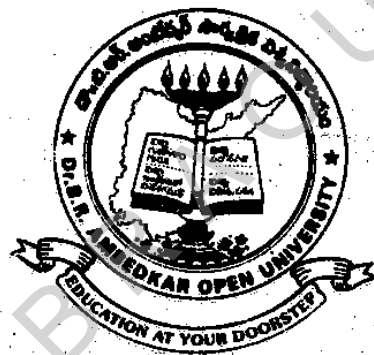


FINANCIAL MANAGEMENT



DR. B. R. AMBEDKAR OPEN UNIVERSITY
HYDERABAD
2004

COURSE TEAM

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First Published 2004

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PREFACE

The course deals with topics in 'Financial Management' included in the syllabus for M.Com (Previous) Programme offered by Dr.B.R.Ambedkar Open University. The syllabus for the sake of convenience is divided into Blocks, each of which, in turn, comprises a given number of units, depending upon the nature and scope of the subject matter presented in that particular block. The units are prepared by specialists in the field in accordance with a format so designed as to enable the learners to study and comprehend the subject matter with least difficulty. Each unit begins with aims and objectives followed by contents. At the end of each unit, Self Assessment Questions (SAQs) are given with a view to test the learners' comprehension of its subject matter. Technical terms which the students may not be familiar with are given at the end of each unit under the "Key Words" besides summary of the unit.

Finance is the lifeblood of business. The course in finance is taught within the framework of maximising shareholders wealth as the goal of management. The behaviour and performance of business enterprises are the key to understanding the modern economic society. Hence, there is an immense need to study 'Financial Management'. The University, therefore, offers FINANCIAL MANAGEMENT as one of the courses to the students of the M.Com. Programme.

The course is organised into 5 Blocks and 17 units. The First Block describes the introductory aspects of Financial Management. This block helps the learner to understand the importance and functions of Financial Management. It also explains the time value of money. The Second Block is devoted to discussing the investment decision in detail. It examines the various techniques of capital budgeting and the relationship between risk and capital budgeting. The Third Block aims at identifying and evaluating the sources of finance to a business enterprise besides analysing the determinants of cost of capital and components of capital structure. The Fourth Block concerns itself with various aspects relating to the distribution of surplus and the policy implications thereof. Finally the Fifth Block explains the concepts of working capital and management of the different components of working capital including its financing.

The University is of strong belief that this material would help the learner gain adequate knowledge of the core issues in Financial Management.

BRAOU

DR. B.R. AMBEDKAR OPEN UNIVERSITY

M. Com. (P) - 3

FINANCIAL MANAGEMENT

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BRAOU

BLOCK - I : FINANCIAL MANAGEMENT : AN OVERVIEW

The objective of this block is to introduce you to the basics of financial management. It helps you to understand the importance, scope, and goals of financial management. In addition, it discusses 'Time Value of Money' in detail. This block has two units.

The first unit explains finance functions, finance manager's role and goals and objectives of financial management.

The second unit explains the concept of 'time value' of money and the computation simple interest, future value, and present value of money.

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UNIT – 1 : FINANCIAL MANAGEMENT – AN OVERVIEW

Objectives

After studying this Unit, you should be able :

- to explain the finance function;
- to discuss the scope of finance function in a modern corporate enterprise;
- to identify the role of a financial manager;
- to explain the goals and objectives of financial management function; and
- to describe the organization of financial function.

Structure

- 1.0 Introduction
- 1.1 Finance Function in a Corporate Enterprise
- 1.2 Scope of Financial Management
- 1.3 Finance Function: Managerial and Routine
- 1.4 Managerial Finance Function : Modern Approach to Financial Management
 - 1.4.1 Investment Decisions
 - 1.4.2 Financing Decisions
 - 1.4.3 Dividend Decision
 - 1.4.4 Risk Return Trade off
- 1.5 Role of Finance Manager
- 1.6 Goals and Objectives of Financial Management
 - 1.6.1 Profit Maximization
 - 1.6.2 Wealth Maximization
- 1.7 Organization of Financial Management Function
- 1.8 Summary
- 1.9 Self Assessment Questions
- 1.10 Further Readings
- 1.11 Key Words

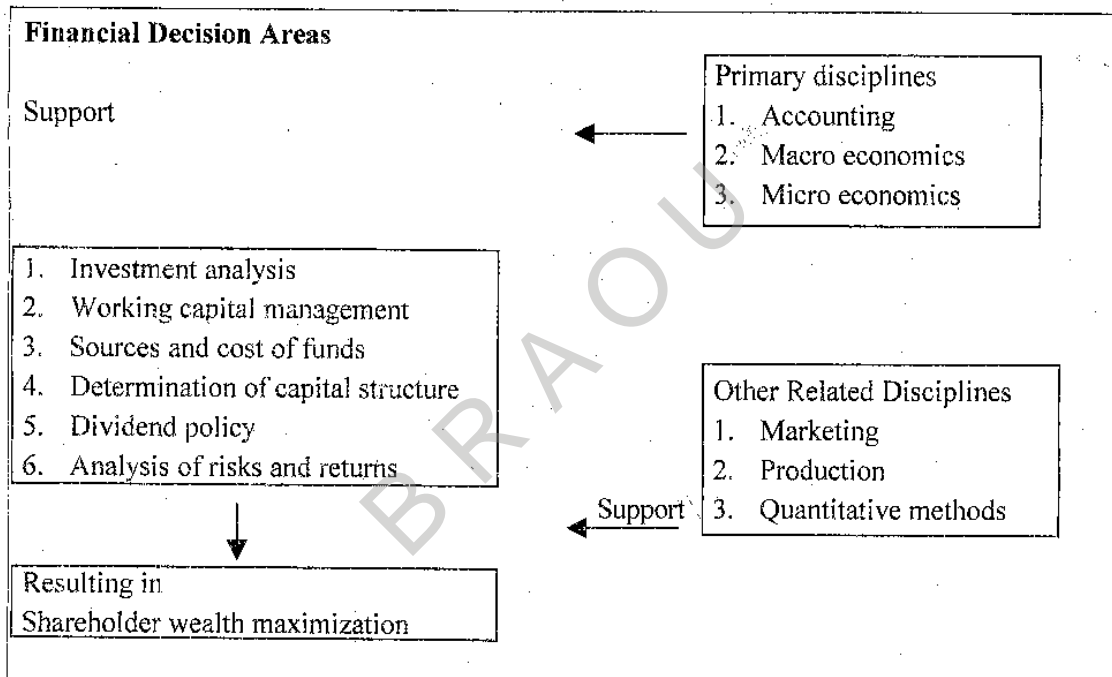
1.0 INTRODUCTION

Financial Management is total management activity related to the planning and controlling of the firm's financial resources. Financial management as a separate activity or discipline is of recent origin and it has gained importance in the recent years. It is concerned with the overall managerial decisions and management of economic resources. Financial management encompasses the procurement and employment of funds in the most optimum way to maximize the returns to the owners or shareholders. Financial management as an

integral part of overall management is not totally independent area and it draws heavily on its related disciplines such as economics, accounting, marketing, production, human resources and quantitative methods. In fact, all these disciplines are interrelated. For instance, financial manager should consider the impact of new product development and promotion plans made in marketing area. These marketing activities require capital outlay and they have an impact on the cashflows of the firm. Similarly, changes in the production process may necessitate the capital expenditure which the finance manager must evaluate and finance. The marketing, production and quantitative methods are related to the decision making by the financial managers and they are supportive in nature. Economics and Accounting are primary disciplines on which the financial manager draws heavily.

The relationship between financial management and supportive disciplines is depicted in the following figure.

Figure 1.1: Financial Management & Other disciplines



1.1 FINANCE FUNCTION IN A CORPORATE ENTERPRISE

Financial Management is that managerial activity which is concerned with the planning and control of firm's financial resources. It was a branch of Economics till the beginning of 20th century and as a separate discipline it is of recent origin. Financial management is a unique body of knowledge and draws heavily on Economics for its theoretical concepts. The three important activities of modern corporates are (1) Finance (2) Production and (3) Marketing. The firm obtains capital and employs this capital. This is called finance activity. The finance raised would be invested for generation of returns, this is called investment and production activity and the goods produced should be marketed and this activity is called marketing activity. A modern corporate enterprise as an entity engages itself continuously in activities so as to perform the functions of finance, production and marketing.

The firm acquires funds from investors and invests the amount with an expectation of return on investment. The returns thus received should be distributed to the investors who

provide the funds. The raising of funds for generating returns and paying returns to the suppliers of the funds is called finance function of the corporate enterprise. In this regard, we have to understand two types of funds that are raised by a firm i.e., equity funds and borrowed funds. A firm raises equity funds by selling the shares to the share holders who are considered as the owners of the company. There are two types of shareholders viz., equity shareholders and preference shareholders. The preference shareholders receive dividends at a fixed rate and they have a prior claim over equity shareholders in regard to distribution of earnings and repayment of capital at the time of liquidation. The equity shareholders receive dividends, if there are profits and the company is not under obligation to pay dividends to the shareholders. The equity shareholders are the residual claimants and they will get back their capital only after satisfying other claimants at the time of liquidation. They suffer capital loss and are called owners of Residue.

Another important source of funds is creditors or lenders. Lenders are not the owners of the company but they provide the funds for the interest agreed upon and interest should be paid to the lenders irrespective of the firm's earnings. It is a fixed financial commitment on the part of the company. In addition to these sources, there is also another source internal to company that is called retained earnings. The 'retained earnings' represent undistributed returns on equity capital and they are available for investment in the company.

Activity – 1

Describe the finance function in a corporate enterprise.

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1.2 SCOPE OF FINANCIAL MANAGEMENT

The financial management in a corporate enterprise as stated earlier, is closely related to other functions including purchasing, production, marketing and distribution, and human resources management. These functions are connected with the problem of financing. Further, the success and efficiency in raising, allocating and application of the funds of business largely influences the success of other functions in the firm and also the management. A large number of business decisions concerning production, human resources and marketing carry financial implications. For example, recruitment and promotion of employees in production department, marketing department, etc., is the responsibility of the related departments but, such activities require payment of wages and salaries and other benefits which involve finance. Similarly, buying a new machine, replacing an old machine, expansion of the production capacity, modernization of the production-all these decisions affect the flow of funds and finances of the business. In the same manner, sales promotion and advertising activities related to marketing department affect the financial flows. Hence, it would not be possible, sometimes, to distinguish between different functions of the firm and it is only the finance function which pervades and influences all the functions in the organization. Thus the scope of finance function is not restricted only to finance department rather it has influence over the other activities related to production, marketing, distribution and human resources, in as much as such activities influence the financial resources of the enterprise.

1.3 FINANCE FUNCTION: MANAGERIAL AND ROUTINE

The finance function can be identified under two categories i.e., managerial finance functions and routine finance functions. The managerial finance functions which can also be called executive finance functions require skillful planning, control, and execution of various financial activities related to investment decisions, financing decisions, dividend decisions and working capital decisions. The routine finance functions, on the other hand, do not require managerial and special skills because they are essentially clerical and are incidental to the effective handling of the managerial finance functions. These routine or non-executive finance functions concern with the routine procedures and routine finance functions and activities. These include, among several others, supervision of cash receipts and payments, the safe-guarding of cash balances and securities; insurance policies and other valuable papers; taking care of details of new source of finance; accounts keeping and reporting. The financial executives of modern corporate are mainly concerned with the managerial financial functions and the routine financial functions are carried out by the people at the lower levels of the finance department.

1.4 MANAGERIAL FINANCE FUNCTION: MODERN APPROACH TO FINANCIAL MANAGEMENT

The modern approach to financial management provides a conceptual and analytical framework for financial decision making. According to this approach, finance function covers both acquisition and allocation of funds in a skillful and planned manner and it forms integral part of over all management of a firm.

The main aspects of this modern approach are:

- i) What is the total volume of funds that a firm should commit?
- ii) What is the nature and type of assets that a firm should acquire?
- iii) What are the sources of finance for the acquisition of the assets?

These are related to firm's decisions in respect of expansion, growth, capital structure and assets structure. These vital decisions obviously influence the direction of growth and the risks-return complexion of the firm.

Thus, the modern approach to Financial Management includes three major managerial financial decisions or functions of finance: (i) Investment Decisions, (ii) The Financing Decisions, (iii) Dividend Policy Decision.

1.4.1 INVESTMENT DECISIONS

Investment decisions relate to the composition of the assets in terms of long term assets and short-term assets. The long term assets otherwise called fixed assets yielding returns over a period of time in future, while short-term assets, otherwise called 'current assets', are convertible into cash usually within a year. The investment decisions pertaining to acquisition of long term assets are regarded as capital budgeting decisions and the financial decisions relating to current assets come under the fold of working capital management.

Capital budgeting decision relates to the allocation of capital and it involves the commitment of huge funds in the long term assets. The returns from long term investments would be derived only in future. Hence, there is a lot of risk involved in such decisions, because of uncertainty in the flow of benefits expected. Hence, capital budgeting decisions involve risk and the risk is to be evaluated and the decision should be taken accordingly. The capital budgeting decisions have to be taken based on the cost of capital for the company. Further, the capital budgeting decisions are irreversible and affect the direction of growth and risk-return complexion of the firm. These decisions involve the calculation of the present value of the future cash flows by applying appropriate discount rate for alternative project proposals. The value of the firm can be enhanced only when the net present value of the proposed project is positive. Thus, the concept of 'time value of money' is to be necessarily adopted in the capital budgeting decisions.

Working capital management is concerned with the management of current assets of a firm. In regard to working capital management, it is necessary to achieve a trade-off between profitability and risk (due to lack of liquidity) and there is always a conflict between profitability and liquidity. If a firm does not have adequate liquidity in terms of working capital in the form of current assets, it may become illiquid. Consequently, it may not be in a position to meet its current obligations and thus it is exposed to the risk of bankruptcy. On the other hand, if a firm has huge investments in current assets its profitability is adversely affected, because such investment involves opportunity cost. Thus, a trade-off should be achieved through optimal level of current assets such as cash, inventories and receivables.

1.4.2 FINANCING DECISION

Other important decision to be taken by the financial manager is the financing decision which involves the acquisition of funds to meet the firm's investment requirements. This decision involves determination of optimal capital structure with right combination of equity capital and debt capital. The optimal capital structure would enhance the value of the firm and it results in the lowest cost of capital. Hence, proper balance has to be struck between return and risk involved in the firm's capital structure decisions.

The use of higher levels of debt implies a higher return to the shareholders but at the same time the firm's financial risk increases. On the other hand, lower debt results in lower profitability and less financial risk. Thus, here also a trade-off has to be struck between risk and return by having optimal capital structure, which means right combination of debt and equity.

1.4.3 DIVIDEND DECISION

The third important managerial financial decision relates to firm's dividend policy. The financial manager should take a decision regarding the firm's dividend policy i.e., proportion of the amount to be distributed as dividend out of total profits. The optimal dividend policy maximizes the value of the share and it is consistent with the objective of wealth maximization. Higher dividend-payout ratio implies loss of current liquidity, lack of resources for investment affecting the growth and long term profitability, while lower dividend-payout ratio affects current market price though growth and long-term profitability could be impressive. Thus, the financial manager has to strike at (i) optimal dividend policy, (ii) achieve trade-off, and (iii) avoid both conservative and liberal dividend policies. This approach is expected to enhance the market value of the share.

1.4.4 RISK RETURN TRADE OFF

The financial decisions of a firm are interrelated and jointly affect the market value of the shares by influencing the risk - return complexion of the firm. Hence, proper balance should be maintained between risk and return in order to maximize the market value of the firm. This process is called 'Risk-Return Trade-off' and every financial decision involves 'Risk-Return Trade-off' and it is depicted in the following chart.

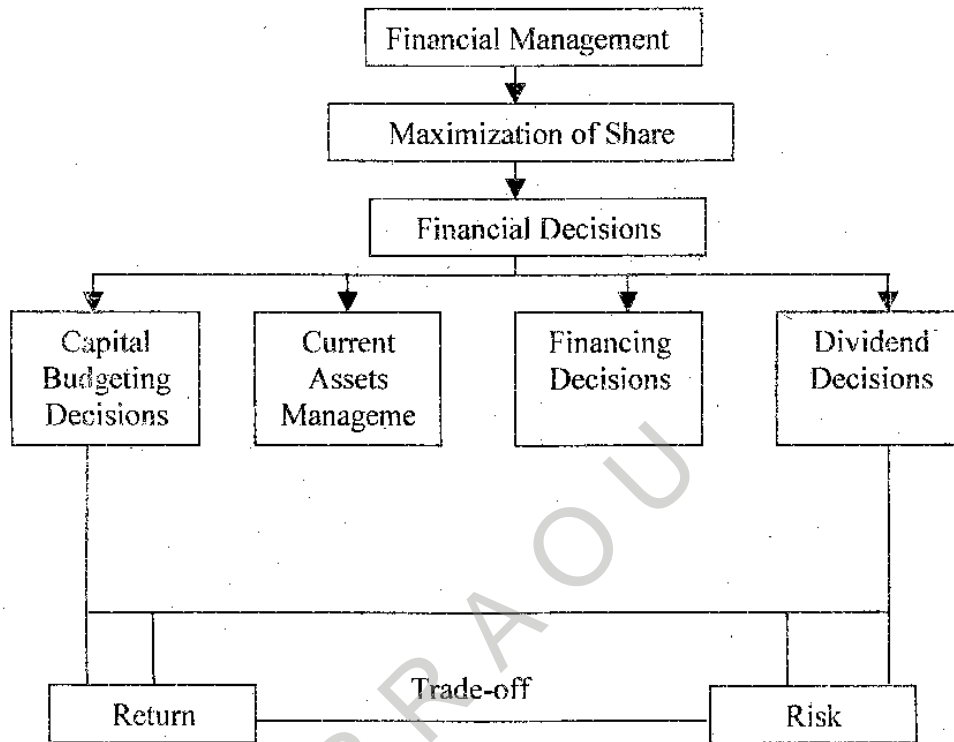


Figure 1.2: Risk Return Trade off

Activity - 2

Explain the managerial finance function.

