) is calculated as follows:

	₹
Materials used	898,800
Wages and other mfg. expenses	668,750
Depreciation	251,450
	1,819,000
Less: Stock of finished goods (10% product not yet sold)	181,900
Cost of goods sold	1,637,100

The figures given above relate only to the goods that have been finished, and not to work-in-progress; goods, equal to 15 per cent of the year's production (in terms of physical units), are in progress on an average requiring full material but only 40 per cent of other expenses. The firm has a policy of keeping two months consumption of material in stock.

All expenses are paid one month in arrear. Suppliers of material grant one and a half months credit; sales are 20 per cent cash while remaining sold on two months credit. 70 per cent of the income tax has to be paid in advance, in quarterly instalments.

SOLUTION:

Table 27.9: Estimation of Working Capital

	₹
A. Investment in inventories	
1. Raw material: 2 months (RMC/12) × 2 = (8,98,800/12) × 2	149,800.00
2. Work-in-process: 15% of COP (adjusted) = COP × 15% = (898,800 + 40% of 668,750) × 15% = 11,66,300 × 15%	174,945.00
3. Finished goods: given 181,900 – non-cash depreciation = 181,900 – 10% of 251,450	156,755.00
	481,500.00
B. Investment in debtors: 2 months (Credit sale (cost)/12) × 2 = (80% cost of sales/12) × 2 = 80% (1,637,100 – 251,450 + 149,800 + 139,100) 2/12	223,273.33
C. Cash balance	0.00
D. Investment in current assets (A + B + C)	704,773.33
E. Current liabilities: deferred payments:	
1. Creditors: 1½ months (Purchases/12) × 1½ = (898,800/24) × 3	112,350.00
2. Deferred wages and other manufacturing, selling and administration expenses: one month (668,750 + 149,800 + 139,100/12) × 1	79,804.17
F. Total current liabilities	192,154.17
G. Net working capital (D – F)	512,619.16

Notes:

1. Depreciation is a non-cash item. Therefore, it has been ignored in calculations.
2. Cost of production does not include selling and administrative expenses.
3. Profit has been ignored in calculating net working capital. Since taxes can be paid out of profits, they have also been ignored. Alternatively, advance payment taxes require additional working capital, and profits are sources of working capital.

PROBLEM 27.3 An engineering company is considering its working capital investment for the next year. Estimated fixed assets and current liabilities for the next year are ₹2.60 crore and ₹2.34 crore, respectively. Sales and profit before interest and taxes (PBIT) depend on current assets investment—particularly inventories and book debts. The company is examining the following alternative working capital policies:

(₹ crore)

Working Capital Policy	*Investment in Current Assets*	*Estimated Sales*	*EBIT*
Conservative	4.50	12.30	1.23
Moderate	3.90	11.50	1.15
Aggressive	2.60	10.00	1.00

You are required to calculate the following for each policy (*a*) rate of return on total assets, (*b*) net working capital position, (*c*) current ratio, and (*d*) current asset to fixed asset ratio. Also discuss the return-risk trade offs of the three policies.

SOLUTION:

Return-risk trade-off: Rate of return on total assets is the measure of return while the CA/CL ratio or net working capital position can be taken as the measure of risk. Expected return and risk are minimum under conservative policy and highest under the aggressive policy. This implies that if the firm wants to increase its profitability by reducing investment in working capital, it has to be ready to bear more risk of being unable to meet its financial obligations.

(₹ crore)

	Working Capital Investment Policies		
	Conservative	Moderate	Aggressive
A. Current assets (CA)	4.50	3.90	2.60
B. Fixed assets (FA)	2.60	2.60	2.60
C. Total assets (TA)	7.10	6.50	5.20
D. Current liabilities (CL)	2.34	2.34	2.34
E. Forecasted sales	12.30	11.50	10.00
F. Expected PBIT	1.23	1.15	1.00
(i) Rate of return (F ÷ C)	17.3%	17.7%	19.2%
(ii) Net working capital (A – D)	2.16	1.56	0.26
(iii) Current ratio (A ÷ D)	1.92	1.67	1.11
(iv) CA/FA	1.73	1.50	1.00

PROBLEM 27.4 Assume that the engineering firm in Problem 27.3 has chosen the moderate working capital policy (that is, investment of ₹3.90 crore in current assets). The company is now examining the use of long-term and short-term borrowing for financing its assets. The company will use ₹2.50 crore of equity funds. The corporate tax rate is 35 per cent. The company is considering the following debt alternatives:

Financing policy	Short-term Debt (₹cr.)	Long-term Debt (₹cr.)
Conservative	0.54	1.12
Moderate	1.00	0.66
Aggressive	1.50	0.16

The average effective interest rate on short-term debt is 12 per cent while on long-term debt it is 16 per cent. Determine the following for each of the financing policies: (*a*) rate of return on shareholders' equity, (*b*) net working capital position, and (*c*) current ratio. Also, evaluate the return-risk trade offs of these policies.

SOLUTION:

Expected return and risk are lowest under the conservative policy and highest under the aggressive policy. It implies that if the company wants more return it will have to incur more risk via its financing policy.