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1.5 ROLE OF FINANCE MANAGER

In addition to his direct role in taking managerial financial decisions, the finance manager of a modern corporate enterprise has to play a new role encompassing even different functions of the enterprise namely marketing, human resource management, production, etc. But, the traditional role of financial manger during the initial years of corporate growth in many countries was confined to raising of funds. His role in the past used to confine to major episodic corporate events viz., promotion, reorganization, expansion, etc., when the financial manger was called upon to attend to such events that involved various sources of funds and financial instruments needed to raise the necessary funds. The important feature of traditional

role of financial manager is that he need not concern himself about the allocative decisions of firm's resources and he should raise needed funds from different sources. This traditional approach is described as an 'outsider looking in approach' and it is circumscribed to the episodic financing function, essentially revolving around different types of securities relating to the money and capital markets, mergers, promotion, and incorporation of companies. Further, the traditional approach has laid emphasis essentially on the long-term problems and ignored the importance of working capital management.

The traditional role of finance manger has been replaced by the new role in view of the new approach and focus to the subject of 'financial management' because of the dynamic changes in the external and internal environment of the business. The emphasis has been shifted from (i) episodic financing to the managerial financial problems and (ii) raising of funds to efficient allocation and use of funds based upon the conceptual and analytical theories. Thus, the new approach is an analytical way of looking into the financial problems of the enterprise and it is considered as a vital and integral part of the enterprise. The central issue of financial policy in the case of modern firms is the wiser allocation and use of funds broadly basing on the potential costs and benefits involved in different alternative sources of funds and different alternative applications of such funds. The financial manger in modern corporates should concern himself with the aspects relating to expansion of the enterprise, commitment of resources in both fixed assets and current assets and also with raising of resources required in the form of long term and short term liabilities. All these vital corporate decisions are concerned with raising of funds and application of the funds based on principles of sound profit planning and financial decisions consistent with the organizational goals and objectives.

1.6 GOALS AND OBJECTIVES OF FINANCIAL MANAGEMENT

According to the modern approach to financial management, financial manager has to make fundamental managerial financial decisions in regard to (i) the source of funds (ii) the investment of the funds (iii) dividends payable to the shareholders. In other words, these managerial financial decisions are respectively called as Financing decision, Investment decision and Dividend decision. The Investment decision in turn may relate to long term decision and short term decision (for working capital). The long term investment decisions are called capital budgeting decisions while the short term decisions are called working capital decisions. Thus, the financial manager of a modern corporate enterprise has to take three important decisions relating to the raising of the funds, allocation and application of the funds and distribution of the profits.

Thus, while taking these decisions, what should be the objective criterion of the financial manager or firm. It is, sometimes, argued that the financial objective of the firm should be the maximization of the owners' economic welfare. Then the question is what are the operational criteria for maximization of owners' economic welfare. There are two operational criteria in this regard *viz.*, (i) Profit maximization and (ii) Wealth maximization. Let us now discuss these two operational criteria.

1.6.1 PROFIT MAXIMIZATION

The profit maximization approach suggests that while taking investment, financing and dividend decisions maximization of profits should be kept in view. This is based on the premise that profit is a test of economic efficiency and it is a measure of economic performance of a firm. Profit maximization criteria assumes the presence of perfect

competition in the market which is expected to ensure efficient allocation of resources and maximum social welfare.

Profit maximization as an objective of financial maximization is subject to criticism. The flaws in this criterion are: (i) Ambiguity (ii) Lack of Timing of benefits (iii) Lack of Quality of benefits, which are explained below.

i) Ambiguity: The term profit is a vague and ambiguous concept and it may be short term profit or long term profit: it can be total profit or rate of profit: it can be return on total capital employed or return on shareholders' total equity. Further, it may be before tax profit or after tax profit. Thus, there are diverse measures of 'profit'. Further the concept of profits is an accounting concept and it is influenced by the accounting conventions, assumptions and personal judgements of accountants

ii) Timing of benefits: Another flaw of profit maximization objective is that it ignores the differences in the time pattern of benefits arising from investments of the firm. Decisions are based on the principle 'bigger the better' and total benefits rather than the timing of such returns. Thus, the concept of time value of money is ignored by the profit maximization objective.

Let us assume that there are two alternative project proposals viz., X and Y involving the same amount of investment. The profit during the three year life of the project are shown below:

Alternative Project Proposals

	(Rs. in lakhs)	
	Profit X	Profit Y
1 year	20	Nil
2 year	20	20
3 year	20	40
	60	60

As both the projects are yielding same profits over the three years, both the alternatives would be ranked equally. But, the returns from two alternatives differ in one respect. While the returns from the X alternative are uniform in all the three years, the returns from the alternative Y are nil in the first year and more in the third year. Alternative Y is riskier than alternative X. The timing of the returns is ignored by the objective of profit maximization.

iii) Quality of Benefits: Profit maximization also ignores the quality of benefits associated with a given course of action. The term quality of benefits refers to the degree of certainty of such benefits: the more certain the returns are the higher is the quality of the benefits; poor quality benefits mean uncertain and risky returns to the investors.

Thus, profit maximization as an operational criterion does not take relative quality of benefits and it does not take into account the degree of certainty in a course of action except considering only the size of the total benefits. The following table illustrates this point.

Alternative Project Proposals

State of Economy	Profit (in Rs. lakhs)	
	Alternative X	Alternative Y
Recession	18	0
Normal	20	20
Boom	22	40
	60	60

It is clear from the above table that the total profits associated with the two alternatives are identical in a normal situation. But, the range of variation is very wide in the case of alternative Y as compared to that of alternative X. Hence, alternative Y is preferable to alternative X assuming that the firm is risk averse. But, the criterion of profit maximization does not recognize this difference in the alternative and it fails to reveal the quality of benefits flowing from the alternative courses of action.

The objective of profit maximization is subject to criticism for lack of clarity in regard to the concept of the term profits. Whether 'profits after the taxes' or 'earnings per share' should be taken as the goal of a firm is subject to argument. Further, the profit maximization objective is also subject to the criticism because of the possible accounting manipulations, particularly relating to depreciation, creation of reserves and valuation of assets. As stated earlier, it does not take into account the risk and uncertainty in the profit nor does it take into account the concept of time value of money. Hence, profit maximization objective cannot be taken as the rational criteria or objective underlying financial management and profit maximization need not necessarily result in the maximization of owners' economic welfare. Hence, it is suggested that the wealth maximization criteria should be taken as the basis for taking the managerial decisions which is expected to increase the shareholders/owners' economic welfare.

1.6.2 WEALTH MAXIMIZATION

Wealth maximization means maximizing the 'net present' value (or wealth of a course of action). The net present value of a course of action is nothing but the difference between the gross present value of the benefits of that course of action and the amount of investment required to achieve such benefits. The gross present value of a course of action is found out by discounting or capitalizing the benefits arising from such course of action at a discount rate which reflects their timing and uncertainty. Thus, a financial course of action which has a positive net present value is expected to create wealth and such action only should be taken up for implementation. On the other hand, a financial action which results in zero or negative net present value should be rejected. Thus, when the managerial financial decisions, in particular, investment decisions are taken in such a way that they result in positive net present value. Such decisions are expected to maximize the economic welfare of the share holders. Thus, wealth maximization instead of profit maximization should be considered as an operational criterion for the managerial financial decisions. This is the objective of modern corporate enterprises. The wealth or the net present value is obtained by the following formula.

$$\text{Net Present Value or Wealth} = \sum_{t=1}^n \frac{A_t}{(1+K)^t} - C$$

The formula can also be written as

$$\text{NPV or Wealth} = \frac{A_1}{(1+k)} + \frac{A_2}{(1+k)^2} + \frac{A_n}{(1+k)^n} - C$$

Where A_1 , A_2 represent the stream of benefits expected to occur if a course of action is taken, C is the outlay or the cost of that course of action, k is the appropriate discount rate to measure the quality of A 's. ' k ' reflects both timing and risk of benefits.

Wealth Maximization benefits the suppliers of capital, Labour, Society and Management. The Wealth maximization objective is consistent with the objective for maximizing the owners' economic welfare. Apart from this, the wealth maximization objective is also consistent with the interest of (i) Suppliers of loan capital (ii) Labor or Employees (iii) Society and (iv) Management.

Let us have an idea of how the interests of all these stakeholders are served. Suppliers of loan capital include trade creditors, debenture holders, banks and financial institutions. These parties are entitled to a fixed rate of interest on the capital provided by them and they would have prior claim on the company's earnings and they are entitled to a fixed rate of interest. The payment of such interest charges is a legal obligation. If a company pursues, the policy of maximizing the wealth of shareholders who get residual earnings, the relative position of the suppliers of the loan capital is much safer.

The corporate policy of wealth maximization implies maximization of corporate efficiency which is directly related to the enhancement of labour productivity. Therefore, the company would undertake various methods that are expected to improve the labour productivity and the rewards to labour also would be commensurate with its efficiency. Ultimately, this objective would result in reduction of labour cost and maximization of the both monetary and non-monetary benefits to the labour.

The society as a whole would be benefited by the objective of wealth maximization because the society's resources are optimally allocated and utilized leading to optimal capital formation and growth in the economy. Wealth as defined earlier is the difference between the gross present values of the benefits and costs and it is regarded as a measure of efficiency. It takes into account the timing of the returns and also the risk involved in the investment or the course of action. The savers would allocate their savings to those companies which are expected to undertake investments on projects that are consistent with the objective of increase in the net present value in other words 'wealth'. It therefore, implies that wealth optimization reflects the most efficient allocation and use of the assets and use of the economic resources in the society.

Wealth maximization objective is also consistent with the interests of management. The management can survive in the long run only when it is successful and efficient and it will be successful only when it manages efficiently the resources of the company and creates wealth. This process simultaneously facilitates the satisfaction of the interests of the all the parties/stakeholders connected with the functioning of the company. Thus, the wealth maximization objective is in harmony with the interests of various groups i.e., owners, employees, society and management.

Activity – 3

How is wealth maximization objective in harmony with the interests of various groups.

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1.7 ORGANIZATION OF FINANCIAL MANAGEMENT FUNCTION

As the financial decisions are of vital importance to the firm, there should be efficient organization of finance function under the direct control of top management/ Board of Directors. The finance department may be headed by the Director (Finance) or the Chief Executive (Finance) who decides major financial policy matters. The routine activities are delegated to the lower levels of financial organizations. However, the exact nature of the organization differs from firm to firm depending upon the factors such as the size of the firm, nature of its business, kinds of financing operations, etc. Under the Director (Finance), two more officers designated as 'Treasurer' and 'Controller of Finance' may be appointed. The tasks of financial management and capital budgeting are distributed between these principal financial officers. The functions of the treasurer are listed below.

- i) Obtaining Finance
- ii) Banking relationship
- iii) Investor relationship
- iv) Short-term financing
- v) Cash management
- vi) Credit administration
- vii) Investments
- viii) Insurance

The functions of the controller are related mainly to accounting and control. The typical functions performed by him include:

- i) Financial accounting
- ii) Internal audit
- iii) Taxation
- iv) Management accounting and control
- v) Budgeting, planning and control
- vi) Economic appraisal and so on.

Figure 1.3 depicts the organizations of the financial management functions in a large enterprise.

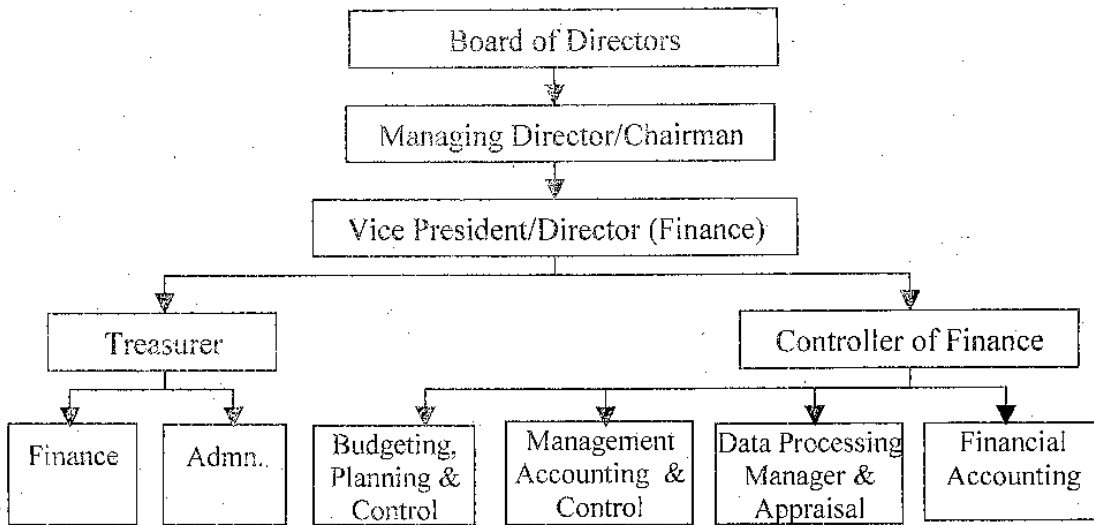


Figure 1.3: Organization of the Financial Management

1.8 SUMMARY

Financial Management is that managerial activity which is concerned with the planning and control of the firm's resources. The three important activities of the firm are finance, production and marketing. The firm raises capital for the purpose of investment in diverse ways. The scope of finance function or financial management is not confined only to finance but there is relationship with other functions like production and marketing. The finance functions are broadly studied under two types i.e., managerial finance function and routine finance function. The managerial financial function is concerned with investment decision, financing decision and dividend decision, while the routine finance function is related to maintenance of accounts and other records and safeguarding the securities of the firm.

The traditional role of a financial manager is concerned with the raising of funds in the context of major episodic events like mergers, consolidations, reorganizations and recapitalization, etc. The traditional role of a financial manager is not concerned with the decisions pertaining to allocation of firm's funds. The emphasis of traditional approach is on raising of funds i.e., 'outsider looking in approach'. The traditional approach places emphasis on the long term problems and ignores the importance of working capital management. The new role of financial manager is concerned with efficient allocation and utilization of funds. The financial manager in his new role is a member of top management team taking decisions in regard to every aspect of corporate life such as How large an enterprise should be? How fast it should grow? In what form the firm should hold its assets (asset structure)? What should be the composition of capital and liabilities (capital structure)? Decisions in regard to these aspects involve the participation of the modern financial manager in a corporate.

In order to take the managerial financial decisions in regard to investment of funds, financing the investments and payment of dividends, what should be the operating criteria is the question. It is well recognized that the main objective of the firm should be maximization owners' economic welfare. For achieving this objective two criteria are proposed i.e., profit maximization and wealth maximization. As the concept of profits is vague, ignores the timing of returns, ignores the risk, it is not considered as a criterion for business decisions. The wealth maximization objective is considered as consistent with the objective of maximizing owners' economic welfare. The wealth maximization principle implies that the fundamental objective

of a firm should be to maximize the market value of its share. The wealth maximization objective subserves the interest of different stake holders of the firm. The interest of suppliers of loan capital, employees, society and management are served by the objective of wealth maximization. Wealth maximization concept takes into account the aspects of 'time value of money' and the 'risk and uncertainty' in the cashflows is taken care off.

The managerial finance decisions are investment decision, relating to capital budget and working capital management; financing decision and dividend decision. While taking these decisions risk return trade off is to be achieved so as to maximize the wealth of the shareholders and value of the firm.

The Financial Manger has also to take decisions regarding current assets management. He has to manage the current assets efficiently protecting the firm against the possible illiquidity and insolvency. Investment in current assets adversely affects the firm's profitability and liquidity and hence there is a risk. Less investment in current assets would mean illiquidity, which may lead to insolvency. Hence, a balance is to be struck by making optimal investment in current assets.

1.9 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. What is finance function?
2. Explain the scope of finance function.
3. Distinguish between managerial finance function and routine finance function.
4. Explain the modern approach to financial management.
5. Describe the role of finance manager in a modern corporate enterprise.
6. distinguish between profit maximization and wealth maximization goals of financial management.
7. Explain how the financial management function is organized.

II. Long Answer Questions

1. Explain the scope of financial function in a modern corporate enterprise.
2. Distinguish between traditional finance functions and modern finance functions.
3. What is meant by wealth maximization and what are the merits of wealth maximization? Distinguish it from profit maximization.
4. Describe important managerial financial decisions?
5. Explain how a trade off is achieved between risk and return while taking financial decisions.

1.10 FURTHER READINGS

1. M.Y.Khan & P.K.Jain : Financial Management, Text and Problems, Tata McGraw-Hill Publishing Company Limited, New Delhi.

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2. I.M.Pandey : **Financial Management**, Vikas Publishing House Pvt. Ltd., New Delhi.
3. Prasanna Chandra : **Financial Management**
-

1.11 KEY WORDS

- Capital Budgeting** : The process of long range planning relating to adding or disposing fixed assets whose returns are expected to extend beyond one year.
- Wealth Maximization** : Maximizing the net present value of the firm while taking financial decisions.
Net Present Value = Gross present value – Initial outlay
- Investment Decision** : Decision pertaining to investment of available funds between fixed assets and current assets.
- Financing Decision** : Decision relating to raising of funds from different sources for implementing the projects. It influences the composition of debt equity in the capital structure.
- Dividend Decision** : Decision pertaining to payout ratio which means how much amount of earnings should be distributed as dividend and how much should be kept as retained earnings.

UNIT – 2 : TIME VALUE OF MONEY

Objectives

The objectives of this Unit are to:

- explain the significance of time value of money in managerial financial decision making;
- understand the concept of time value of money;
- learn the concepts of simple interest and compound value of a lumpsum and compound value of an annuity in the context of investment decisions;
- understand the concept of present value of future returns; and
- discuss the concept of present value of annuity to be received in future periods.

Structure

- 2.0 Introduction
- 2.1 Time Preference for Money
- 2.2 Time Preference Rate-Simple Interest
- 2.3 Compound Value (Future Value)
- 2.4 Compound Value of a Lumpsum
- 2.5 Compound Value of an Annuity
- 2.6 Present (or) Discounted Value
- 2.7 Present Value of a Lumpsum
- 2.8 Present Value of an Annuity
- 2.9 Illustrations
- 2.10 Summary
- 2.11 Self Assessment Questions
- 2.12 Further Readings
- 2.13 Key Words

2.0 INTRODUCTION

A firm has to commit the funds in anticipation of the expected benefits in the future. Particularly in regard to capital budgeting decisions, the firm is committing current liquid funds for expansion, modernization, replacement and acquisition of assets in anticipation of benefits in future. All these financial decisions affect firm's cash flows. For example, if an asset is purchased, it would involve an immediate cash outlay (cash outflow) and it will generate a series cash inflows during many years in future. Similarly, if the firm borrows funds from a bank or public financial institution, it receives cash now and it is committing itself to pay interest and repay principal amount in future periods. In other words, the firm's financial decisions involve immediate outflows or inflows of funds against which the inflows or outflows will be occurring at different points of time in future. In order that the firm should take decision regarding the worthwhile and financial feasibility of the projects, both cash

inflows and outflows should be compared. But they are occurring at different points of time. Hence, sound financial decision making requires that the cash inflows and outflows occurring at different points of time should be logically comparable. Absolute cash flows which occur at different points of time are not directly comparable. These cash flows are differing in terms of timing and risk. Hence, we have to adjust for their differences in timing and risk for the purpose of achieving their comparability. The recognition of the concept of 'time value and money' is very important in financial decision making so as to achieve the object of maximization of owners' welfare. As stated, in the previous lesson, the welfare of the owners would be maximized when the net present value is created by taking financial decisions. Calculation of net present value involves discounting the cash inflows generated by a project with an appropriate discount rate relevant to the timing and risks involved in such projects.

2.1 TIME PREFERENCE FOR MONEY

It is a matter of common understanding that a rational individual would not value the opportunity to receive some amount of money today as equivalent to the same amount of money in future. Most people value the opportunity to receive money now higher than an equal amount to be received in future. This tendency is referred to as individual's 'time preference for money'. Thus, an individual's preference for possession of a given amount of cash now rather than same amount at a future date is called 'time preference for money'.

We can attribute this phenomenon to three reasons. **Firstly**, we are living in uncertain world and we are not sure of future cash receipts because everything associated with future is subject to uncertainty. Hence, we would like to prefer receiving cash now rather than future. **Secondly**, we give preference to present consumption over future consumption of goods and services because of the inherent risk of being not able to enjoy future consumption. This is due to illness or death that is associated with the future. Hence, individuals acquire goods and services and prefer present consumption to future consumption. **Thirdly**, we prefer present cash to future cash because of the availability of investment opportunities. For example, if an individual is given a choice of having Rs.100/- now or Rs.100/- one year from now, he would prefer to have Rs.100/- now because he could earn some amount of interest say Rs.6/- by depositing that amount in a bank. His total cash after one year will be Rs.106/-. Thus, he wants to maximize his wealth by availing the opportunity to earn interest on the present cash inflow.

Activity – I

What is time preference for money?

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2.2 TIME PREFERENCE RATE-SIMPLE INTEREST

The time preference for money is expressed by an interest rate and it can also be called as the 'time preference' rate or the discount rate. For instance, if an individual's time preference rate is 10%, it means that he can forego the opportunity of receiving Rs.100/- now, if he is offered Rs.110/- now that means Rs.100/- at present is equal to Rs.110/- after one year. This is because, he will be earning interest of Rs.10/- on Rs.100/- in a year. Hence, the individual is said to be indifferent between Rs.100/- now and Rs.110/- a year from now. The

time preference rate of individuals need not be the same and hence it is considered as subjective. Another individual may be indifferent between Rs.100/- offered now and Rs.115/- offered after one year implying that his time preference rate is 15%. Like individuals, firms have also time preference rate or discount rate which they use for evaluating alternative financial decisions.

2.3 COMPOUND VALUE (FUTURE VALUE)

When investment decisions involve more than one year, we have to extend the logic explained above. Let us assume that an investor requires 10% interest rate to make him indifferent to cash flows beyond 2,3 or any number of years from now. Assuming that individual's time preference rate is 10%, he would like to receive on the principal amount of one rupee at least Rs.1.10/- after one year or a total of 110% of the original outlay of one rupee today. Thus, he would be receiving Rs.1.10/- at the end of the first year in exchange for his principal amount of Rs.1/-. If the total amount so received (Rs.1.10/-) after one year is reinvested, the investor would expect 110% of that amount or Rs.1.21/- i.e., (Rs.1 x 110 x 1.10) at the end of second year. In other words he would be getting interest at 10% on the compound amount available at the end of the first year i.e., Re.1. Thus at the end of second year, he must have received Rs.1.21/- which when invested at 10% interest would work out Rs.1.33/- Thus, the interest that is paid on the principal as well as on the interest earned but not withdrawn during earlier periods is called compound interest. The process of finding the future value of a payment or receipt is known as compounding.

Activity – II

Explaining the concept of compounding?

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2.4 COMPOUND VALUE OF A LUMP SUM

Let 'i' represent interest rate per period, 'n' the number of periods, and 'F' the future payoff, or compound value. If the present amount P is invested at i, rate of interest for one year, then the future value F_1 (viz., principal **plus** interest) at the end of one year, will be:

$$F_1 = P(1+i)^1$$

The outstanding amount at the beginning of second year is: $F_1 = P(1+i)$. The compound sum at the end of second year will be:

$$F_2 = P(1+i)^2$$

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

$$F_n = P(1+i)^n \quad - \quad (\text{Eq.2.1})$$

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.

To take an example, let us assume that an amount of Rs.1,000 is deposited and placed in the savings account of a bank at 5 per cent interest rate. It will grow to Rs.1,050 at the end of one year, since $F_1 = \text{Rs.}1,000(1 + 0.05) = \text{Rs.}1,050$. It may be noticed that the outstanding sum of Rs.1,050 by the end of the first year, will earn an interest of Rs.52.50, thus making the outstanding amount equal to Rs.1,102.50 at the end of second year.

$$\begin{aligned} F_2 &= F_1(1 + i) \\ &= \text{Rs.}1,050(1 + 0.05) \\ &= \text{Rs.}1,102.50 \end{aligned}$$

$$\begin{aligned} F_3 &= F_2(1 + i) \\ &= 1,102.50(1 + 0.05) \\ &= \text{Rs.}1,157.60 \end{aligned}$$

Thus, the compound value at the end of third year will grow to: $F_3 = \text{Rs.}1,157.60$. We can see from Table-A that the compound value factor for a lump sum of one rupee (CVF) at 5 per cent for one year is 1.05, for two years it is 1.1025 and for three years it is 1.1576. We can also get the same values by applying the equation directly:

$$F_n = P(1 + i)^n \quad \text{-(Eq.2.2)}$$

$$\text{Compound sum at the end of first year} = F_1 = 1,000(1 + 0.05) = 1050$$

$$\text{Compound sum at the end of second year} = 1,000(1 + 0.05)^2 = \text{Rs.}1,102.50$$

$$\text{Compound sum at the end of third year} = 1,000(1 + 0.05)^3 = 1,157.60$$

The compound value can be computed for any lumpsum amount at i rate of interest for n years employing Equation-2.2 (given above). But, the calculation of a compound value is very difficult if the amount is invested for a very long period say 20 years. However, in order to overcome the computational problems, the compound value of one rupee for various periods of time at different rates of interest is available. Table A appended at the end of the course material would show the compound values. To compute the future value of a lumpsum, we have to simply multiply the lumpsum by the compounding amount value factor (CVF) for a given ' i ' and ' n ' from the Table A.

Let us illustrate the use of Table-A. If we deposit Rs.50,000 in a bank which is paying 10% rate of interest in 10 year time deposit, the amount that would grow at the end of 10 years can be ascertained with the help of Table-A. First, find out the compound value factor at 10% for 10 years (from Table-A) and the factor is 2.594. This factor from Table-A is obtained by reading ten year period row and 10% column. Multiplying 2.594 factor by Rs.50,000, we get Rs.1,29,700 as the compound value of Rs.50,000 at 10% for 10 years. Thus, for computing future value of lumpsum with the help of Table-A, we can apply the following formula. $FV = P(CVF_{n,i})$ where FV is the future or compound value, p is principal amount and $CVF_{n,i}$ is the compound value factor where subscript ' n ' refers to periods and ' i ' rate of interest. Thus in our example, the future value is:

$$\begin{aligned}
 \text{FV} &= \text{Rs.}50,000 (\text{CVF}_{10,10}) \\
 &= \text{Rs.}50,000 \times 2.594 = \text{Rs.}1,29,700
 \end{aligned}$$

2.5 COMPOUND VALUE OF AN ANNUITY

An annuity may be explained as a fixed payment or receipt each year for a specified number of years. For example, if you take a house or flat on rent, and promise to make a series of uniform fixed payments over an agreed period, you are committed for annuity payments. If you take housing loan, you are committed to make equal installments towards the loan repayment. The compound value of an annuity cannot be computed directly from Equation-2.1. Let us illustrate the computation of the compound value of an annuity. Suppose, a constant sum of Re.1 is deposited in a savings bank at the end of the each year for five years at 6% interest. This implies that Re.1 deposited at the end of the first year will grow for four years, Re.1 at the end of the second year will grow for three years, Re.1 at the end of third year will grow for two years and Re.1 at the end of 4th year will grow for 1 year and the Re.1 at the end of 5th year will not yield any interest. Using the concept of compounding value of a lumpsum, we can compute the value of annuity. Thus the, compound value of Re.1 deposited in the first year will be: $\text{Re.}1 (1+0.06)^4 = \text{Rs.}1.262$, that of Re.1 deposited in the second year will be: $\text{Re.}1 (1+0.06)^3 = \text{Rs.}1.191$ and Re.1 deposited at the end of third year will grow to $\text{Re.}1 (1+0.06)^2 = \text{Rs.}1.124$ and Re.1 deposited at the end of fourth year will grow to $\text{Re.}1 (1+0.06)^1 = 1.060$. Re.1 deposited at the end of the fifth year will not yield any interest. The aggregate compound value of Re.1 deposited at the end of every year for five years would be:

$$\text{Rs.}1.262 + \text{Rs.}1.191 + \text{Rs.}1.060 + \text{Rs.}1.000 = \text{Rs.}5.637$$

The graphic presentation of the compound values of an annuity of Re.1 at 6% rate of interest is shown in fig.1. It can be seen that for a given interest rate, the compound value increases over a period.

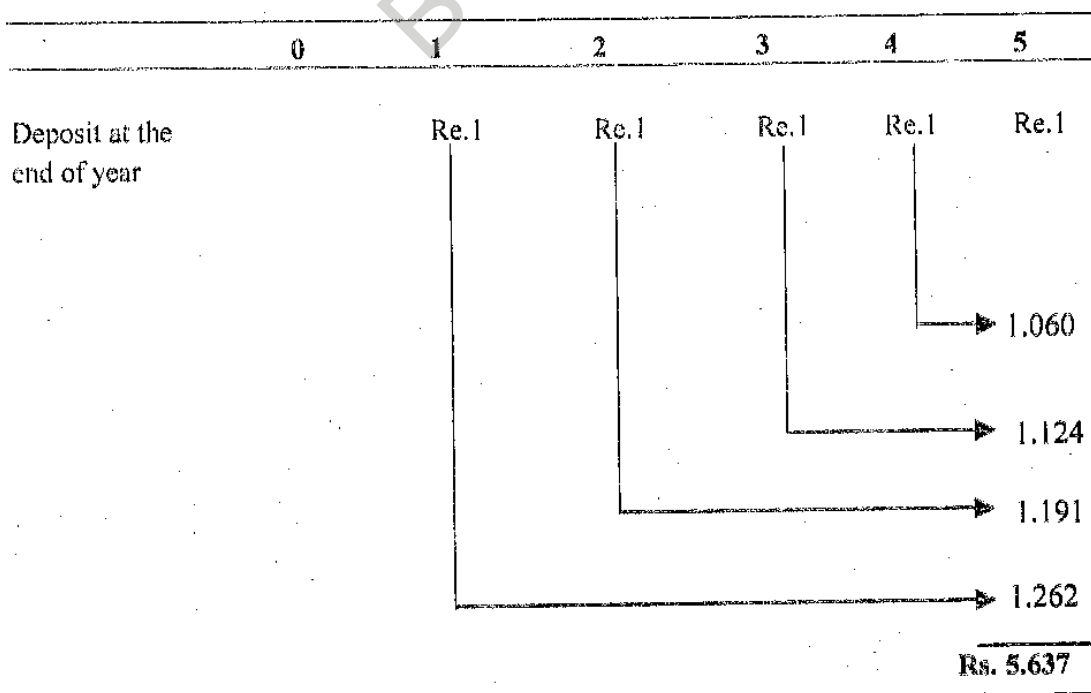


Figure 2.1: Graphic Representation of Compound Value of an Annuity of Re.1

The computations shown in Fig. 2.1 can be expressed as follows:

$$F_5 = A(1+i)^4 + A(1+i)^3 + A(1+i)^2 + A(1+i) + A \quad (\text{Eq.2.3.})$$

$$F_5 = A \left[(1+i)^4 + (1+i)^3 + (1+i)^2 + (1+i) + 1 \right] \quad (\text{Eq.2.4.})$$

Where A is the annuity.

We can extend the above Equation for 'n' periods and rewrite it as follows:

$$F_n = \left[A \frac{(1+i)^n - 1}{i} \right] \quad (\text{Eq.2.5.})$$

Where A is the constant periodic flow of cash (annuity) and the term within brackets is the compound value factor for an annuity of Re.1, which we shall be referred to as CFAF.

For example, if an amount of Rs.100 is deposited at the end of each of the next three years at 10 per cent interest rate, its compound value employing Equation (3) is:

$$\begin{aligned} F_n &= \text{Rs.100} \left[\frac{(1.10)^3 - 1}{0.10} \right] \\ &= \text{Rs.100} \times 3.31 \\ &= \text{Rs.331} \end{aligned}$$

It would be quite difficult to solve Equation (3) if n is very large. Our calculations are facilitated by pre-calculated compound values of annuity of Re.1 as given in Table B at the back of this book. This table is constructed under the assumption that the funds are deposited at the end of a period. The **compound value factor of an annuity (CFAF)** should be ascertained from the table to find out the future value of the annuity.

Let us assume that a firm deposits Rs.10,000 at the end of each year for five years at 10% rate of interest. How much would this annuity accumulate to at the end of fifth year? From Table-B we find that fifth row and 10 per cent column gives us a CFAF of 6.105. If we multiply 6.105 by Rs.10,000, we obtain a compound value of Rs.61,050

We can also write the equation as under:

$$FV = A (CFAF_{5,10})$$

Where $CFAF_{n,i}$ is the compound value factor of an annuity for n periods at i rate of interest. Applying the formula and using Table-B, we get:

$$\begin{aligned} FV &= 10,000 (CFAF_{5,10}) \\ &= 10,000 \times 6.105 = \text{Rs.61,050} \end{aligned}$$

2.6 PRESENT (OR) DISCOUNTED VALUE

We have just seen in the foregoing analysis how any amount of present cash transforms into an amount of cash of equivalent value to be received at the end of any number of future periods. This increases our analytical power to compare cash inflows and outflows that are separated by more than one period for the given time preference rate. Similarly, in a reverse direction, we can work out the present value of future cash flows. The present value of a future cash flow (future cash inflow or outflow) is the amount of current cash of equivalent desirability to the decision maker to a specified amount of cash to be received or paid at a future date. We can work out present value of a lumpsum and present value of annuity in the later part of the present unit.

Activity –III

Explain the concepts of discounted value?

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2.7 PRESENT VALUE OF A LUMP SUM

We arrived at a conclusion earlier that an investor with a time preference rate or discount rate 'i' would remain indifferent between Re.1 now, and $(1 + i)$ one year from now, or $(1 + i)^2$ after two years, $(1 + i)^3$ after three years, $(1 + i)^n$ after 'n' years. We can now raise some related questions: How much would the investor give up now to get an amount of Re 1 at the end of one year, two years, or three years? Assuming a 10 per cent time preference rate, we know that amount sacrificed in the beginning of a year will grow to $F_1 = P (1+.10)$ after a year. If the amount grows to $F_1 = \text{Re } 1$ after a year at 10 per cent, we can easily find out the amount to be deposited and sacrificed in the beginning as follows.

$$F_1 = P(1 + i)$$

$$P = \frac{F_1}{(1 + i)}$$

$$P = \frac{\text{Re.1}}{1.10} = \text{Re. } 0.909$$

It implies that if the time preference rate is 10 per cent, the present value of Re 1 to be received after one year is equivalent to Re.0.909. In other words, at a 10 per cent time preference rate, Re 1 to be received after a year is 110 per cent of Re 0.909 sacrificed now. This can also be interpreted to mean: Re.0.909 deposited now will grow to Re.1 after one year.

Similarly, Rs.1 inflow at the end of two years can also be worked out easily. An amount of P deposited now would grow to $F_2 = P (1 + i)^2$ after two years. Therefore, if F_2 expected to be received after two years is Re.1, the following amount should be deposited now:

$$P = \frac{F_2}{(1+i)^2} = \frac{\text{Re.1.00}}{(1+0.10)^2} = 0.826$$

Re.0.826 is the present value of Re.1 at 10 per cent interest rate to be received after two years at 10 per cent discount rate. In other words, if Re.0.826 is deposited for two years at an interest rate of 10%, the total amount that we get at the end of second year is Re.1. The investor would be indifferent between Re.1 after 2 years and Re.0.826 now. At 10 per cent interest rate, Re.0.826 now will grow to Re.1 after two years.

Similarly, the present value of Re.1 to be received after three years will be:

$$P = \frac{F_3}{(1+i)^3} = \frac{\text{Re. 1.00}}{(1+0.10)^3} = 0.751$$

The present values can be worked out for any number of years and for any interest rate. The following formula can be employed to calculate the present value of a lump sum to be received after some future periods:

$$P = \frac{F_n}{(1+i)^n}$$

The term in brackets is the 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.