Table 27.10: Effects of Alternative Financial Policies

(₹ crore)

	Conservative	*Moderate*	*Aggressive*
1. Current assets (CA)	3.90	3.90	3.90
2. Fixed assets (FA)	2.60	2.60	2.60
3. Total assets (TA)	6.50	6.50	6.50
4. Current liabilities	2.34	2.34	2.34
5. Short-term debt	0.54	1.00	1.50
6. Long-term debt	1.12	0.66	0.16
7. Equity capital	2.50	2.50	2.50
8. Total capital (4 + 5 + 6 + 7)	6.50	6.50	6.50
9. Forecasted sales	11.50	11.50	11.50
10. Expected EBIT	1.15	1.15	1.15
11. Interest: STD	0.06	0.12	0.18
LTD	0.18	0.11	0.03
12. Profit before tax (10 – 11)	0.91	0.92	0.94
13. Taxes, 35%	0.32	0.32	0.33
14. Profit after tax (12 – 13)	0.59	0.60	0.61
(*a*) Return on equity (14 ÷ 7)	23.7%	23.9%	24.4%
(*b*) Net working capital position [1 – (4 +5)]	1.02	0.56	0.06
(*c*) Current ratio [1 ÷ (4 + 5)]	1.35	1.17	1.02

Chapter 02

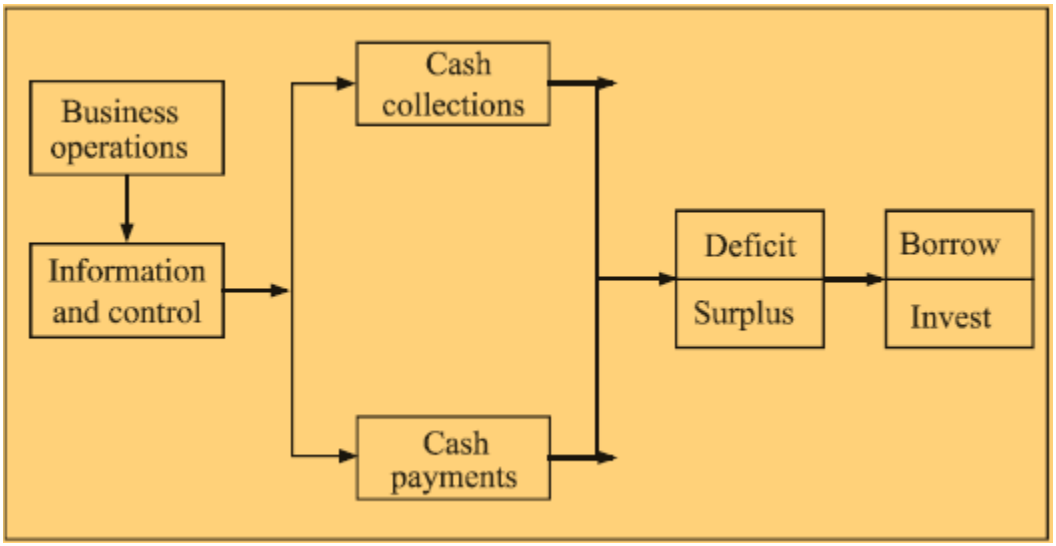
Cash Management

❖ Cash Management

- Cash is the important current asset for the operations of the business.
- It is the basic input needed to keep the business running on a continuous basis; it is also the ultimate output expected to be realized by selling the service or product manufactured by the firm.
- The firm should keep sufficient cash, neither more nor less.
- Cash shortage will disrupt the firm's manufacturing operations while excessive cash will simply remain idle, without contributing anything towards the firm's profitability.
- Thus, a major function of the financial manager is to maintain a sound cash position.
- Cash is the money which a firm can disburse immediately without any restriction.
- The term cash includes coins, currency and cheques held by the firm, and balances in its bank accounts.
- Sometimes near-cash items, such as marketable securities or bank term deposits, are also included in cash.
- The basic characteristic of near-cash assets is that they can readily be converted into cash.
- Generally, when a firm has excess cash, it invests it in marketable securities. This kind of investment contributes some profit to the firm.

❖ Cash Management Cycle

- Cash management is concerned with the managing of: (i) cash flows into and out of the firm, (ii) cash flows within the firm, and (iii) cash balances held by the firm at a point of time by financing deficit or investing surplus cash.
- It can be represented by a cash management cycle as shown in below Figure.
- Sales generate cash which has to be disbursed. The surplus cash has to be invested while deficit has to be borrowed.
- Cash management seeks to accomplish this cycle at a minimum cost. At the same time, it also seeks to achieve liquidity and control.
- Cash management assumes more importance than other current assets because cash is the most significant and the least productive asset that a firm holds.
- It is significant because it is used to pay the firm's obligations. However, cash is unproductive. Unlike fixed assets or inventories, it does not produce goods for sale.
- Therefore, the aim of cash management is to maintain adequate control over cash position to keep the firm sufficiently liquid and to use excess cash in some profitable way.



❖ Four Facets of Cash Management

- In order to resolve the uncertainty about cash flow prediction and lack of synchronization between cash receipts and payments, the firm should develop appropriate strategies for cash management.
- The firm should evolve strategies regarding the following four facets of cash management:

1) **Cash planning:** Cash inflows and outflows should be planned to project cash surplus or deficit for each period of the planning period. Cash budget should be prepared for this purpose.
2) **Managing the cash flows:** The flow of cash should be properly managed. The cash inflows should be accelerated while, as far as possible, the cash outflows should be decelerated.
3) **Optimum cash level:** The firm should decide about the appropriate level of cash balances. The cost of excess cash and danger of cash deficiency should be matched to determine the optimum level of cash balances.
4) **Investing surplus cash:** The surplus cash balances should be properly invested to earn profits. The firm should decide about the division of the cash balance between alternative short-term investment opportunities such as bank deposits, marketable securities, or inter-corporate lending.