When we want to know the present value of some amount, we need not make the complicated calculations. We can refer to Table C given at the end of the material which gives the present value of Re.1 received (or paid) after 'n' periods at 'i' rate of interest. To find out the present value of a future amount, we have simply to find out the Present Value Factor (PVF) from the Table and multiply it by the amount. Suppose that an investor wants to find out the present value of Rs.50,000 to be received after 10 years. His interest rate is 10 per cent. First we will find out the present value factor from Table-C. When we read row 10 and 10 per cent column, we get 0.386 as the present value factor. Multiplying 0.386 by Rs.50,000, we obtain Rs.19,300 as the present value. We can also write:

$$PV = F_n (PVF_{n,i})$$

Where, $PVF_{n,i}$ is the present value factor for n periods at i rate of interest, applying the formula and using Table C, we get:

$$\begin{aligned} PV &= \text{Rs.50,000} (PVF_{10,10}) \\ &= \text{Rs.50,000} \times 0.386 = \text{Rs.19,300} \end{aligned}$$

2.8 PRESENT VALUE OF AN ANNUITY

An investor may have an opportunity to receive a fixed periodic amount otherwise called as an 'annuity', for some number of years. The present value of such an annuity can be found out by adding or aggregating all the present values of cash inflows received in different

years. For example, an investor has time preference rate 10% and has an opportunity to receive an annuity of Re.1 for five years. **The present value of Re.1 received**

- after one year is: $P=1/(1+0.10)=\text{Re.}0.909,$
- after two years is, $P=1/(1+0.10)^2=\text{Re.}0.826,$
- after three years is, $P=1/(1+0.10)^3=\text{Re.}0.751,$
- after four years is, $P=1/(1+0.10)^4=\text{Re.}0.683,$ and
- after five years is $P=1/(1+0.10)^5=\text{Re.}0.621.$

Thus the total present value of annuity of Re.1 for five years discounted at 10% is:

$$P = \frac{1}{(1+0.10)} + \frac{1}{(1+0.10)^2} + \frac{1}{(1+0.10)^3} + \frac{1}{(1+0.10)^4} + \frac{1}{(1+0.10)^5}$$

$$= \text{Re } 0.909 + 0.826 + 0.751 + 0.683 + 0.621 = \text{Rs. } 3.791$$

The present value of an annuity of Re.1 for five years at 10 per cent discount, interest rate is Rs.3.791. Notice that the present value factors of Re.1 after one, two, three and four years and so on can be ascertained from Table C, and when they are aggregated we obtain the present value of an annuity. The present value of an annuity of Re.1 for five years at 10 per cent interest rate is shown in Figure 2.2. The general form of present value of an annuity can be written as:

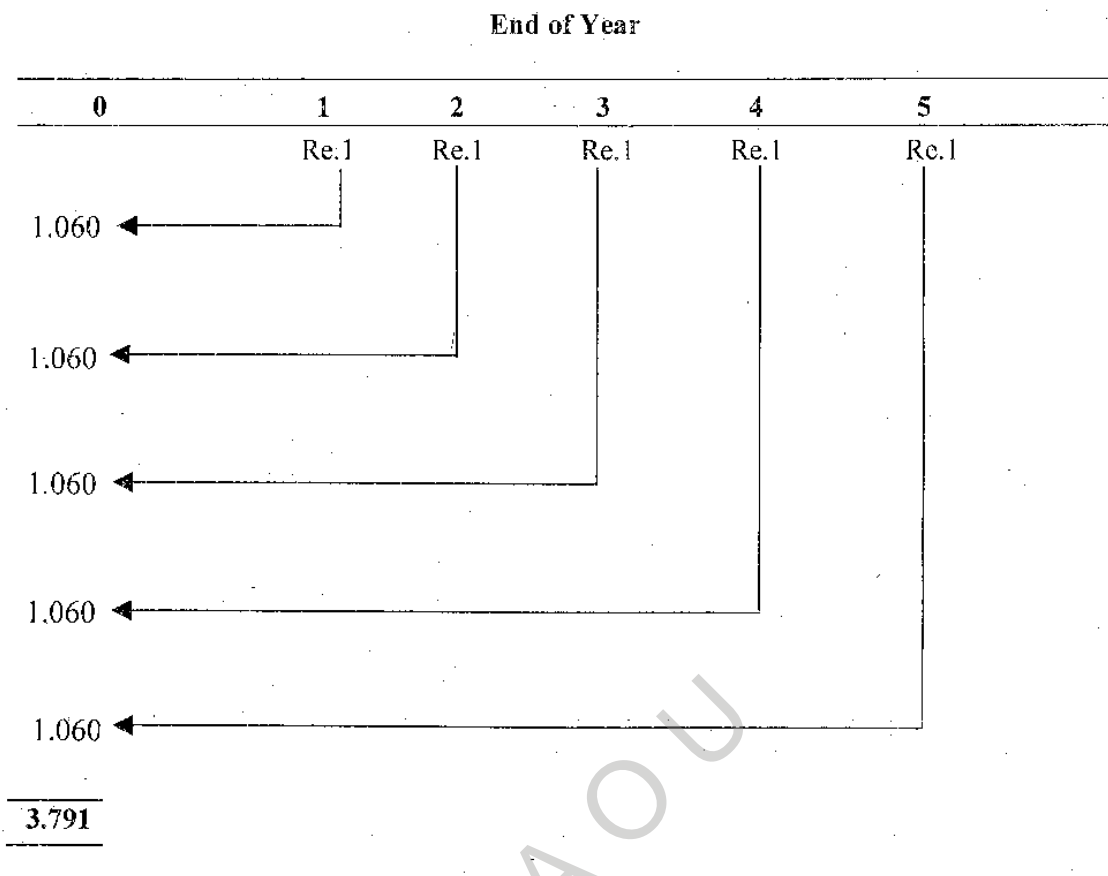
$$P = \frac{A}{(1+i)} + \frac{A}{(1+i)^2} + \frac{A}{(1+i)^3} + \dots + \frac{A}{(1+i)^n}$$

where A is a payment (or receipt) each year. Above equation can be solved and expressed as follows:

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

The term in brackets is the Present Value Factor for an Annuity (PVAF) of one rupee.

Figure 2.2: Graphic Representation of Present Value of an Annuity of Re.1 at 10%



To illustrate, let us assume that a person receives an annuity Rs.10,000 for five years. If the rate of discount is 10% the present value of 10,000 annuity is:

$$P = 10,000 \left[1 - \frac{1}{(1+0.10)^5} \right]$$

$$= 10,000 \times 3.791 = \text{Rs.}37,910.00$$

Similarly, if a person receives an annuity of Rs.5,000 for 5 years, the present value discounted at 12% is:

$$P = 5,000 \left[1 - \frac{1}{(1+0.12)^5} \right]$$

$$= 5,000 \times 3.605 = \text{Rs.}18,025.00$$

As it is tedious to calculate present value of annuity for longer period, we can find out such values with the help of Table-D i.e., Present Value of Annuity of One Rupee given at the end of the present material. To compute the present value of annuity of Rs.10,000 for five years at 10% rate of interest, we should simply find out the appropriate factor from Table-D

and multiply by the annuity value. In our example, the value of 3.791 solved using the equation could be taken directly from Table-D. Reading from the fifth row and 10% column, the present value of annuity factor $PVAF_{5,10}$ is 3.791. We can write the above calculation as shown below:

$$\text{Present Value of Annuity} = A (PVAF_{n,i})$$

When $PVAF_{n,i}$ is present value factor of an annuity of Re.1 for n periods n at i rate of interest, applying the formula and using Table-D we get

$$= \text{Rs.}10,000 (PVAF_{5,10})$$

$$= \text{Rs.}10,000 \times 3.791 = \text{Rs.}31,791$$

Similarly, it can be noted from Table-D that the present value factor for annuity of Re.1 for 5 year period at 12% rate of interest, $PVAF_{5,12} = 3.605$. Accordingly, the present value of annuity of 5,000 for five years at 12% (interest) discount rate is $= \text{Rs.}5,000 \times 3.605 = \text{Rs.}18,025.00$.

2.9 ILLUSTRATIONS

1. 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.

Solution

Table C will be used to compute the present value.

- 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:

$$\text{Rs.}600 \times .952 = \text{Rs.}571.20.$$

- b) The present factor at 5 per cent at the end of five year is: 0.784. Therefore, present value of Rs.600 will be: $\text{Rs.}600 \times .784 = \text{Rs.}470.40$.

- 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: $\text{Rs.}600 \times .481 = \text{Rs.}288.60$.

2. Determine the present value of Rs.700 each paid at the end of each of the next six years. Assume a 8 per cent rate of interest.

Solution

As the present value of annuity is Rs.700 has to be computed, Table D will be used. The present value factor of an annuity of Re.1 at 8 per cent for 6 years is 4.623. Therefore, the present value of annuity of Rs.700 will be: $4.623 \times \text{Rs.}700 = \text{Rs.}3,236.10$.

3. Assume 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 the through four years.

Solution

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

$$\begin{aligned} P &= \text{Rs. } 1,100 \times .909 + \text{Rs. } 900 \times .826 + \text{Rs. } 1,500 \times .751 + \text{Rs. } 700 \times .683 \\ &= \text{Rs. } 999.90 + \text{Rs. } 743.40 + \text{Rs. } 1,126.50 + \text{Rs. } 478.10 \\ &= \text{Rs. } 3,347.90. \end{aligned}$$

2.10 SUMMARY

The financial decisions such as acquisition of assets and procurement of funds affect the firm's cash flows occurring at different points of time. There are cash outflows and inflows in the case of capital expenditure decisions. Similarly if a firm borrows funds from banks and financial institutions or issues bonds, there would be cash inflows initially but it is also committing an obligation to pay interest periodically and return the capital amount at the end of the specified number of years. In all such decisions, cash inflows and outflows are occurring at different points of time. In order that a firm should take a right decision in regard to these decisions, the cash inflows and outflows should be logically comparable. The absolute cash flows which differ in timing and risk are not directly comparable. Hence, cash flows become logically comparable when they are discounted or adjusted with discounting rate. This approach is called recognition of 'the time value of money' and the concept of time value of money is very important in financial decision making. If the timing and risk of cash flows is not considered, the firm may make decisions inconsistent with the objective of maximization of owners' welfare. Individuals have preference for possession of a given amount of cash now rather than the same amount at a future time and it is 'called time preference money'. This time preference for money assumes importance because of (i) uncertain environment in which we live (ii) subjective preference for present consumption over future consumption (iii) individuals' preference to have present cash to future cash because of availability of the investment opportunities. Hence, the time preference for money is expressed by an interest rate. The interest rate or required rate of return from the investment would compensate the investor for both time and risk involved in cashflows.

The required rate of return = risk free rate + risk premium

If the investor's required rate of interest is 10%, he would be investing Rs.100/- at 10% rate of interest and at simple rate of interest the total amount that he is expected to get at the end of the year is Rs.110/-. This can be interpreted to mean that the individual is prepared to sacrifice Rs.100/- today for getting Rs.110/- after one year. In other words the value of Rs.110/- to be received at the end of one year is equal to Rs.100 now.

In case when the investor has an opportunity of investing a sum of money for a number of years at 10% compound rate of interest, the value of such compounded amount that can be obtained. Assuming the principal amount and interest accruing at the end of every year are further invested and it is not withdrawn during the earlier periods, this can be worked by the formula

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

Thus, the compound value of lumpsum amount can be found out. For example, a sum of Rs.100 deposited at compound rate of 10% for 5 years would give us

$$\text{Rs.}100(1 + 0.10)^5 = 100 \times 1.611 = \text{Rs.}161.1$$

When an investor deposits fixed sum of money say Rs.100 in his savings account at the end of each year for five years at compound interest rate of 10%, we can work out the compound value of annuity of Rs.100 by applying the formula:

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

$$= 100 \times 6.105 = \text{Rs.}610.50$$

The compounding technique explained above also helps us at translating any amount of present cash to an amount of cash of equivalent value to be received at the end of any number of future periods. The present value of future cash in flows or outflows can be worked out by using an appropriate discount rate. The present value of a future cash inflow or outflow is the amount of current cash that is equivalent desirability to a specified amount of cash to be received or paid at a future date. In this context, we can work out the present value of a lumpsum amount of Rs.1000 to be received at the end of one year at 10% discount rate. The present value is $\text{Rs.}1000/1.10 = \text{Rs.}909$. In other words, the present value of Rs.1000 to be received at the end of one year when discounted at 10% is equivalent to only Rs.909.

If an investor has an opportunity to receive constant periodic amount for certain number of years, we can work out the present value of such annuity. For example, if an investor has an opportunity to receive an annuity of Rs.100 for four years we can work out the present value of such an amount of Rs.100. The total present value of an annuity of Rs.100 for four years at 10% rate of (interest) discount works out to Rs.3,169.

Thus, we can incorporate the time preference for money in the financial decision making which involves cash inflows and outflows at different points of time. The computations in this regard are available readily in the Tables appended at the end of the book. Students are advised to work out simple exercises using the Tables as given at the end of the study material.

CONSULT

Table – A : Compound value of Re.1/-

Table – B : Compound Value of an annuity of Re.1 for N periods

Table – C : Present Value of Re. 1.

Table – D : Present Value of an annuity of Re.1

2.11 SELF ASSESSMENT QUESTIONS

A. Short Answer Questions

1. 'Individuals show a time preference for money'. Explain the statement.
2. Why is the consideration of time important in financial decision making?
3. What is meant by compound value of annuity?
4. Explain present value and future returns.

B. Long Answer Questions

1. Explain the mechanics of calculating the present value of cash flows.
2. Distinguish between present value of a lumpsum and future value of a lumpsum.
3. Distinguish between present value of annuity and compound value of an annuity.
4. Determine the future values utilising a time preference rate of 9 per cent
 - i) The future value of Rs.15,000 invested now for a period of four years.
 - ii) The future value at the end of five years of an investment of Rs.6,000 now and of an investment of Rs.6,000 one year from now.
 - iii) The future value at the end of eight years of an annual deposit of Rs.18,000 each year.
 - iv) The future value at the end of eight years of annual deposit of Rs.18,000 at the beginning of each year.
 - v) The future values at the end of eight years of a deposit of Rs.18,000 at the end of the first four years and a withdrawal of Rs.12,000 per year at the end of years five through seven.
5. Compute the present value of each of the following cash flows using a discount rate of 13 per cent.
 - i) Rs.2,000 cash outflow immediately.
 - ii) Rs.6,000 cash inflow one year from now.
 - iii) Rs.6,000 cash inflow two years from now.
 - iv) Rs.4,000 cash outflow three years from now.
 - v) Rs.7,000 cash inflow three years from now.
 - vi) Rs.3,000 cash inflow four years from now.
 - vii) Rs.4,000 cash inflow at the end of each of the next five years.
 - viii) Rs.4,000 cash inflow at the beginning of each of the next five years.

2.12 FURTHER READINGS

1. M.Y. Khan & P.K. Jain : **Financial Management, Text and Problems**, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. I.M. Pandey : **Financial Management**, Vikas Publishing House Pvt. Ltd., New Delhi.

3. P.V. Kulkarni : **Financial Management**, Himalaya Publishing House, Bombay.
4. Prasanna Chandra : **Financial Management**
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2.13 KEY WORDS

- Annuity** : A series of receipts or payments of a fixed amount for a specified number of years. Alternatively, pattern of cash flows that equal in each year. Equal annual cash flow.
- Discounting** : The process of finding the present value of a series of future cash flows. Also called present value analysis. Discounting is reverse of compounding.
- Discount Rate** : The rate used in the discounting process to determine present values of future benefits.
- Compounding** : The arithmetic process of determining the terminal value of a series of cash flows when the principle of compound interest is used.

TABLE A-Compound Value of Rs. 1

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%
1	1.010	1.030	1.040	1.050	1.060	1.080	1.090	1.100	1.120	1.140	1.150		
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145	1.166	1.186	1.210	1.254	1.300	1.322
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	1.405	1.482	1.521
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	1.574	1.689	1.749
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	1.762	1.925	2.011
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	1.975	2.195	2.313
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	2.211	2.502	2.660
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	2.476	2.853	3.059
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	2.773	3.252	3.518
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	3.106	3.707	4.046
11	1.116	1.243	1.384	1.539	1.710	1.898	2.104	2.332	2.580	2.853	3.479	4.226	4.652
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	3.896	4.818	5.350
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	4.363	5.492	6.153
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	4.887	6.261	7.076
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	5.474	7.138	8.137
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	6.130	8.137	9.358
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	6.86	9.276	10.761
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	7.690	10.575	12.375
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	8.613	12.056	14.232
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.728	9.646	13.743	16.367
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835	17.000	26.462	32.919
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449	29.960	50.940	66.212

Period	16%	18%	20%	24%	28%	32%	36%	40%	50%	60%	70%	80%	90%
1	1.160	1.180	1.200	1.240	1.280	1.320	1.360	1.400	1.500	1.600	1.700	1.800	1.900
2	1.346	1.392	1.440	1.538	1.638	1.742	1.850	1.960	2.250	2.560	2.890	3.240	3.640
3	1.561	1.643	1.728	1.907	2.067	2.300	2.515	2.744	3.375	4.096	4.913	5.832	6.859
4	1.811	1.939	2.074	2.364	2.684	3.036	3.421	3.842	5.062	6.544	8.352	10.498	13.032
5	2.100	2.288	2.488	2.932	3.436	4.097	4.653	5.378	7.594	10.486	14.199	18.896	24.761
6	2.436	2.700	2.986	3.635	4.398	5.290	6.328	7.530	11.391	16.777	24.138	34.012	47.046
7	2.826	3.185	3.583	4.508	5.629	6.983	8.605	10.541	17.086	26.844	41.034	61.222	89.387
8	3.278	3.759	4.300	5.590	7.206	9.217	11.703	14.758	25.629	42.950	69.758	110.200	169.836
9	3.803	4.435	5.160	6.931	9.223	12.166	15.917	20.661	38.443	68.720	118.588	198.359	322.688
10	4.411	5.234	6.192	8.594	11.806	16.060	21.647	28.925	57.665	109.951	201.599	347.047	613.107
11	5.117	6.176	7.430	10.657	15.112	21.199	29.439	40.496	86.498	175.922	342.719	642.684	1164.902
12	5.926	7.288	8.916	13.215	19.343	27.983	40.037	56.694	129.746	281.475	582.622	1156.831	2213.314
13	6.886	8.599	10.699	16.386	24.759	36.937	54.451	79.372	194.619	450.360	990.457	2082.295	4205.297
14	7.988	10.147	12.839	20.319	31.961	48.757	74.053	111.120	291.929	720.576	1683.777	3748.131	7990.065
15	9.266	11.974	15.407	25.196	40.565	64.359	100.712	155.568	437.894	1152.921	2862.421	6746.636	15181.122
16	10.748	14.129	18.488	31.243	51.923	84.954	136.97	217.795	656.84	1844.7	486.1	12144.	28844.0
17	12.468	16.672	22.186	38.741	66.461	112.14	186.28	304.914	985.26	2951.5	8272.4	21859.	54804.0
18	14.463	19.673	26.623	48.039	85.071	148.02	253.34	426.879	1477.9	4722.4	14063.0	39346.	104130.0
19	16.777	23.214	31.948	59.568	108.89	195.39	344.54	597.630	2216.8	7555.8	23907.0	70824.	197840.0
20	19.461	27.393	38.338	73.864	139.38	257.92	468.57	836.683	3325.3	12089.0	40642.0	127480.	375900.0
25	40.874	62.669	95.396	216.542	478.90	1033.6	2180.1	4499.880	25251.	126760.0	577060.0	2408900.	9307600.0
30	85.850	143.371	237.376	634.820	1645.5	4142.1	10134.	24201.432	191750.	1329200.	8193500.0	45517000.	23047000.0