❖ Motives for Holding Cash

The firm's need to hold cash may be attributed to the following three motives:

1) The transactions motive
2) The precautionary motive
3) The speculative motive

1) Transaction Motive

- The transactions motive requires a firm to hold cash to conduct its business in the ordinary course.
- The firm needs cash primarily to make payments for purchases, wages and salaries, other operating expenses, taxes, dividends etc.
- The need to hold cash would not arise if there were perfect synchronization between cash receipts and cash payments, i.e., enough cash is received when the payment has to be made.
- But usually cash receipts and payments are not perfectly synchronized.
- For those periods, when cash payments exceed cash receipts, the firm should maintain some cash balance to be able to make required payments.
- For transactions purpose, a firm may invest its cash in marketable securities.
- Usually, the firm will purchase securities whose maturity corresponds with some anticipated payments, such as dividends, or taxes in the future.
- Notice that the transactions motive mainly refers to holding cash to meet anticipated payments whose timing is not perfectly matched with the cash receipts.

2) Precautionary Motive

- The precautionary motive is the need to hold cash to meet contingencies in the future. It provides a cushion or buffer to withstand some unexpected emergency.
- The precautionary amount of cash depends upon the predictability of cash flows.
- If cash flows can be predicted with accuracy, less cash will be maintained for an emergency.
- The amount of precautionary cash is also influenced by the firm's ability to borrow at short notice when the need arises.
- Stronger the ability of the firm to borrow at short notice, less will be the need for precautionary balance.

- The precautionary balance may be kept in cash and marketable securities.
- Marketable securities play an important role here. The amount of cash set aside for precautionary reasons is not expected to earn anything; therefore, the firm should attempt to earn some profit on it.
- Such funds should be invested in high-liquid and low-risk marketable securities.
- Precautionary balance should, thus, be held more in marketable securities and relatively less in cash.

3) Speculative Motive

- The speculative motive relates to the holding of cash for investing in profit-making opportunities as and when they arise.
- The opportunity to make profit may arise when the security prices change.
- The firm will hold cash, when it is expected that interest rates will rise and security prices will fall.
- Securities can be purchased when the interest rate is expected to fall; the firm will benefit by the subsequent fall in interest rates and increase in security prices.
- The firm may also speculate on materials' prices.
- If it is expected that materials' prices will fall, the firm can postpone materials' purchasing and make purchases in future when price actually falls. Some firms may hold cash for speculative purposes.
- By and large, business firms do not engage in speculations.
- Thus, the primary motives to hold cash and marketable securities are the precautionary motives.

❖ Cash Planning

- Cash flows are inseparable parts of the business operations of firms.
- A firm needs cash to invest in inventory, receivables and fixed assets and to make payment for operating expenses, in order to maintain growth in sales and earnings.
- It is possible that the firm may be making adequate profits, but may suffer from the shortage of cash as its growing needs may be consuming cash very fast.
- Cash planning is a technique to plan and control the use of cash.

❖ Cash Forecasting and Budgeting

- Cash budget is the most significant device to plan for and control cash receipts and payments.
- A cash budget is a summary statement of the firm's expected cash inflows and outflows over a projected time period.
- It gives information on the timing and magnitude of expected cash flows and cash balances over the projected period.
- This information helps the financial manager to determine the future cash needs of the firm, plan for the financing of these needs and exercise control over the cash and liquidity of the firm.
- Cash forecasts are needed to prepare cash budgets. Cash forecasting may be done on short or long-term basis.
- Generally, forecasts covering periods of one year or less are considered short-term; those extending beyond one year are considered long-term.

❖ Short-term Cash Forecasts

- It is comparatively easy to make short-term cash forecasts.

- The important functions of carefully developed short- term cash forecasts are:
  - To determine operating cash requirements
  - To anticipate short-term financing
  - To manage investment of surplus cash.

❖ Short-term Forecasting Methods

- Two most commonly used methods of short-term cash forecasting are:
  1) The receipt and disbursements method
  2) The adjusted net income method.

1) The Receipt and Disbursements Method

- The virtues of the receipt and payment methods are:
  - It gives a complete picture of all the items of expected cash flows.
  - It is a sound tool of managing daily cash operations.

- This method, however, suffers from the following limitations:
  - Its reliability is reduced because of the uncertainty of cash forecasts. For example, collections may be delayed, or unanticipated demands may cause large disbursements.
  - It fails to highlight the significant movements in the working capital items.

2) The Adjusted Net Income Method

- The benefits of the adjusted net income method are:

- It highlights the movements in the working capital items, and thus helps to keep a control on a firm's working capital.
- It helps in anticipating a firm's financial requirements.

- The major limitation of this method is:
  - It fails to trace cash flows, and therefore, its utility in
  - controlling daily cash operations is limited.