TABLE B-Compound Value of Annuity of Re. 1 for N periods

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100	2.120	2.140
3	3.030	3.060	3.091	3.122	3.152	3.184	3.215	3.246	3.278	3.310	3.374	3.440
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641	4.770	4.921
5	5.101	5.204	5.309	5.416	5.526	5.737	5.751	5.867	5.985	6.105	6.353	6.610
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716	8.15	8.536
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487	10.089	10.730
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	1.436	12.300	13.233
9	9.369	9.755	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579	14.776	16.085
10	10.462	10.950	1.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937	17.549	19.337
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531	20.655	23.044
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384	24.133	27.271
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523	28.029	32.089
14	14.947	15.974	17.086	18.292	19.599	21.051	22.550	24.215	26.019	27.975	32.393	37.581
15	16.097	17.293	18.599	20.024	21.579	22.276	25.129	27.152	29.361	31.772	37.280	43.842
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950	42.753	50.980
17	18.430	20.012	21.762	23.698	25.840	28.213	30.840	33.750	36.974	40.545	48.884	59.118
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599	55.750	68.394
19	20.81	22.841	25.17	27.671	30.539	33.760	37.379	41.446	46.018	51.159	63.440	78.969
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275	72.052	91.025
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347	133.334	181.871
30	34.785	40.568	47.575	56.805	66.439	79.058	94.461	113.283	136.308	164.494	241.333	356.787

Period	16%	18%	20%	24%	28%	32%	35%	40%	50%	60%	70%	80%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.160	2.180	2.200	2.240	2.280	2.320	2.360	2.400	2.500	2.600	2.700	2.800
3	3.506	3.572	3.640	3.778	3.918	4.062	4.210	4.360	4.750	5.160	5.590	6.040
4	5.066	5.215	5.368	5.684	6.016	6.362	6.725	7.104	8.125	9.256	10.503	11.872
5	6.877	7.154	7.442	8.048	8.700	9.398	10.146	10.846	13.188	15.810	18.855	22.370
6	8.977	9.442	9.930	10.980	12.136	13.406	14.799	16.324	20.781	26.295	33.054	41.265
7	11.414	12.142	12.916	14.615	16.534	18.696	21.126	23.853	32.172	43.073	57.191	75.278
8	14.240	15.327	16.499	19.123	22.163	25.678	29.732	34.395	49.258	69.915	98.225	136.500
9	17.518	19.086	20.799	24.712	29.369	34.895	41.435	49.153	74.887	112.86	167.983	246.699
10	21.321	23.521	25.959	31.643	38.592	47.062	47.352	69.814	113.330	181.585	286.570	445.058
11	25.733	28.755	32.150	40.238	50.399	63.122	78.998	98.739	170.995	291.536	488.170	802.105
12	30.850	34.931	39.580	50.985	65.510	84.320	108.437	139.235	257.493	467.458	830.388	1444.788
13	36.786	42.219	48.497	64.110	84.853	112.303	148.475	195.929	387.239	748.933	1413.510	2601.619
14	43.672	50.818	59.196	80.496	109.612	149.240	202.926	275.300	581.859	1199.293	2403.968	4683.914
15	51.660	60.965	72.035	100.815	141.303	197.997	276.979	386.420	873.788	1919.869	4097.745	8432.045
16	60.925	72.939	87.442	126.011	181.87	262.36	377.69	541.99	1311.7	3072.8	6950.2	15179.0
17	71.673	87.068	105.931	157.253	233.79	347.31	514.6	759.78	1968.5	4917.5	11816.0	27323.0
18	84.141	103.740	128.17	195.994	300.23	459.45	700.94	1064.7	2953.8	7868.9	20089.0	49182.0
19	98.603	123.414	154.740	244.033	385.32	607.47	954.28	1491.6	4431.7	12591.0	34152.0	88528.0
20	115.380	146.628	186.688	303.601	494.21	802.86	1298.8	2089.2	6648.5	20147.0	58059.0	159350.0
25	249.214	342.603	471.981	898.092	1706.8	3226.8	6053.0	11247.0	50500.0	211270.0	824370.0	3011100.4
30	530.312	790.948	1181.882	2640.916	5873.2	129410	28172.0	60501.0	383500.0	2215400.0	11705000.0	56896000.0

TABLE C - Present Value of Re. 1

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%
1	.990	.980	.971	.962	.952	.943	.935	.926	.917	.909	.893	.877	.870
2	.920	.961	.943	.925	.907	.890	.873	.857	.842	.826	.797	.769	.756
3	.971	.942	.915	.889	.864	.840	.816	.794	.772	.751	.712	.675	.658
4	.961	.924	.889	.855	.823	.792	.763	.735	.708	.683	.636	.592	.572
5	.951	.906	.863	.822	.784	.747	.713	.681	.650	.621	.567	.519	.497
6	.942	.888	.838	.790	.746	.705	.66	.630	.596	.564	.507	.456	.432
7	.933	.871	.813	.760	.711	.665	.623	.583	.547	.513	.452	.400	.376
8	.923	.853	.789	.731	.677	.627	.582	.540	.502	.467	.404	.351	.327
9	.914	.837	.766	.703	.645	.592	.544	.500	.460	.424	.361	.308	.284
10	.905	.820	.744	.676	.614	.558	.508	.463	.422	.386	.322	.270	.247
11	.896	.804	.722	.650	.585	.527	.475	.429	.388	.350	.287	.237	.215
12	.887	.788	.701	.625	.557	.497	.444	.397	.356	.319	.257	.208	.187
13	.879	.773	.681	.601	.530	.469	.415	.368	.326	.290	.229	.182	.163
14	.870	.758	.661	.577	.505	.442	.388	.340	.299	.263	.205	.160	.141
15	.861	.743	.642	.555	.481	.417	.362	.315	.275	.239	.183	.140	.123
16	.853	.778	.623	.534	.458	.394	.339	.292	.252	.218	.163	.123	.107
17	.844	.714	.605	.513	.436	.371	.317	.270	.231	.198	.146	.108	.093
18	.836	.700	.587	.494	.416	.350	.296	.250	.212	.180	.130	.095	.081
19	.828	.686	.570	.475	.396	.331	.276	.232	.194	.164	.116	.083	.070
20	.820	.673	.554	.456	.377	.312	.258	.215	.178	.149	.104	.073	.061
25	.780	.610	.478	.375	.295	.233	.184	.146	.116	.092	.059	.038	.030
30	.742	.552	.412	.308	.231	.174	.131	.099	.075	.057	.033	.020	.015

Period	16%	18%	20%	24%	28%	32%	36%	40%	50%	60%	70%	80%	90%
1	.862	.847	.833	.806	.781	.758	.735	.714	.667	.625	.588	.556	.526
2	.743	.718	.694	.650	.610	.574	.541	.510	.444	.391	.346	.309	.277
3	.641	.609	.579	.524	.477	.435	.398	.364	.296	.244	.204	.171	.146
4	.552	.516	.482	.423	.373	.329	.292	.260	.198	.153	.120	.095	.077
5	.476	.437	.402	.341	.291	.250	.215	.186	.132	.095	.070	.053	.040
6	.410	.370	.335	.275	.227	.189	.158	.133	.088	.060	.041	.029	.021
7	.354	.314	.279	.222	.178	.143	.116	.095	.059	.037	.024	.016	.011
8	.305	.266	.233	.179	.139	.108	.085	.068	.039	.023	.014	.009	.006
9	.263	.226	.194	.144	.108	.082	.063	.048	.026	.015	.008	.005	.003
10	.227	.191	.162	.116	.085	.062	.046	.035	.017	.009	.005	.003	.002
11	.195	.162	.135	.094	.066	.047	.034	.025	.012	.006	.003	.002	.001
12	.168	.137	.112	.076	.052	.036	.025	.018	.008	.004	.002	.001	.001
13	.145	.116	.093	.061	.040	.027	.018	.013	.005	.002	.001	.001	.001
14	.125	.099	.078	.049	.032	.021	.014	.009	.003	.001	.001	.000	.000
15	.108	.084	.065	.040	.025	.016	.010	.006	.002	.001	.000	.000	.000
16	.093	.071	.054	.032	.019	.012	.007	.005	.002	.001	.000	.000	.000
17	.080	.060	.045	.026	.015	.009	.005	.003	.001	.000	.000	.000	.000
18	.069	.051	.038	.021	.012	.007	.004	.002	.000	.000	.000	.000	.000
19	.060	.043	.031	.017	.009	.005	.003	.002	.000	.000	.000	.000	.000
20	.051	.037	.026	.014	.007	.004	.002	.001	.000	.000	.000	.000	.000
25	.024	.016	.010	.005	.002	.001	.000	.000	.000	.000	.000	.000	.000
30	.012	.007	.004	.002	.001	.000	.000	.000	.000	.000	.000	.000	.000

TABLE D - Present Value an Annuity of Re. 1

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.793	5.601	5.417	5.242	5.076	4.917	4.766	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.785	7.435	7.108	6.802	6.515	6.247	6.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.060	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.312	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.128	8.514
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
30	25.808	22.397	19.600	17.292	15.373	13.765	12.409	11.258	10.274	9.427

Period	12%	14%	16%	18%	20%	24%	28%	32%	36%
1	0.893	0.877	0.862	0.847	0.833	0.806	0.781	0.758	0.735
2	1.690	1.647	1.605	1.566	1.528	1.457	1.392	1.332	1.276
3	2.402	2.322	2.246	2.174	2.106	1.981	1.868	1.766	1.674
4	3.037	2.914	2.798	2.690	2.589	2.404	2.241	2.096	1.966
5	3.605	3.433	3.274	3.127	2.991	2.745	2.532	2.345	2.181
6	4.111	3.889	3.685	3.498	3.326	3.020	2.759	2.534	2.339
7	4.564	4.288	4.039	3.812	3.605	3.242	2.937	2.678	2.455
8	4.968	4.639	4.344	4.078	3.837	3.421	3.076	2.786	2.540
9	5.328	4.946	4.607	4.303	4.031	3.566	3.184	2.868	2.603
10	5.650	5.216	4.833	4.494	4.193	3.682	3.269	2.930	2.650
11	5.938	5.453	5.029	4.656	4.327	3.776	3.335	2.978	2.683
12	6.194	5.660	5.197	4.793	4.439	3.851	3.387	3.013	2.708
13	6.424	5.842	5.342	4.910	4.533	3.912	3.427	3.040	2.727
14	6.628	6.002	5.468	5.008	4.611	3.962	3.459	3.061	2.740
15	6.81	6.142	5.575	5.092	4.675	4.001	3.483	3.076	2.750
16	6.974	6.265	5.69	5.162	4.730	4.033	3.503	3.088	2.758
17	7.120	6.373	5.749	5.222	4.775	4.059	3.518	3.097	2.763
18	7.250	6.467	5.818	5.273	4.812	4.080	3.529	3.104	2.767
19	7.366	6.550	5.877	5.316	4.844	4.097	3.539	3.109	2.770
20	7.469	6.623	5.929	5.353	4.870	4.10	3.546	3.113	2.772
25	7.843	6.873	6.097	5.467	4.948	4.147	3.564	3.122	2.776
30	8.055	7.003	6.177	5.517	4.979	4.160	3.569	3.124	2.778

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BLOCK – II : INVESTMENT DECISION

This block discusses the importance of studying investment proposals and types of investment proposals and their evaluation. It consists of three units.

Unit 3 introduces the nature and importance of investment decision and investment evaluation criteria.

Unit 4 presents investment appraisal techniques and the process of capital budgeting under rationing.

Unit 5 describes the concept of 'risk', nature of 'risk measurement', and techniques to handle the risk.

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UNIT - 3 : INTRODUCTION TO INVESTMENT DECISIONS

Objectives

After studying this unit, you should be able to:

- estimate Cash flows and appreciate the relevant aspects covered under capital budgeting process;
- explain the kinds of investment decisions and proposals and underlying rationale of these proposals;
- describe the nature of investment decisions and their significance; and
- explain the associated variables and their impact on effective investment decisions.

Structure

- 3.0 Introduction
- 3.1 Significance of Capital Budgeting Decisions
- 3.2 Rationale of Capital Budgeting Decisions
- 3.3 Classification of Investments
- 3.4 Identifying Relevant Cash Flows
- 3.5 Tax Effects
- 3.6 Working Capital Effects
- 3.7 Time Horizon Effects
- 3.8 External Effects
- 3.9 Keeping Operating and Finance Flows Separate
- 3.10 Effect of Inflation
- 3.11 Computation of Cash Flows
- 3.12 Illustrations
- 3.13 Summary
- 3.14 Self Assessment Questions
- 3.15 Further Readings
- 3.16 Key Words

3.0 INTRODUCTION

Every business unit irrespective of its size and nature process modernizes, upgrades, replaces the assets of long-term nature such as land and buildings, plant and machinery, etc. Hence, an understanding of various kinds of such proposals, their nature, the underlying rationale and relevant aspects covered under this process in addition to how such proposals are evaluated, enhances the quality of such decisions

3.1 SIGNIFICANCE OF CAPITAL BUDGETING DECISIONS

The financial management focuses not only on the procurement of funds but also on their efficient use with the objective of maximizing the owners wealth. The allocation of funds is, therefore, an important function of financial management. The allocation of funds involves the commitment of funds to assets and activities. It is also referred to as the investment decision i.e. making a choice regarding the assets in which funds will be invested. These assets fall into two broad categories: (i) short-term or current assets; and (ii) long term or fixed assets. Accordingly, there are two types of investment decisions viz., short term investment decision and the long term investment decision. The long term investment decision is widely known as capital budgeting or the capital expenditure decision.

The capital budgeting decisions pertain to fixed assets/long term assets. The capital budgeting decision, therefore, involves a current outlay or series of outlays of cash resources in return for an anticipated flow of future benefits. In other words, the system of capital budgeting is employed to evaluate expenditure decisions which involve current outlays but are likely to produce benefits over a period of time longer than one year. These benefits may be either in the form of increased revenues or reductions in costs. Capital expenditure management, therefore, includes addition, disposition, modification and replacement of fixed assets.

Capital budgeting decisions are of paramount importance in financial decision making. In the first place, such decisions affect the profitability of a firm. They also have a bearing on the competitive position of the enterprise. This is mainly because of the fact that they relate to fixed assets.

True current assets are important to operations, but without fixed assets, the firm would not be able to operate. Further, they are "strategic" investment decisions-as against "tactical" which involves relatively small amount of funds. Therefore, such capital investment decisions may result in a major departure from what the company has been doing in the past. Acceptance of a strategic investment will involve a significant change in the company's expected profits and in the risks to which these profits will be subject. These changes are likely to lead stockholders and creditors to revise their evaluation of the company.

Thus, capital budgeting decisions determine the future destiny of the company. An opportune investment decision can yield spectacular returns. On the other hand, an ill-advised and incorrect investment decision can endanger the very survival even of the large sized firms. A few wrong decisions may force the firm into bankruptcy.

Secondly, a capital expenditure decision has its effect over a long time span and inevitably affects the company's future cost structure. To illustrate, if a particular plant has been purchased by a company to start a new product, the company commits itself to a sizable amount of fixed assets, in terms of labour, supervisors' salary, insurance, rent of the building and so on. If the investment, in future turns out to be unsuccessful or yields less profit than anticipated, the firm will have to bear the burden of fixed assets unless it writes off the investment completely. In short, a firm's future costs, break even points, sales and profits will be determined by the firm's selection of assets.

Thirdly, capital investment decisions, once made, are not easily reversible without much financial loss to the firm. It is because there may be no market for second hand plant and equipment and their conversion to other uses may not be financially feasible.

Further, capital investment decisions, involve costs and the majority of the firms have scarce capital resources. This underlines the need for thoughtful, wise and correct investment decisions, as an incorrect decision would not only result in losses but also prevent the firm from earning profits from other investments which could not be undertaken for want of funds.

The field of investment decisions is both comprehensive and challenging. It clearly plays a vital role in assisting most business firms to achieve their various goals (e.g., profitability, growth, stability, risk reduction, social goals, etc.). It has been closely allied to the economic problem; which is rather broadly defined as the allocation of scarce resources among competing alternatives. Since virtually no unlimited resources situations exist, the firm is placed in the same position as is the aggregate economy resources must be allocated among the best alternatives. The allocation of funds is, therefore, an important function of financial management as it involves the commitment of funds to assets and activities. Analysis of capital expenditures is predicated on the knowledge of the cash outflows needed to acquire assets and the cash inflows that are expected to result from their use.

3.2 RATIONALE OF CAPITAL BUDGETING DECISIONS

The rationale underlying the capital budgeting decision is efficiency. Thus, a firm must replace worn out and obsolete plants and machinery, and acquire fixed assets for current and new products. All these involve strategic investment decisions that will enable the firm to achieve its objective of maximizing profits either by way of increased revenues or by cost reduction. The quality of these decisions is improved by capital budgeting. Capital expenditure decisions are of considerable significance to the firm as the future success and growth of the firm depends heavily on them. Unfortunately, they are not easy to take. There are a number of factors responsible for this.