❖ Long-term Cash Forecasting

- Long-term cash forecasts are prepared to give an idea of the company's financial requirements in the distant future.
- They are not as detailed as the short-term forecasts are.
- Once a company has developed a long-term cash forecast, it can be used to evaluate the impact of, say, new product developments or plant acquisitions on the firm's financial condition, for three, five, or more years in the future.
- The major uses of the long-term cash forecasts are:
  - It indicates as company's future financial needs, especially for its working capital requirements.
  - It helps to evaluate proposed capital projects. It pinpoints the cash required to finance these projects as well as the cash to be generated by the company to support them.
  - It helps to improve corporate planning. Long-term cash forecasts compel each division to plan for future and to formulate projects carefully.

❖ Optimum Cash Balance

- One of the primary responsibilities of the financial manager is to maintain a sound liquidity position of the firm so that the dues are settled in time.
- The firm needs cash to purchase raw materials and pay wages and other expenses, as well as for paying dividend, interest and taxes.
- The test of liquidity is the availability of cash to meet the firm's obligations when they become due.
- A firm maintains the operating cash balance for transaction purposes. It may also carry additional cash as a buffer or safety stock. The amount of cash balance will depend on the risk-return trade-off.
- If the firm maintains small cash balance, its liquidity position weakens, but its profitability improves as the released funds can be invested in profitable opportunities (marketable securities). When the firm needs cash, it can sell its marketable securities (or borrow).
- On the other hand, if the firm keeps high cash balance, it will have a strong liquidity position but its profitability will be low.

❖ OPTIMUM CASH BALANCE UNDER CERTAINTY: BAUMOL'S MODEL

- The Baumol model of cash management provides a formal approach for determining a firm's optimum cash balance under certainty.
- It considers cash management similar to an inventory management problem. As such, the firm attempts to minimize the sum of the cost of holding cash (inventory of cash) and the cost of converting marketable securities to cash.
- The Baumol's model makes the following assumptions:

➢ Baumol's Model–Assumptions:

- The firm is able to forecast its cash needs with certainty.
- The firm's cash payments occur uniformly over a period of time.
- The opportunity cost of holding cash is known and it does not change over time.
- The firm will incur the same transaction cost whenever it converts securities to cash.

➢ Baumol's Model

- The firm incurs a **holding cost** for keeping the cash balance. It is an opportunity cost; that is, the return foregone on the marketable securities. If the opportunity cost is k, then the firm's holding cost for maintaining an average cash balance is as follows:

  Holding cost = k (C / 2)

- The firm incurs a **transaction cost** whenever it converts its marketable securities to cash. Total number of transactions during the year will be total funds requirement, T, divided by the cash balance, C, i.e., T/C. The per transaction cost is assumed to be constant. If per transaction cost is c, then the total transaction cost will be:

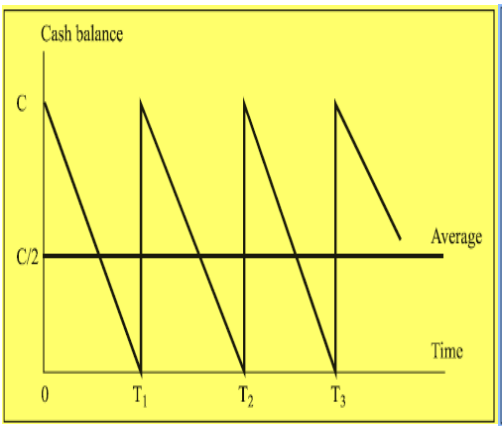
  Transaction cost = c(T / C)

- The total annual cost of the demand for cash will be:

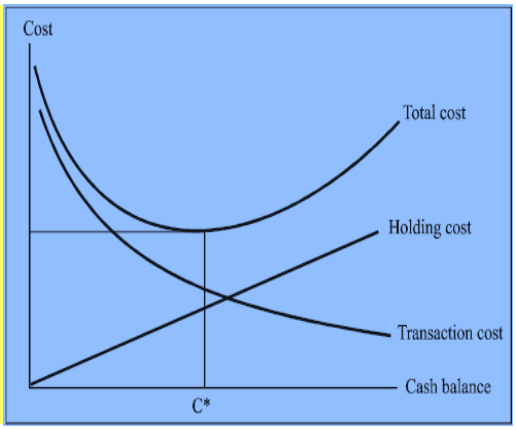
  Total cost = k (C / 2) + c(T / C)

- The optimum cash balance, C*, is obtained when the total cost is minimum. The formula for the optimum cash balance is as follows:

$$C^* = \sqrt{\frac{2cT}{k}}$$



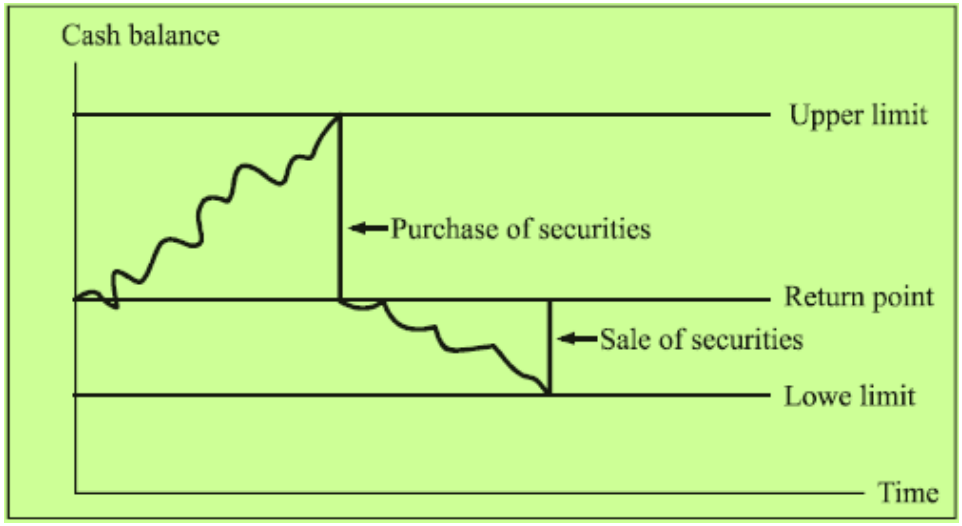
Baumol's model for cash balance



Cost trade-off: Baumol's model

❖ OPTIMUM CASH BALANCE UNDER UNCERTAINTY: THE MILLER–ORR MODEL

- The limitation of the Baumol model is that it does not allow the cash flows to fluctuate. Firms in practice do not use their cash balance uniformly nor are they able to predict daily cash inflows and outflows.
- The Miller-Orr (MO) model overcomes this shortcoming and allows for daily cash flow variation.
- It assumes that net cash flows are normally distributed with a zero value of mean and a standard deviation.
- The MO model provides for two control limits–the upper control limit and the lower control limit as well as a return point.
- If the firm's cash flows fluctuate randomly and hit the upper limit, then it buys sufficient marketable securities to come back to a normal level of cash balance (the return point).
- Similarly, when the firm's cash flows wander and hit the lower limit, it sells sufficient marketable securities to bring the cash balance back to the normal level (the return point).



- The difference between the upper limit and the lower limit depends on the following factors:
  - the transaction cost (c)
  - the interest rate, (i)
  - the standard deviation (s) of net cash flows.
- The formula for determining the distance between upper and lower control limits (called Z) is as follows:

  (Upper Limit – Lower Limit) = (3/ 4 × Transaction Cost × Cash Flow Variance / Interest Rate)$^{1/3}$

  Upper Limit = Lower Limit + 3Z

  Return Point = Lower Limit + Z
- The net effect is that the firms hold the average the cash balance equal to:

  Average Cash Balance = Lower Limit + 4/3Z

❖ STUDENT'S ACTIVITIES

PROBLEM 30.1

From the information and the assumption that the cash balance in hand on 1 January 2021 is Rs. 72,500, prepare a cash budget. Assume that 50 per cent of total sales are cash sales.

Assets are to be acquired in the months of February and April. Therefore, provisions should be made for the payment of ₹8,000 and ₹25,000 for the same. An application has been made to the bank for the grant of a loan of ₹30,000 and it is hoped that the loan amount will be received in the month of May.

Month	*Sales (₹)*	*Materials Purchases (₹)*	*Salaries & Wages (₹)*	*Production Overheads (₹)*	*Office and Selling Overheads (₹)*
January	72,000	25,000	10,000	6,000	5,500
February	97,000	31,000	12,100	6,300	6,700
March	86,000	25,500	10,600	6,000	7,500
April	88,600	30,600	25,000	6,500	8,900
May	102,500	37,000	22,000	8,000	11,000
June	108,700	38,800	23,000	8,200	11,500

It is anticipated that a dividend of ₹35,000 will be paid in June. Debtors are allowed one month's credit. Creditors for materials purchased and overheads grant one month's credit. Sales commission at 3 per cent on sales is paid to the salesman each month.

SOLUTION: See Table 30.4

Table 30.4: Cash Budget

	Jan. (₹)	*Feb.* (₹)	*Mar.* (₹)	*Apr.* (₹)	*May* (₹)	*June* (₹)	*Total* (₹)
Receipts							
Cash sales	36,000	48,500	43,000	44,300	51,250	54,350	277,400
Collections from debtors	–	36,000	48,500	43,000	44,300	51,250	223,050
Bank loan	–	–	–	–	30,000	–	30,000
Total	36,000	84,500	91,500	87,300	125,550	105,600	530,450
Payments							
Materials	–	25,000	31,000	25,500	30,600	37,000	149,100
Salaries and wages	10,000	12,100	10,600	25,000	22,000	23,000	102,700
Production Overheads	–	6,000	6,300	6,000	6,500	8,000	32,800
Office and selling overheads	–	5,500	6,700	7,500	8,900	11,000	39,600
Sales commission	2,160	2,910	2,580	2,658	3,075	3,261	16,644
Capital expenditure	–	8,000	–	25,000	–	–	33,000
Dividend	–	–	–	–	–	35,000	35,000
Total	12,160	59,510	57,180	91,658	71,075	117,261	408,844
Net cash flow	23,840	24,990	34,320	(4,358)	54,475	(11,661)	121,606
Balance, beginning of month	72,500	96,340	121,330	155,650	151,292	205,767	194,106
Balance, end of month	96,340	121,330	155,650	151,292	205,767	194,106	315,712

PROBLEM 30.3 Bharat Engineering Company undertakes large turnkey projects. It is situated in Lucknow and receives large payments on contracts as and when work progresses. The cheques received from customers are deposited in a local branch of a nationalized bank and the money becomes available after 10 days. The cheques are mostly drawn on a bank in Mumbai. The company is thinking of collecting the funds sooner by sending an accounts executive to Mumbai. A visit to Mumbai may cost ₹10,000. If Bharat Engineering Company's opportunity cost of capital is 18 per cent, what minimum cheque amount will justify sending a person to Mumbai?