The benefits from investments are received in some future period, which is uncertain. Therefore, an element of risk is involved. For instance, a decision to acquire an asset that is going to last for 15 years requires a 15-year forecast. A failure to forecast correctly will lead to serious errors which can be corrected only at considerable expense. Revenue involves estimating the size of the market for a product and the expected share of the firm in that. These estimates depend on a variety of factors, including price, advertising and promotion, and sales effort.

Adding to the uncertainties are the possibilities of shifts in consumer preferences, the actions of competitors, technological developments and changes in the economic or political environment. Problems also arise because costs incurred and benefits received from the capital budgeting decisions occur in different time periods. They are not logically comparable because of the time value of money. It is not often possible to calculate in strictly quantitative terms all the benefits or the costs relating to a particular investment decision.

3.3 CLASSIFICATION OF INVESTMENTS

Any useful scheme of controlling investments must be based on a classification of types of investments. Different kinds of investments will require different types of analysis. Subsequently, a careful examination of each investment proposal for the purpose of classifying it properly will often eliminate costly errors in allocating resources.

Dependent, independent, and mutually exclusive investments

In evaluating the investment proposals, it is important to be aware of the possible inter-relationships between pairs of investment proposals. A given investment proposal may be economically independent or dependent, of another investment proposal.

An **independent investment** is one that can technically be undertaken whether or not any other investment proposal is accepted and implemented. The benefits and costs of such an investment are not affected by the acceptance or rejection of other proposals. In other words, the investment stands alone and remains virtually unaffected by any concurrent or subsequent investment decision, except, of course, those subsequent investments specifically intended to alter the investment's operating characteristics (for investments specifically intended to alter the investment's made to increase efficiency or output or materially change the design of the product). Management must constantly be alert to ways of reducing costs or improving products, and such improvement in previous investments do not keep them from being classified as independent at the time they are first being analyzed.

An investment proposal is said to be **economically dependent** if the cash flows associated for the first investment are affected by the decision to accept or reject the second investment, the first investment is said to be economically dependent on the second. The dependency relationship can be further classified. If a decision to undertake the second investment will increase the benefits expected from the first, the second investment is said to be complement of the first. If the decision to undertake the second investment will decrease the benefits expected from the first, the second is said to be a substitute for the first. In the extreme case when the potential benefits to be derived from the first investment will completely disappear if the second investment is accepted, or when it is technically impossible to undertake the first when the second has been accepted, the two investments are said to be **mutually exclusive**. It is also possible to define an extreme case for investments that are complements. Suppose that the second investment is impossible (technologically) or would result in no benefits whatsoever if the first were not accepted. Then the first investment can be said to be a prerequisite of the second.

Profit (service) maintaining and profit (service) adding investment

Investments may fall into two basic categories, profit maintaining and profit adding. For example, the replacement of a worn-out printing press with a new machine having twice the hourly production capacity is both profit maintaining and profit adding. If the new machine had the same output as its predecessor, the investment would have been profit maintaining. Within the public domain, the widening of a two-lane highway into four lanes is an investment that both maintains and adds service.

Since there is often an overlap in the profit or service maintaining and adding aspects of an investment, it is more convenient to view investment as either replacement or new. These two types are discussed in detail, below:

Replacement Investments

The following factors should be considered while making a replacement decision. These factors represent an expansion of the underlying considerations in formulating long-range capital budgeting plans.

- The annual operating costs of the existing and proposed assets.
- The cost effectiveness of an overhaul of the existing assets.
- The potential alternative uses of the new assets if market conditions change.
- The probability of new and more efficient equipment becoming available in the future.
- The anticipated demand continuing for products or services currently being produced.

These factors are applicable to decisions regarding replacement of equipment rather than to manufacturing procedures or processes. However, with rapidly changing technology, the latter are becoming increasingly more important. Manufacturing engineers view manufacturing processes as the primary factor in the plan design (or re-design). Further, they view buildings, facilities and equipment as a part of the process. The capital budgeting process is applicable not only to a single piece of equipment, but to entire plant.

Expansion and New Product Investment

Most of the capital investment undertaken by business is for replacement of machinery, plant, and facilities, which either wear out or become obsolete. While a good deal of analysis is necessary in making replacement capital budgeting decisions, the analysis is simplified by the general availability of detailed, accurate data on which a decision may be based. The management has experience in using the old equipment. Wage rates, material costs, and the market demand are all known with a good degree of precision. Accurate data regarding costs, market conditions, and profitability are much more difficult to obtain for expansion and new business investments. Hence, it is much more difficult to reach decisions regarding investments in these areas.

Expansion and new business investments can generally be divided into four groups:

- i) **Expansion of current production to meet increased demand:** The expansion may lead to more complete utilization of existing facilities, such as operating three shifts instead of two. Expansion could also involve expanding existing plant size or new site location and plant construction.
- ii) **Expansion of production into fields closely related to current operations:** For example, a firm producing household furniture might expand into office furniture. This process is known as **horizontal integration**. Expansion also includes vertical integration, which is the purchase or development of supply and distribution lines for products being manufactured. For example, a company which is currently using the services of a distributor to sell its products may decide to establish retail outlets and sell to the public directly.
- iii) **Expansion of production in new fields not associated with the current operations:** Such expansion often comes about by a firm's acquiring another business.
- iv) **Research into and development of new products.**

As a firm enters into areas in which it has had little experience, the capital budgeting decisions become increasingly more difficult and risky. For example, expansion of a current product line to meet existing demand involves little risk. Management has expertise in making the product and knows the demand. Moreover, undertaking basic research and development is very risky. Since management generally wants to avoid risk, it requires increasingly higher returns from investments as their degree of risk increases.

The detailed analysis required in making expansion and new business investment decisions is complex, time-consuming and expensive. Once the needed data are gathered, the capital budgeting analysis is undertaken, using analytical procedures.

Activity – 1

State various expansion and new business investments of a manufacturing business.

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3.4 IDENTIFYING RELEVANT CASH FLOWS

Cash flow refers to cash revenue minus cash expense. The concept of cash flows should be distinguished from the concept of net income reported in the profit and loss statement. Since depreciation and other non-cash expenses are deducted in the computation of net income, the reported net income understates the cash flow by the amount of these deductions. In addition, under conditions of uncertainty a distinction should be made between cash flows computed before debt and preference shares financing and those computed after such financing. However, since the impact of taxation on different investments varies the cash flow associated with each investment should be compared when tax has been deducted, whichever definition of cash flows is employed.

Reasons for using cash flows

The reasons for using cash flows as against the net profit, in evaluating investment projects are listed below:

Firstly, the firm is really interested in estimating the economic value of a proposed investment project. This economic value is related to the economic outlays (costs) and inflows (benefits) associated with the project. Only cash flows describe the cash transactions that the firm will experience if the project is accepted. The firm must pay for an asset purchased with cash, and this cash outlay represents a foregone opportunity to use the cash in other productive economic alternatives.

Consequently, the firm should measure the future net benefits (revenue minus costs) in cash terms also. When the firm makes a new investment, traditional, accounting procedures spread out the initial investment by capitalizing it over the life of the asset and then reducing future net benefits by subtracting annual depreciation charge. But this accounting treatment doesn't reflect the original need for cash at the time of investment, nor does the accounting treatment reflect the actual size of the net cash inflows or outflows in later years. Only cash flows reflect the actual cash transactions associated with the project. Since investment analysis is concerned with finding out whether future economic inflows are sufficiently large to warrant the initial investment, only the cash flow method is appropriate for investment decision analysis.

Secondly, the use of cash flows avoids accounting ambiguities. There are many ways to value inventory, allocate costs, and choose a depreciation schedule to calculate net income, all of which are permissible under GAAPs. Thus different net income numbers could be developed for the same project depending upon the accounting procedures followed. But there

is only one set of cash flows associated with the project. The firm pays the initial investment and has a single stream of future cash flows. There are far fewer ambiguities in the cash flow stream. Thus more pragmatic reason reinforces the need to use cash flows rather than ambiguous net income flows.

Finally, the cash flow approach takes into account the time value of money. A sale on account is an economic event recorded by the accountant and effecting accounting income. But the firm has not yet received the cash, it cannot spend the cash, and the ultimate collection of the cash is uncertain. For purposes of investment analysis we are more interested in the moment when the cash is to be received. At that moment the firm reaches a new decision point the cash may be returned to the shareholders by the payment of a dividend. It may be used to retire debt, increase the working capital, or to acquire new long lived assets. In other words, accounting measures which are quite useful as performance measures are less useful as decision criteria.

Incremental cash flow

For any investment project generating either expanded revenues or cost savings for the firm, the appropriate cash flows used in evaluating the project must be incremental cash flow. Since the objective of financial management, is to increase the wealth of the present owners, and investment worthwhile if it enhances the market value of the company's currently outstanding equity. It follows that the attractiveness of any investment proposal should be evaluated in terms of its effect on the size and quality of the firm's present and future net cash flows. Hence the first requirement in any investment appraisal is an accurate forecast of the incremental cash flows arising from the proposed investment.

In estimating the incremental cash flow from an investment the computation should follow the "with and without" principle rather than the "before and after" principle. The "before and after" method merely compares the present cash flow of the company with the expected cash flow after a certain investment has been made. However, the "with and without" principle strives to isolate the effect of the investment from other factors that may cause changes in the firm's cash flows, so it compares the expected cash flow with the expected cash flow if the investment is made. Thus, project should be evaluated on the basis of the effect specifically attributable to it. In some situations the increase in cash flow might occur in any case so that the "before and after" method would over state the benefits of the investment and in other situations the investment might have the effect of forestalling a decline and so the "before and after" method would under state the benefits of the investment. The "with and without" principle requires that both possible effects be accounted for in the appraisal.

Cash flow estimates

For capital budgeting the estimates must be made of the effect on future cash flows of the various alternatives. Decisions as to what should be included are difficult in the context of the firm. It is here that the judgment of the analyst is critical, for once estimates are prepared application of the decision criterion is almost routine. There are certain ingredients of cash flow streams. The basic principle to be applied in the analysis of these ingredients is outlined below:

3.5 TAX EFFECTS

Tax considerations of capital investment decisions are both very important and very complex. In complicated matters, tax laws and tax rates periodically change, and procedures that are relevant in one year become no longer relevant. Moreover, some industries have specialized tax aspects associated with the kind of assets companies with in that industry regularly invest in. Besides of the enormous complexities and diversity of tax laws and because the tax laws change so frequently, we only examine the tax effects.

There are at least two ways to deal with tax effects in analyzing the investment. One is to put the cash flows in income statement format. Consider an investment of Rs.1,00,000 that produces the cash flows shown below in the first year. Cash inflow is Rs.20,000. Cash outflows include Rs.5,000 for expenses, Rs.2,000 for taxes, and Rs.500 for working capital. This gives net cash inflow of Rs. 12,500.

TABLE - 1

	Year1
Sales	Rs. 20,000*
Cash Expenses	- 5,000
Depreciation	-10,000
Profits Before Taxes	Rs.5,000
Tax at 40%	- 2,000
Profit After Taxes(PAT)	Rs.3,000
Increase in Working Capital	- 500
Net cash Flow after Taxes	Rs.12,500

*cash flow item.

Note that cash flow from operations, leaving out working capital, is Rs.20,000 less Rs.5,000 for expenses and Rs.2,000 for taxes, or Rs.13,000. We arrive at the same answer by taking profit after tax and adding back depreciation which is non-cash charge. This way we get Rs.3,000 plus Rs.10,000 or Rs.13,000 for cash flow from operations, as before. Profit after taxes plus depreciation is a handy shorter way to get after-tax cash flow from operations, but it is important to understand why it gives the correct answer.

A second method of dealing with taxes, and probably the most direct method after one becomes accustomed to it, is to convert each cash flow to its after tax equivalent. Applying this method to the above example, we get another Table-2. Note that we get the same result as before. With respect to sales revenue, we receive Rs.20,000 but the taxes increase by Rs.8,000, leaving Rs.12,000 net after taxes. We pay Rs.5,000 in expenses, but as a result, the tax bill declines by Rs.2,000 for a net after tax expense of Rs.3,500.

TABLE - 2

Equivalent	Pre-tax	Tax Effect	After-Tax
Sales	Rs.20,000	(1-0.40)	Rs.12,000
Cash Expenses	-5,000	(1-0.40)	-3,000
Depreciation tax shield	10,000	(0.40)	4,000
Working Capital	-500		-500
Net cash flow after taxes			<u>Rs.12,500</u>

The depreciation charge of Rs.10,000 provides a depreciation tax shield, that is, a reduction in taxes, of Rs.4,000. The working capital increase has no effect on taxes. From the preceding examples, we derive the general rules in Table-3. T is the tax rate applicable to the cash flow on question. Remember that changes in items such as working capital do not affect taxes. Remember also that non-cash expenses reduce taxes, so the tax shields is an inflow, not an outflow.

TABLE - 3

Type of Item	Calculation
For cash items:	Pre-tax amount $\times (1-T) =$ After tax
Sales, Cash Expenses, etc.	equivalent
For non-cash items:	Pre-tax amount $\times T =$ Tax shield
Depreciation, etc.	

It is important to keep in mind that tax effects may be quite different if the firm is losing money at the time and therefore paying no taxes. Tax laws permit carrying losses forward to be applied against future income. In such cases, tax consequences still may be very important, but the actual cash flows due to tax effects may take place in years other than the current one.

3.6 WORKING CAPITAL EFFECTS

An investment in plant assets will usually lead to funds being tied up in working capital. This will include the cash necessary to meet payroll and other bills, funds invested in raw materials, work-in-process and finished goods inventory, and receivables from customers. The size of these items will dependent on the exact measure of the capital investment, but all the previously mentioned funds requirements will usually accompany an investment in long lived assets. The one possible exception would be an investment that would decrease the use for working capital by increasing efficiency. Examples of these nature are: accounting machines that expedite the billing to customers, storage facilities, inventory-control devices etc.

3.7 TIME HORIZON EFFECTS

Over what time period should an investment opportunity be analysed? The answer depends on the nature of decision, the decision maker, the size and importance of decision, the

time and effort that justifiable can be devoted to the analysis, and the time period over which incremental cash flows will be generated.

A possible criterion for project time horizon is the maximum physical life of the assets contained in the project. A horizon constructed on this basis is very long indeed for many assets, since continued repairs can keep many assets functioning nearly indefinitely if the costs of repair can be borne. The latter point is crucial in suggesting a more important criterion- the economic life of assets. Because assets become obsolete due to technological advance and because repair and maintenance costs rise with age, the economic life of an asset is shorter than physical life. For example, a firm producing some product may find it desirable to purchase new productive assets to replace old assets even though the old productive assets are not physically worn out. The economic life of the new assets will determine the project time horizon of cash flows. However, a project involving the production of the additional or new product will have an economic life based not on equipment used to produce the product but upon the number of years the product will be produced. Product life may equal, exceed, or be less than asset life. In either case, determination of the economic life of a project is a problem of optimization.

As a definition, we may regard economic life as that time horizon maximizing the increase in shareholder wealth caused by the project. Finally, the concept of depreciable life of assets is sometimes used to define the time horizon for project cash flows. Depreciable life is the length of time over which an asset may be depreciated for tax purposes. Only by coincidence will depreciable and economic life be the same thing.

In general, economic life is the proper concept to use in defining the project time horizon of cash flows. Physical life has relatively little meaning for defining time horizons nor, except, for computing depreciation charges and income taxed, does depreciable life. Yet, while economic life is significant for cash flow determination this lack of precision are varied. Given the time value of money, it is evident the errors made in estimating the economic life of short-lived assets will be more costly than errors made with long-lived assets. This result occurs because additional years of cash flows in the near term are not discounted to a high degree.

3.8 EXTERNAL EFFECTS

The external effects of a project are those benefits and costs which do not accrue to the decision-making unit. Ideally, from the point of welfare economics, all the decision-making units should take into account the external consequences of their acts and behave accordingly, for it is only in such conditions that an ideal allocation of resources will be attained. Costs that cannot be directly identified with activities are allocated to those activities for accounting purposes. Allocation sometimes is done on the basis of number of workers involved in the activity, floor space used, sales revenue, or some similar common factor. However, overhead allocation to cash flows of projects are improper to the extent that the overhead represents the sunk costs. Sunk costs are prior to expenditures being allocated to the current time period. Prior plant and equipment expenditures or past research and development outlays are examples of such costs. These costs cannot be affected by current activity and are irrelevant to the decision affecting future cash flows. In the long run, all costs are variable. The incremental cash flow rule gives the right answer, but in the case of overhead it is difficult to apply, for often it is not easy to identify the overhead expenses that really will change, and when the changes will occur.

3.9 KEEPING OPERATING AND FINANCING FLOWS SEPARATE

When financing sources are closely related to the investment there may be the temptation to include interest and principal payments among the cash flows to be discounted. Such imputed interest is not a cash flow (if it is, the project and its financing are hopelessly scrambled up and should be separated), and its inclusion as an expense results in an understatement of the desirability of the project. The appropriate allowance for interest is included in the analysis when cost of capital is computed as part of the decision process.

A safer procedure is to discount the operating cash flows, of the project, that is, all flows other than interest, principal, and dividend payments. Operating cash flows are defined as those attributable to the project without regard to sources of funds.

3.10 EFFECT OF INFLATION

An increasing amount of attention has been focused on the problem of price level changes, particularly inflation, in recent years. That these produce distortions in reported incomes, using conventional accounting standards, is reasonably clear. Unless care is taken, they may also distort the decision making process and lead to inappropriate choices.

It should be noted that we have no clear way of forecasting price changes accurately. This does not mean we may ignore them. It may mean we should budget against them by appropriate capital structure adjustments, openly to assume a continuation of the present price level is to forecast a change, and is no "sunder", than making an explicit forecast (unless we are budgeted against it). Because of the forecasting difficulty, a conservative policy would seem to state expected cash flows in nominal, that is inflated values, taking into account as well as possible the differential inflation effects on various categories of cash flows.