SOLUTION:

The company will be able to save interest for 10 days at 18 per cent. Thus, the amount of cheque should be:

$$0.18 \times 10/360 \times \text{Amount} = 10{,}000$$

$$\text{Amount} = (10{,}000) \div (0.18 \times 10/360)$$

$$= 10{,}000/0.005$$

$$= ₹2{,}000{,}000$$

PROBLEM 30.4 Hansa Steel Tube Limited is considering whether or not to go for a lock-box system. The cost of the system is expected to be ₹1.25 per cheque. The average cheque size will be ₹5,000. The firm can invest the funds received earlier by using the lock-box system in the money market instruments earning a return of 8 per cent per annum. How much should be the reduction in the cheque collection time for Hansa to be able to accept the decision about the lock-box?

SOLUTION:

The company needs to balance the cost of lock-box (₹1.25 per cheque) with its benefits (return on investment of ₹5,000 at 8 per cent for certain number of days). We assume there are 360 days in a year. Thus:

$$1.25 = \text{Days} \times ₹5{,}000 \times 0.08/360$$
$$1.25 = \text{Days} \times 1.111$$
$$\text{Days} = 1.25/1.111 = 1.13 \text{ days}$$

PROBLEM 30.5 Sonal Hand Tools Limited has annual sales of ₹2.65 crore. The company has investment opportunities in the money market to earn a return of 16 per cent per annum. If the company could reduce its float by 2 days, what would be the company's total return?

SOLUTION:

$$\text{Sales per day} = \frac{₹2.65 \text{ crore}}{365}$$
$$= ₹72{,}603 \text{ (Assuming 365 days / years)}$$
$$\text{Total returns} = 72{,}603 \times 0.16 \times \text{days} = ₹23{,}233$$

Chapter 03

Receivables Management

❖ Introduction

- Trade credit happens when a firm sells its products or services on credit and does not receive cash immediately.
- A credit sale has three characteristics:
  - First, it involves an element of risk that should be carefully analyzed.
  - Second, it is based on economic value.
  - Third, it implies futurity.

❖ Nature of Credit Policy

- A firm's investment in accounts receivable depends on: (a) the volume of credit sales, and (b) the collection period.
- For example, if a firm's credit sales are Rs. 30 lakh per day and customers, on an average, take 45 days to make payment, then the firm's average investment in accounts receivable is:

Daily credit sales × Average collection period

Rs. 30 lakh × 45 = Rs. 1,350 lakh

- Investment in receivable
  - volume of credit sales
  - collection period

- Credit policy
  - credit standards
  - credit terms
  - collection efforts

❖ Goals of Credit Policy

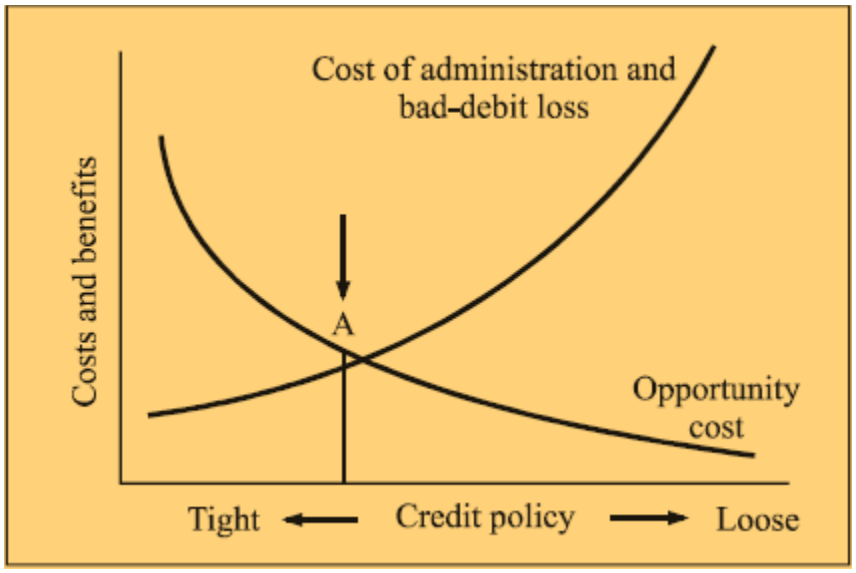
- A firm's credit policy aims at maximizing shareholders' wealth through increase in sales leading to net improvement in profitability.
- Increased sales will not only increase operating profits, but will also require additional investment and costs.
- Hence, a trade-off between incremental return and cost of incremental investment is involved.
- A firm may follow a lenient or a stringent credit policy.
- The firm, following a lenient credit policy, tends to sell on credit to customers on very liberal terms and standards; credits are granted for longer periods even to those customers whose creditworthiness is not fully known or whose financial position is doubtful.
- In contrast, a firm following a stringent credit policy sells on credit on a highly selective basis, only to those customers who have proven creditworthiness and who are financially strong.
- In practice, firms follow credit policies ranging between stringent to lenient.