3.11 COMPUTATION OF CASH FLOWS

Decisions concerning the purchase of fixed assets must obviously be based upon the effect of future cash flows. Since a long time span is involved, estimates have considerable room for error. In general, a project's cash flows will fall into one of three categories:

- i) Cash outlays for investments;
- ii) Cash inflows from investments; and
- iii) Terminal cash flow

Cash outlays for investments

Determining the amount of cash outflow involved in the purchase of a fixed or other long-term asset may appear to be simple. However, in this part of the problem, care must be exercised. What must be figured is the net cash outflow. Some offsetting cash inflows will often result from the purchase (as contrasted with the use) of an asset and will be received at approximately the same time that the payments for the investment are made. Tax rules are such that if the old machine is traded in rather than sold the book loss adds to the depreciable base of the new machine. In this event the tax saving occurs during the life of the new machine and therefore, affects the cash inflows over the life new machine rather than the initial outflow.

In focusing attention on outlays for plant and equipment it is possible to lose sight of the fact that the working capital needed to operate the investment project should also be included in computing the investment outlays. Because residual working capital is recoverable at the termination of operations, this leads to the investment having a net terminal value that should be taken into consideration. The term working capital is used here in the sense, and applicable current liabilities are subtracted from the increase in current assets to compute the use of cash. It is assumed that the additional current liabilities do not change the proportion of current liabilities to other sources of capital.

Certainly, any costs of installing the new machine and removing the old one is to be included in the initial cash outlay. In short, what is sought for the initial net cash outlay figure is the total net amount of extra cash that must be spent as a result of the decision. This figure may correspond with the amount recorded by the accountant as the increase in fixed assets, but in many cases it will not.

Example

In order to clarify the calculation of the initial outlay, let us consider an example of a company in the 50% marginal tax bracket. This company is considering the purchase of a new machine for Rs.90,000 which will be depreciated using the straight-line method down to a salvage value of zero in 10 years. The new machine will replace an existing machine originally purchased for Rs.30,000 ten years ago. The existing machine is being depreciated by the straight-line method down to zero over its expected life of 20 years. In order to put this machine in running order, it is necessary to pay transportation charges of Rs.1,500 and installation charges of Rs.7,500. Because the new machine will work faster than the old one, it will require an increase in goods-in-process inventory of Rs.11,250. Finally, the old machine can be sold for Rs.18,000 to a scrap dealer.

The installation cost of the new machine would be Rs.90,000 plus Rs.1,500 transportation and Rs.7,500 installation fees, for a total of Rs.99,000. Additional outflows are associated with taxes incurred on the sale of the old machine and with increased investment in inventory. Although the old machine had a book value of Rs.15,000, it was sold for Rs.18,000. The increased taxes from recapture of depreciation will be equal to selling price of the old machine less its depreciated book value times the firm's marginal tax rates, or $(Rs.18,000 - Rs.15,000)(.50)$ or Rs.1,500. The increase in goods in process inventory of Rs.11,250 must be considered part of the initial outlay, with an offsetting inflow of Rs.11,250 corresponding to the recapture of this inventory occurring at the termination of the project. In effect the firm invests Rs.11,250 in inventory now, resulting in an initial cash outlay, and liquidates this inventory in 10 years, resulting in a cash inflow at the end of the project. The total outlays associated with the new machine are Rs.99,000 and for its installed cost, Rs.1,500 in increased taxes, and Rs.11,250 in investment in inventory, for a total of Rs.1,11,750. This is somewhat offset by the sale of old machine for Rs.18,000. Thus, the net initial outlay associated with this project is Rs.93,750.

Cash inflows from investments

The amount of future cash inflows expected from an investment may be difficult to calculate accurately. These flows may continue for a very long period, and obviously, the degree of accuracy in the estimate is somewhat a function of time. By using cash flows rather than profit, one incorporates the same concept into capital budgeting.

The cash flows can be calculated either 'before' or 'after the taxes' resulting. Obviously a consistent approach must be adhered to 'either before' or 'after tax figure' must be used for all projects being compared. However because of the nature of tax regulations, using after-tax figures throughout will make the calculations simpler and reduce the chances for inaccuracy.

The added cash flow expected from a project may come either from increase in revenues or from reduction in expenses. There is really little analytical difference between a machine that will increase the net annual cash flow and a machine that will reduce the annual operating cost. The pertinent figure is the expected net incremental cash flow. The source is quite irrelevant except in terms of risk.

In most cases, the net incremental cash will be received throughout the year. There is a difference in present value between expected inflow of Re.1 each day for a year and an expected inflow of Rs.365 at the end of the year. This difference will be ignored for the sake of simplicity, and the assumption will be made that all cash inflows are expected at the end of each year.

Cash outflows related to the cost of money will be treated different from other cash outflows. The cost of capital will be used either as a hurdle rate that must be exceeded by the anticipated rate of return or as the rate of discount. If cash outflows connected with the financing of a project were deducted from anticipated net incremental inflows, this would constitute a double counting.

Extending the earlier example, which illustrated the calculations of the initial outlay, suppose that purchasing the machine is expected to reduce salaries by Rs.18,000 per year and fringe benefits by Rs.1,500 annually, because it will take only one man to operate, where as the old machine requires two operators. In addition, the cost of defects will fall from Rs.9,000 per year to Rs.1,500. However, maintenance expenses will increase by Rs.1,500 annually. The annual depreciation on this new machine is Rs.9,900 per year. While the depreciation expense lost with the sale of the old machine is Rs.1,500 for each of the next 10 years. Annual depreciation on the new machine is determined by taking its depreciable value-that is, the cost of the new machine plus any expenses necessary to put it in operating order-subtracting out the salvage value, and dividing by the machine's expected life.

Terminal Cash Flow

When an asset's economic life is terminated there is frequently some value left in the asset. The asset may still be usable in its current form. For example, a pump on a depleted oil well may transfer the pump and saves the purchase price of another pump or if the firm sells the pump to another firm there is a cash inflows created. In the transfer case this inflow is in the form of a cost savings and in the case of the sale the cash salvage cash flow before tax created. Alternatively, if the asset is worn out and beyond repair it may still have value as scrap metal. The sale of asset creates a salvage cash flow before tax in the year of abandonment. Additionally, the firm will recover any increased net working capital that was committed to the project in the initial time period.

Activity – 2

Explain the various categories of cash flows.

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.....
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3.12 ILLUSTRATIONS

Illustration - 1

NIMCO is purchasing an asset to replace an existing asset. The purchase price is Rs.6,00,000 plus an additional Rs.80,000 to transport and install it. It will operate much more quickly than the asset it replaces and therefore will tie up additional inventory worth Rs.1,20,000. The asset qualifies the firm for a Rs.90,000 investment tax credit. The firm has an existing asset that can be sold for Rs.90,000, but it will cost Rs.30,000 to remove it so that it can be delivered to the buyer. The book value on the existing asset is Rs.80,000. What is the net initial outlay for the new asset?

Solution

Calculation of initial net outlay is tabulate as follows:

Outflows

Purchase price	Rs. 6,00,000	
Transportation and Installation Cost	Rs. 80,000	
Installed cost of machine		Rs. 6,80,000
Increase investment in inventory		Rs. 1,20,000
Total Outflows		Rs. 8,00,000

Inflows

Investment tax credit		Rs. 90,000
Salvage value of the old machine (Rs.90,000 - Rs.30,000)		Rs. 60,000
Tax Savings		Rs. 10,000
Net Initial Outlay		Rs. 6,40,000

Illustration - 2

A machine costs Rs.15,000. It has a life of 5 years and will be depreciated by following straight line method to zero salvage value. Use of the machine will result in an increase in income of Rs.20,000 per year. Concurrently, operating expenses will rise by Rs.16,000 per year. Assume that the firm bracket considering the purchase of the machine has a 40% tax. Determine the profits and cash flow of the machine.

Solution

Particulars	Changes in Income Statement Rs.	Changes in Cash Flow Rs.
Income	20,000	20,000
Less operating expenses	(-) 16,000	(-) 16,000
Less depreciation	(-) 3,000	--

Earnings before tax	1,000	4,000
Less tax	(-) 400	(-) 400
Earning after taxes	<u>600</u>	
Increased cash flow		<u>3,600</u>

The cash flow may be determined by adding earnings after taxes to the depreciation. The depreciation expenses did not result in any outflow of cash, so at the end of the year, the firm would have Rs.600 + Rs.3,000 of increased cash inflow from operating the machine.

Illustration - 3

A firm has an asset that currently generates annual revenues of Rs. 22,95,000 and incurs annual costs of Rs.9,45,000. These costs do not include Rs.1,62,000 of depreciation. If replacement machine is purchased, the revenue would rise to Rs.25,65,000 and the costs would drop to Rs.8,64,000, but depreciation on the new machine would be Rs.2,16,000 per year. The company is in the tax bracket of 50%. What are the annual after-tax cash flows on each machine?

Solution

Particulars	Present Machine Rs.	New Machine Rs.
Annual Revenue	22,95,000	25,65,500
Less : Annual cost of operations	9,45,000	8,64,000
Less : Depreciation	1,62,000	2,16,000
Earnings before tax	11,88,000	14,85,000
Less : tax	5,94,000	7,42,500
Earning after taxes	5,94,000	7,42,500
Add back depreciation	1,62,000	2,16,000
	<u>7,56,000</u>	<u>9,58,500</u>

Illustration - 4

The following are the cash inflows before depreciation and taxes of a company with and without a proposed capital expenditure.

Year	With proposed Expenditure	Without proposed Expenditure
	Rs.	Rs.
1	1,80,000	1,50,000
2	2,00,000	1,60,000
3	2,20,000	1,70,000
4	3,80,000	2,00,000
5	3,20,000	2,10,000
6	3,40,000	2,20,000

Charge depreciation @ Rs. 6,000 per year over the next 6 years on a machine, with the company. The company proposes to replace the machine with one which costs Rs.2,60,000 requiring Rs.40,000 installation costs and has a life span of 6 years.

The depreciation has to be provided over this period and no salvage value is expected. Determine the differential cash flows of the machine considering that the company adopts straight line method of depreciation and company is in the tax bracket of 55 %.

Solution

Year	CFBT Rs.	Depreciation Rs.	Taxable Income	Taxes	CFAT Rs.
1.	180000	50000	130000	75500	58500
2.	200000	54000	150000	82500	67500
3.	220000	50000	170000	93500	76500
4.	380000	50000	330000	181500	148500
5.	320000	50000	270000	148500	121500
6.	340000	50000	290000	159500	130500

Depreciation has been worked out as given below:

$$\begin{aligned}
 \text{Depreciation} &= \frac{\text{Cost of the machine} + \text{Installation Cost}}{\text{Number of years of useful life}} \\
 &= \frac{260000 + 40000}{6} \\
 &= \text{Rs.50000 per year}
 \end{aligned}$$

CFAT without new machine

Year (1)	CFBT (2) Rs.	Depreciation (3)	Taxable Income (4)	Taxes (5)	CFAT (6) Rs.
1	150000	6000	144000	79200	64800
2	160000	6000	154000	84700	69300
3	170000	6000	164000	90200	73800
4	200000	6000	194000	106000	87300
5	210000	6000	204000	112200	91800
6	220000	6000	214000	117700	96300

The following table presents that differential after tax cash flows should be considered in evaluating the benefits of undertaking capital expenditure for new machines:

Differential After Tax Cash Flow

Year	CFAT With Proposed Exp	CFAT without Proposed Exp	Differential After Tax Cash flow
1	58500	64800	6300
2	67500	69300	1800
3	76500	73800	2700
4	148500	87300	61200
5	121500	91800	29700
6	130500	96300	34200

Illustration - 5

A furniture Company wishes to acquire a new machine costing Rs.40,00,000 which has a life of 5 years. Its expected scrap value is insignificant and hence considered to be nil. The company proposes to sell 25000 chairs every year at a price of Rs.200 per chair and cash expenses will be Rs.100 per chair. An increase in working capital is Rs.10000 required to start with. The company pays 55% of income tax. Determine the cash inflows assuming straight line method of depreciation.

Solution

After tax cash inflows (Including Depreciation)

Year	Gross Proceeds	Cash Expenses	Depreciation	Accounting Profits	tax	Accounting profit after tax	After tax cash inflows
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	5000	2500	800	1700	935	765	845
2	5000	2500	800	1700	935	765	845
3	5000	2500	800	1700	935	765	845
4	5000	2500	800	1700	935	765	845
5	5000	2500	800	1700	935	765	845

Illustration - 6

The ABC Company wishes to consider two mutually exclusive proposals for buying a new equipment:

Cash outlay	Rs.2,00,000	Rs. 1,50,000
Salvage Value	NIL	NIL
Estimated Life(in years)	4	4

The net cash savings in operating expenses before depreciation and after taxes are given below:

Year	P (Rs)	Q (Rs)
1	50,000	36,000
2	60,000	40,000
3	70,000	44,000
4	50,000	40,000

Assume straight line method of depreciation. The company is in the tax bracket of 55%. Determine the relevant cash flows.

Solution

As the projects P and Q are mutually exclusive, let us find out the differential cash flows i.e. calculating the cash flows in case costly machine is bought. Also the net increased saving i.e. marginal increase in saving also can be determined in the same manner

Cash out flows	Rs.
Cost of the Machine P	2,00,000
Cost of the Machine Q	1,50,000
Differential Cash out flow	<u>50,000</u>

The relevant cash outflow to evaluate capital expenditure of proposal P is Rs. 50000.

Cash inflows

Year	Cash Operating Expenses saved in machine P in excess of Machine Q	Tax liability on savings	Net cash benefit	Depreciation in Machine P in excess of Q	Tax benefit on such excess deprn.	Total cash benefits of Machine over Machine Q.
(1)	(2)	(3)	(4) = (2-3)	(5)	(6)	(7) = (4+6)
1	14000	7700	6300	12500	6875	13175
2	20000	11000	9000	12500	6875	15875
3	26000	14000	11700	12500	6875	18575
4	10000	5500	4500	12500	6875	11375

Working Notes

Depreciation Charges (P) $\text{Rs. } 200000/4 = 50,000$

(Q) $\text{Rs. } 150000/4 = 37,500$

Hence excess depreciation is = Rs. 12,500

Important Points

- Cash savings do not constitute net flows. It is because the company is now required to pay more taxes on its increased income. Hence cash savings benefit in terms of reduction in operating expense, is to be adjusted for the tax factor.

- ii) Depreciation is a deductible item to arrive at the taxable income. Hence the excess depreciation charged in machine P reduces the tax liability and increases cash flows to that extent.

Thus the incremental cash flow would be the sum of these two individual components.

Illustration - 7

Wadhwa Industries is using a machine whose original cost was Rs.5,85,000. The machine is 5 years old and is expected to last for an additional ten years. It is being depreciated on a straight line basis over its fifteen years life to an expected zero salvage. It can be sold currently for Rs.1,30,000. A replacement is being contemplated. The new machine has a cost of Rs.5,20,000 and will have zero salvage value at the end of ten years. The machine will produce savings (before interest and depreciation) of Rs.78,000 per year. The tax rate is 40%. Determine the cash flows associated with this replacement.

Solution

Outflows	Rs.
Purchase price	5,20,000
Sale of old machine	1,30,000
Tax savings on loss	1,04,000
Net Cash Outlay	<u>8,00,000</u>
Cash benefits	
Savings	78,000
Incremental Depreciation	13,000
Taxable Income	<u>65,000</u>
Earnings after taxes	39,000
Add back depreciation	13,000
Cash flow (Years 1-10)	<u>1,17,000</u>

Cash Outflows refer to the sum of all outflows (expenditure incurred on acquiring and installation of new asset) and inflows (proceeds from sale of existing assets) occurring at zero time period (the time the expenditure is made to determine the initial investment required of the proposed capital expenditure). The following are the factors to be considered in estimating cash out flows:

Determination of net cash outflows

- Cost of New Project
- Installation Costs
- Working capital
- Proceeds from sale of assets
- Taxes on sale of assets
- Investment allowance

Working capital refers to that portion of total capital required to keep the business going on. In other words, working capital constitutes life and blood of any given business. Without working capital, the business unit cannot function. Working capital, if considered as the difference between current assets and current liabilities as on a given date is referred to as Net Working Capital

Working Capital, if referred to the aggregate of current assets, is called gross working capital.

In the context of evaluating long term investment proposals, net working capital concept is in much use. Working capital affects over the life of the project and the cash flows. This needs a detailed analysis.

If capital expenditure is expected to increase sales, the current assets are likely to increase in the form of accounts receivables or inventory or cash. The current liabilities i.e. accounts payable, creditors etc., are likely to increase offsetting the increase in current assets and the increase in current liabilities.

The additional working capital or increased working capital should be added to the cost of new project, similarly, when investment project makes free some part of the working capital (to be treated as cash inflow). Such freed working capital should be deducted from the cost of the new project. On the other hand, the increased working capital required in the subsequent years should be treated as cash outflow of that year only. It should not be added to the initial investment. Likewise, the surplus working capital during the subsequent years should be treated as cash inflow of that year.

The way the sale proceeds of assets are fixed, depends directly on the relationship among the proceeds, initial purchase price and the present book value of an asset which is to be replaced.

The following are the distinct possibilities for the treatment of taxes in estimating the net cash proceeds.

- i) The asset is sold for a price more than the cost price
- ii) The asset is sold for a price more than its book value but less than its cost price
- iii) The asset is sold for a price which is very much equal to its book value, and
- iv) The asset is sold for less than its book value.

The same can be explained in the following example:

Illustration - 8

A firm purchased a machine of 4 years age for Rs. 60000. Its useful life was 6 years and it has no salvage value. Straight Line Method of depreciation was being followed.

Determine the net cash inflow on the sale of the machine if the firm wants to replace it under the following selling prices:

- (1) Rs. 75000 (2) Rs.40000 (3) Rs.20000 (4) Rs.12000

Also note that the firm's tax bracket is 55% and capital gains are taxed @20%

Solution

1) Sale Price	Rs.75,000	
less book value	Rs.20,000	
Total gain	<u>Rs.55,000</u>	
Capital gains (Rs.75000—60000)		= Rs. 15,000
Normal Profit (Rs.55000—15000)		= Rs. 40,000

Total Taxes

a) On capital gains = Rs.15000 x 0.20	=	3,000
b) On normal profits = Rs. 40000 x 0.55	=	<u>22,000</u>
Total Taxes	=	<u>Rs. 25,000</u>

Net Cash Proceeds from the sale of machine will be Rs.75,000 – 25,000 = 50,000

Selling Price	=	40,000
(-) Book Value		<u>20,000</u>
		<u>20,000</u>

The selling price is less than the initial purchase price of the machine. Hence there is no capital gain.