- Marketing tool
  - Maximisation of sales Vs. incremental profit
- production and selling costs
  - administration costs
  - bad-debt losses

❖ Optimum Credit Policy

- The firm's operating profit is maximized when total cost is minimized for a given level of revenue.
- Credit policy at point A in Figure represents the maximum operating profit (since total cost is minimum). But it is not necessarily the optimum credit policy.
- Optimum credit policy is one which maximizes the firm's value.
- The value of the firm is maximized when the incremental or marginal rate of return of an investment is equal to the incremental or marginal cost of funds used to finance the investment.
- The incremental rate of return can be calculated as incremental operating profit divided by the incremental investment in receivables.
- The incremental cost of funds is the rate of return required by the suppliers of funds, given the risk of investment in accounts receivable.
- In sum, we may state that the goal of the firm's credit policy is to maximize the value of the firm.
- To achieve this goal, the evaluation of investment in accounts receivable should involve the following four steps:
    - Estimation of incremental profit
    - Estimation of incremental investment in receivable
    - Estimation of incremental rate of return (IRR)
    - Comparison of incre-mental rate of return with required rate of return (RRR)

Optimum credit policy: IRR = RRR



Costs of Credit Policy

❖ Credit Policy Variables

- In establishing an optimum credit policy, the financial manager must consider the important decision variables which influence the level of receivables.
- The major controllable decision variables includes the following:
  - Credit standards and analysis
  - Credit terms
  - Collection policy and procedures
- The financial or the credit manager may administer the credit policy of a firm.
- It should, however, be appreciated that credit policy has important implications for the firm's production, marketing and finance functions.
- Therefore, it is advisable that a committee that consists of executives of production, marketing and finance departments formulates the firm's credit policy.
- Within the framework of the credit policy, as laid down by this committee, the financial or credit manager should ensure that the firm's value of share is maximized.

➢ Credit Standards and Analysis

- Credit standards are the criteria which a firm follows in selecting customers for the purpose of credit extension.
- The firm may have tight credit standards; that is, it may sell mostly on cash basis, and may extend credit only to the most reliable and financially strong customers.
- Such standards will result in no bad-debt losses, and less cost of credit administration. But the firm may not be able to expand sales.
- The profit sacrificed on lost sales may be more than the costs saved by the firm.
- On the contrary, if credit standards are loose, the firm may have larger sales. But the firm will have to carry larger receivables.
- The costs of administering credit and bad-debt losses will also increase.
- Thus, the choice of optimum credit standards involves a trade-off between incremental return and incremental costs.

○ Credit Analysis

- Credit standards influence the quality of the firm's customers. There are two aspects of the quality of customers: (i) the time taken by customers to repay credit obligations and (ii) the default rate.
- The average collection period (ACP) determines the speed of payment by customers. It measures the number of days for which credit sales remain outstanding.
- The longer the average collection period, the higher is the firm's investment in accounts receivable.
- Default rate can be measured in terms of bad-debt losses ratio—the proportion of uncollected receivables.
- Bad-debt losses ratio indicates default risk.

- Default risk is the likelihood that a customer will fail to repay the credit obligation.
- On the basis of past practice and experience, the financial or credit manager should be able to form a reasonable judgment regarding the chances of default.
- To estimate the probability of default, the financial or credit manager should consider three C 's: (a) character, (b) capacity, and (c) condition.

➢ Credit Terms

- The stipulations under which the firm sells on credit to customers are called credit terms. These stipulations include:

(a) Credit period: The length of time for which credit is extended to customers is called the credit period. It is generally stated in terms of a net date. For example, if the firm's credit terms are 'net 35', it is expected that customers will repay credit obligation not later than 35 days. A firm's credit period may be governed by the industry norms. But depending on its objective, the firm can lengthen the credit period. On the other hand, the firm may tighten its credit period if customers are defaulting too frequently and bad-debt losses are building up.

(b) Cash discount: A cash discount is a reduction in payment offered to customers to induce them to repay credit obligations within a specified period of time, which will be less than the normal credit period. It is usually expressed as a percentage of sales. Cash discount terms indicate the rate of discount and the period for which it is available. If the customer does not avail the offer, he must make payment within the normal credit period.

➢ Collection Policy and Procedures

- A collection policy is needed because all customers do not pay the firm's bills in time.
- Some customers are slow-payers while some are non-payers.
- The collection efforts should, therefore, aim at accelerating the collections from slow-payers and reducing the bad-debt losses.
- A collection policy should ensure prompt and regular collection.
- Prompt collection is needed for fast turnover of working capital, keeping collection costs and bad-debts within limits and maintaining collection efficiency.
- Regularity in collections keeps debtors alert, and they tend to pay their dues promptly.

- Regularity of collections
- Clarity of collection procedures
- Responsibility for collection and follow-up
- Case-by-case approach
- Cash discount for prompt payment

❖ STUDENT'S ACTIVITIES

PROBLEM 28.1 A company is currently selling 100,000 units of its product at ₹50 each unit. At the current level of production, the cost per unit is ₹45, variable cost per unit being ₹40. The company is currently extending one month's credit to its customers. It is thinking of extending credit period to two months in the expectation that sales will increase by 25 per cent. If the required rate of return (before-tax) on the firm's investment is 30 per cent, is the new credit policy desirable?

SOLUTION:

The incremental sales units are 25,000 units and contribution per unit is ₹10. Therefore, the incremental contribution (Δ CONT) is:

$$\Delta \text{ CONT} = 25{,}000 \times ₹10 = ₹250{,}000$$

If the credit is increased to 60 days, it may be assumed that it will be availed by all customers. Therefore, the new level of receivables, given increased sales of ₹6,250,000 (i.e., 125,000 × ₹50) will be:

$$\text{New level of receivables} = \frac{6{,}250{,}000 \times 60}{360} = ₹1{,}041{,}667$$

$$\text{Old level of receivables} = \frac{5{,}000{,}000 \times 30}{360} = ₹416{,}667$$

The incremental investment in receivables is:

New level of receivables – Old level of receivables

= 1,041,667 – 16,667 = ₹625,000

The incremental rate of return is:

$$r = \frac{250{,}000}{625{,}500} = 0.4 \text{ or } 40 \text{ per cent}$$

Since the expected incremental rate of return, 40 per cent, is greater than the required rate of return, 30 per cent, the firm should change its credit period. In fact, the net gain to the firm is:

$$\text{Increment profit} - \text{Increment cost}$$
$$= 250{,}000 - 0.30 \times 625{,}000$$
$$= 250{,}000 - 187{,}500 = ₹62{,}500$$

The result is based on the following assumptions: (*i*) all sales are credit sales, (*ii*) fixed costs do not change and (*iii*) investment in receivables is represented by sales value. If we drop the third assumption and calculate investment in receivables at cost, the profitability would increase. The calculations for investment in receivables at cost are as follows:

$$\text{Old level of receivables (at cost)} = 5{,}000{,}000 \times \frac{45}{50} \times \frac{30}{360}$$
$$= ₹375{,}000$$

Since fixed costs will remain constant and they have been absorbed by existing sales, the level of receivables in additional sales will be calculated at variable cost. Thus:

New level of receivables (at cost)

$$= 5{,}000{,}000 \times \frac{45}{50} \times \frac{60}{360} + 1{,}250{,}000 \times \frac{40}{50} \times \frac{60}{360}$$
$$= 750{,}000 + 166{,}667 = ₹916{,}667$$

Thus, the incremental level of receivables at cost is:

916,667 – 375,000 = ₹541,667

The required profit on incremental investment (Δ INVST) is:

0.3 × 541,667 = ₹162,500

Thus the net gain to the firm is:

250,000 – 162,500 = ₹87,500

PROBLEM 28.2 A company currently has annual sales of ₹500,000 and an average collection period of 30 days. It is considering a more liberal credit policy. If the credit period is extended, the company expects sales and bad-debt losses to increase in the following manner:

Credit Policy	*Increase in Credit Period*	*Increase in Sales (₹)*	*Bad-debt % of Total Sales*
A	10 days	25,000	1.2
B	15 days	35,000	1.5
C	30 days	40,000	1.8
D	42 days	50,000	2.2

The selling price per unit is ₹2. Average cost per unit at the current level of operation is ₹1.50 and variable cost per unit is ₹1.20. If the current bad-debt loss is 1 per cent of sales and the required rate of return investment is 20 per cent, which credit policy should be undertaken? Ignore taxes, and assume 360 days in a year.

SOLUTION:

The firm will maximize the shareholders value if it extends its period by additional 30 days (since expected return is higher than required return). In fact, it can further relax credit period until its expected return becomes 20% or net gain becomes zero.

The investment in receivables could be calculated at cost. At current level of sales, the firm's average unit cost is ₹1.50. Since variable cost per unit is ₹1.20, we can find total fixed costs:

$$\text{Fixed cost} = \text{Total cost} - \text{Variable cost}$$

$$= \frac{₹500,000 \times ₹1.50}{₹2} - \frac{₹500,000 \times ₹1.20}{₹2}$$

$$= ₹375,000 - ₹300,000 = ₹75,000$$

		Increase in Credit Period			
	Existing	10 days	15 days	30 days	42 days
A. Credit period (days)	30	40	45	60	72
B. Annual sales	500,000	525,000	535,000	540,000	550,000
C. Level of receivables (at sales value) {(A × B)/360}	41,667	58,333	66,875	90,000	110,000
D. Incremental investment in receivables, {C – 41,667}	–	16,667	25,208	48,333	68,333
E. Required incremental profit at 20%, (0.2 × D)	–	3,333	5,042	9,667	13,667
F. Incremental contribution on additional sales @ 40%	–	10,000	14,000	16,000	20,000
G. Bad-debt losses, {B × % bad-debt}	5,000	6,300	8,025	9,720	12,100
H. Incremental bad-debt losses, {G – 5,000}	–	1,300	3,025	4,720	7,100
I. Incremental expected profit, (F – H)	–	8,700	10,975	11,280	12,900
J. Net gain, (I – E)	–	5,367	5,933	1,613	(767)
K. Expected return, {I/D}	–	52.2%	43.5%	23.3%	18.9%

Thus the total cost of different level of sales is (assuming unit price and fixed costs do not change):

Sales	*Cost*
525,000	(525,000) × (1.20)/2 + 75,000 = ₹390,000
535,000	(535,000) × (1.20)/2 + 75,000 = ₹396,000
540,000	(540,000) × (1.20)/2 + 75,000 = ₹399,000
550,000	(550,000) × (1.20)/2 + 75,000 = ₹405,000

and level of account receivables will be:

Level of Receivables	*Δ INVST*
(375,000) × (30)/360 = ₹31,250	–
(390,000) × (40)/360 = ₹43,333	12,083
(396,000) × (45)/360 = ₹49,500	18,250
(399,000) × (60)/360 = ₹66,500	35,250
(405,000) × (72)/360 = ₹81,000	49,750

The net gain from the credit policy can be recalculated using incremental investment in accounts receivables at cost. It would be higher now.