The amount of tax is Rs.11,000 (20000 x 0.55)

Net cash proceeds from the sale of the machine would be Rs. 29000 (40000 – 11000)

Selling Price	Rs.20,000
Book Value	<u>Rs.20,000</u>
Profit	<u>NIL</u>

The total cash proceeds from the sale of the asset would be Rs.20000. Since there are no profits, no further treatment is required.

	Rs.
Selling price	12,000
Book value	<u>20,000</u>
Loss	(-) <u>8,000</u>

This loss results in savings in tax.

If the firm's current year's earnings are not adequate to set off the loss, the firm can carry it forward to subsequent year and adjust the same.

3.13 SUMMARY

Capital Budgeting is the process of evaluating relative worth of long term investment proposals on the basis of their profitability. Long Term Investment Proposals are also called Capital Expenditure proposals. These may be mutually exclusive or contingent or complementary. Various kinds of capital budgeting proposals include replacements, expansion, diversification, research and development. Expected future cash flows on an after-tax basis form the basis to evaluate investment proposals. Cash flows may be conventional or non-conventional. Depreciation is to be added back to cash inflow after taxes to arrive at cash flows to analyse capital investment proposals. Differential (after tax) cash flows form meaningful basis for capital expenditure decisions. The factors affecting determination of net cash outflows include (a) cost of new project (b) installation costs (c) working capital (d) proceeds of sale of assets (e) taxes on sale of assets and (f) investment allowance. Depreciation acts as tax shield and plays a major role in taking investment decisions of an on going concern.

3.14 SELF ASSESSMENTS QUESTIONS

I. Short Answer Questions

1. What do you understand by cash flows?
2. Compare cash flows with accounting profits.
3. What are conventional and non-conventional cash flows.
4. Write a brief note on incremental cash flows.
5. What are the various types of cash flows?
6. Is there any effect of depreciation and tax on cash flows?

II. Long Answer Questions

1. Examine the concept of cash flow for investment decisions.
2. Distinguish between accounting profits and cash flows. Why are cash flows considered to be a better measure of economic viability as compared to accounting profits?
3. Explain in detail the differences between conventional and non-conventional cash flows.
4. What do you mean by incremental cash flows?
5. What are the various types of cash flows? Explain.
6. How net annual cash flows are determined? Explain with the help of hypothetical figures.
7. What do you understand by initial investment? How is it determined?
8. What do you understand by terminal cash flows? What are its components? Explain.
9. How are cash flows influenced by depreciation and taxes? Explain with imaginary figures.

Problems

1. A project costs Rs. 200000 and yields annually a profit of Rs.30000 after charging depreciation @ 10% per annum but before tax at 50%. Calculate net annual cash inflows for the project.
2. A firm is purchasing an asset to replace an existing asset. The purchase price is Rs.300000 and an additional amount of Rs.40000 to transport and install it. It will operate much more quickly than the asset it replaces and therefore will tie up an additional inventory worth Rs.60000. The firm has an existing asset that can be sold for Rs.45000 and it will cost Rs.15000 to remove it so that it can be delivered to the buyer. The book value on the existing asset is Rs.40000. What is the net cash outlay for the new asset?
3. A company has estimated the following earnings after depreciation and taxes with its present leather-cutting machine and a machine it proposes to buy:

Year	Earnings with the present machine	Earnings without the present machine
1	40000	60000
2	40000	70000
3	40000	90000
4	40000	100000
5	40000	120000

The firm currently has machine that it is depreciating at the rate of Rs.5000 per year over the next 6 years with no salvage value. The new machine will cost Rs.110000 and require Rs.10000 as installation costs. The useful life of the machine is 6 years with no salvage values. The firm employs the straight line depreciation method and is in the 55% tax bracket.

- a) Calculate the cash flow associated with each machine.
 - b) Calculate the incremental cash flows resulting from the acquisition of the new machine.
4. A company is considering the introduction of a new product. The firm estimates that it can sell annually 4000 units of this product at Rs.30 per unit. The cash variable expenses to manufacture and sell the product are estimated at Rs.20 per unit. It will also involve cash fixed cost of Rs.4000 per annum. The plant to manufacture the product is available for Rs.80000. Further, Rs.20000 will have to be spent on installation of the plant. The salvage value of the plant after its life of 8 years is estimated at Rs. 2000. A working capital investment of Rs.20000 is also required in the year of installing the plant.

The firm uses the straight line method of depreciation of original cost of the asset ignoring salvage value. Tax rate for firm is 50%. You are required to calculate (a) initial investment (b) annual net cash flows and (c) Terminal cash flows.

5. A company has two mutually exclusive proposals under consideration and provides you the following information.

Particulars	Proposal 1 Rs. 100000	Proposal 2 Rs. 80000
Initial Investment		
Net Cash savings in operating cost before depreciation and taxes		
Year 1	30000	28000
2	40000	36000
3	25000	20000
4	20000	18000
5	15000	10000

You are required to determine the incremental cash flows assuming straight line method of depreciation, no salvage value and the tax rate at 50%.

3.15 FURTHER READINGS

1. James C. Van Horne : **Financial Management and Policy**, Prentice Hall of India.
2. John H. Hampton : **Financial Decision Making**, Prentice Hall of India, New Delhi.
3. V.K. Bhalla : **Financial Management**, Anmol Publications Pvt. Ltd, New Delhi.
4. M.Y. Khan and P.K. Jain : **Financial Management**, Tata Mcgraw Hill.
5. Prasanna Chandra : **Financial Management**, Prentice Hall of India, New Delhi.
6. I.M. Pandey : **Financial Management**, Vikas Publishing House, New Delhi.
7. Manmohan and S.N. Goyal : **Principles of Management Accounting**, Sahitya Bhavan.

3.16 KEY WORDS

- Adjusted Present Value (APV)** : The sum of the discounted value of project's operating cash flows (assuming equity financing) plus the value of any tax-shield benefits of interest associated with the project's financing minus any floatation costs.
- Cost of Capital** : The required rate of return on the various types of financing. The overall cost of capital is a weighted average of the individual required rates of return (costs).

- Cost of Debt (Capital)** : The required rate of return on investment of the lenders of a company.
- Cost of Equity Capital** : The required rate of return on investment of the common shareholders of the company.
- Cost of Preferred Stock (Capital)** : The required rate of return on investment of the preferred shareholders of the company.
- Economic Value Added (EVA)** : A measure of business performance. It is a type of economic profit that is equal to a company's after tax net operating profit minus a total cost of capital charge (and possibly including some adjustments).
- Hedging (Maturity Matching Approach)** : A method of financing where each asset would be offset with a financing instrument of the same approximate maturity.
- Indifference Curve** : A line representing all combinations of expected return and risk that provide an investor with an equal amount of satisfaction.
- Risk Adjustment Discount Rate (RADR)**: A required return (discount rate) that is increased relative to the firm's overall cost of capital for projects or groups showing greater than "average" risk and decreased for projects or groups showing less than "average" risk.
- Subsidiary** : A company that has more than half of its voting shares owned by another company (the parent company).

UNIT – 4 : CAPITAL BUDGETING

Objectives

After studying this unit you should be able to:

- describe the stages in the project formulation process;
- explain the methods of investment profitability analysis; and
- rank the projects for taking the investment decisions.

Structure

- 4.0 Introduction
- 4.1 Project Formulation
- 4.2 Project Formulation Stages
- 4.3 Investment Profitability Analysis
 - 4.3.1 Pay Back Period
 - 4.3.2 Average Rate of Return
 - 4.3.3 Net Present Value
 - 4.3.4 Profitability Index
 - 4.3.5 Internal Rate of Return
- 4.4 Comparison of the IRR Approach with NPV
- 4.5 Limitations of Investment Appraisal Techniques
- 4.6 Summary
- 4.7 Self Assessment Questions
- 4.8 Further Readings
- 4.9 Key Words

4.0 INTRODUCTION

Planning is a dynamic process. It aims at accelerating the development at all levels and in diverse fields. Any development plan to be sound, realistic and consistent presupposes a great deal of knowledge about the existing and potential projects. But the projects in turn cannot be appraised critically without a plan. It implies that plans require projects and projects require planning. Planning in the context of projects is a means of organizing the work, how and for whom, determining the resources required, allocating these resources on a time phased basis, defining and allocating responsibility, communicating amongst all those involved on a project, co-ordinating activities and people involved, controlling progress, estimating time of completion and handling unexpected events and changes. Planning is also a basis for the authority of Project Manager, for the budgeting and financial control of a project, for self-analysis and learning, means of orienting people to look ahead and above all, a way of initiating and maintaining a sense of urgency, i.e., time consciousness. The bona fides of a project thus, can only be well assessed within the framework of a plan.

4.1 PROJECT FORMULATION

Project planning is a cyclic process. It takes the "seeds" of a project from its inception, launches it into the full blooming and steers it throughout its life. In order to achieve the real time benefits of planning as envisaged in the policy resolutions and plan documents, efforts have to be intensified and accelerated in the direction of project formulation. Project formulation refers to a series of steps to be taken to convert an idea or aspiration into a feasible plan of action. As Myrdal rightly observes, "Project formulation is one of the basic techniques through which planning can change from an institutional base to an institutional and rational base."

Project formulation aims at a systematic analysis of project potential with the ultimate objective of arriving at an investment decision. In this process, it makes an objective assessment from all possible angles starting from identification of investment options up to its appraisal stage. It includes technical analysis (whether specifications of technical parameters is realistic and optimal); social profitability analysis (whether it is worth-while from society's point of view); financial analysis (whether costs/returns are properly estimated and project is also financially viable); and commercial analysis (whether production specification, marketing plan and organizational structure are soundly conceived).

Project formulation exercise cannot be a one man's show. It is a joint effort of experts drawn from diverse disciplines e.g., engineering, finance, economics, management as well as a host of other subject-matter specialists. Project formulation has an in-built warning mechanism. It helps the entrepreneur to stop further investment as soon as it spots out some weak symptoms. This in turn, facilitates in controlling the expenditure during the project development.

Formulation of projects is a complex and an intelligent task. It involves a number of sequential stages. Failure to appraise even one step on scientific lines adversely affects its health. J.M.Kitchlu while outlining the phases of life cycle of a project says, 'The need for carrying out detailed planning is being increasingly recognized, but, there are still cases where projects are being approved without essential steps regarding all stages of preparation and scrutiny being undertaken in the pre-construction stage. This has resulted in the formulation of incompletely conceived plans and estimates and has thus, led to unsound decisions on project size, scope location and product mix. As such, lack of well formulated projects retard the implementation of development plans. Projects provide information to the planning agencies, which in turn, determine the use of existing resources to achieve the desired purposes.

"The availability of well-conceived projects and the institution of work on their formulation simultaneously with the institution of the formulation of plans will improve their implementability. By the time, a plan is finalized and approved enough projects should be available to go in the implementation phase".

4.2 PROJECT FORMULATION STAGES

Project formulation process can be outlined under five stages:

1. Project identification;
2. Technical Analysis (Input analysis: Demand and Supply analysis);
3. Economic Analysis;

4. Financial Analysis (Commercial Analysis; Social Cost-Benefit Analysis); and
5. Project Appraisal.

1. Project Identification

Projects usually do not emerge themselves. The impetus to set up a project can come from different sources such as governmental agencies, credit and financial institutions, non-governmental organizations, and the people in general.

Once the venture ideas have been developed by following one or combination of sources, these have to be screened and evaluated in a preliminary fashion on the basis of internal and external constraints prior to their being put to additional tests of pre-feasibility. This stage is an important one in context of project identification, because it facilitates in determining whether:

- a) the investment opportunity is so promising that an investment decision can be taken on the basis of the information elaborated at the pre-feasibility stage.
- b) the project concept justifies a detailed analysis by a feasibility study;
- c) any aspects of the project are critical to its feasibility and necessitate in-depth investigation through studies such as market surveys; and
- d) the information is adequate to decide that the project is not either a viable proposition or attractive enough for potential investors.

2. Technical Analysis

a) Input analysis

It deals with identifying, quantifying and evaluating the human and material resources required (project location, raw materials, manpower, technology, plant and machinery) and the sources from which these are to be obtained in an integrated manner throughout the life-cycle of project.

- i) **Location:** Location of a site for the project has to be decided judiciously and objectively without giving undue importance to the personal whims and prejudices of the decision-makers or the party in power.

The selection of project site, in fact, has to be a group endeavor comprising the generalists, professionals, technocrats, and representatives from the government, financial institutions, and legal departments. Ideally, it would be advantageous if the final selection is made after evaluation of the pros and cons of more than one project site. It is here that sometimes in utter disregard to technical considerations, weightage might have to be given to social, economic or other national/regional/local considerations. But, this should be done with proper justification based on well established techniques of decision-making, cost-benefit analysis, social cost-benefit, discounted cash flow, etc. According to Planning Commission's guidelines, the following considerations should invariably be taken into account.

- a) The availability and cost of land required for plant and township;
- b) Suitability of site for building purpose, the seismic zone in which the site is located and whether the seismicity has any financial implications in the design of structure;

- c) The availability of water and power and other utility services and assurances of State Government in this regard;
- d) The extent to which existing infrastructure, if available, is to be utilized;
- e) The availability of trading network at the location which could be relied upon to supply general stores items;
- f) The availability of a sufficient number of machine shops, welding shops, electrical repair shops, etc.; and
- g) The state of labour relations locally.

b) Demand and Supply Analysis

Demand and supply analysis is one of the essential dimensions for the success of a project. Simply stated, this analysis makes an attempt to determine whether the proposed project would produce those goods and services at a time, price, place, quantity and quality for which there is a potential demand. This in turn ensures its profitability as well. In other words, forecasts have to be made about the existing and potential demand and supply position of goods in a systematic and organized manner lest a particular project may have to be abandoned simply for want of the demand itself. Some critics may argue that since estimates or forecasts are never exact, there is no fun of carrying out such analysis. But this is their ill notion.

Forecasting of demand and supply at least facilitates in reducing the chance of committing errors of not altogether eliminating its evil effects. It is only after this analysis that an entrepreneur sometimes even takes the risk of investing huge capital beyond his means if he is confident that there is a potential demand of the proposed goods and services in the market.

In order to carry out the analysis, a lot of information has to be obtained concerning the buyers, consumers and the sellers. The desired information is gathered through well established techniques of research methods. Generally the data is obtained both through secondary and primary sources. It is primarily the secondary data which provides clues to the existing information available within or outside the country and facilitates further investigation. For this purpose, an in-depth study of a huge literature available in the form of reports, surveys, periodicals, guides, etc., has to be made. In the Indian context the secondary information can be collected from Plan documents, Yearbooks, Economic surveys, Sample surveys, etc.

Once the data has been obtained both through secondary and primary sources, it has to be processed, analyzed and interpreted with the help of a number of statistical tools and techniques such as correlations, regressions, econometric methods, averages, frequencies, ratio, etc., with or without computers. The data so analyzed is presented in the form of a report duly edited and supported by various tables, charts, graphs, etc., depicting the various trends and highlights of the data gathered.

Let us explain concept of demand and supply analysis with an illustration for fertilizers. Fertilizers are the key to modern scientific farming. Although the three major crop nutrients N, P, K, act in their own way to exploit inherent productive power of seeds, their joint interaction is capable of contributing more than the sum total of individual nutrients. Producers prefer readymade fertilizers. Out of these three varieties, our country is not self-sufficient in matter of complex fertilizers; these have to be imported in bulk. The powered fertilizers are not preferred

due to a number of agronomic considerations. Accordingly, studies have established that granular fertilizer serve to provide tailor-made fertilizers to meet the requirements of a large variety of crops.

It follows that there is a great demand for the supply of granular fertilizers. On the other hand, the supply position of basic as well as other varieties of fertilizers has all the time been quite erratic. That is why, the Government has invested huge amounts in setting-up a large number of fertilizer units in the country. It has, however, been estimated that even if all the existing units in public, private and co-operative sectors run to their rated capacity and the indigenous factories manufacturing complex fertilizers go into stream as scheduled, the existing demand would not be met completely. Thus, the above illustration amply proves that there is a big gap between the supply and demand positions and it needs to be bridged by setting up more and more fertilizer plants in the country, which would also save scarce foreign exchange on account of imports.

3. Economic Analysis

Economic analysis determines the viability of a project over a period of time. It is on this basis that the intended profit and loss can be arrived at and final decision taken for the selection and implementation of the proposed project. Economic analysis is carried out by taking into consideration the following requirements:

1. Capital cost;
2. Working capital requirements;
3. Estimates of operating costs;
4. Estimates of operating revenue;
5. Depreciation/taxes; and
6. Profits.

Capital costs are essentially those which are incurred before the commencement of commercial production. These can be categorized under five main headings viz. preliminary expenditure, land cost, plant and equipment cost, expenditure on construction including townships, engineering and project management cost. The capital costs after the commencement of the project are in the form of replacement and modernization expenditure.

The working capital requirements are derived from the data relating to requirements of inventories, reserves of fuel or raw materials, spare parts as well as cash needs of the project in production and marketing. In order to determine exact working capital estimates for a period of two years after the start of production, the unit price for various items has to be taken into account.

Operating costs are those which have to be incurred once the project commences production. These can be broken down into direct as well as into indirect costs. Direct costs include cost on account of raw materials, direct labour and overheads. Indirect costs on the other hand, has to be incurred on account of supervisory and accounting staff, stores operation, technical staff, rental utility costs, consultant's fees, interest on working capital, material and transportation charges which cannot be directly charged to the end production, sales promotion and advertising expenses, etc., The operating requirements have to be worked out for various units under two sets of formats- one indicating the costs on the basis of the prices prevailing in

the year in which capital cost estimates are prepared and the other on basis of prices that are likely to be incurred at the time of actual commissioning of project.

The estimates pertaining to operating revenue are worked out in the light of the likely sales volume and price of end product by adding some minimum margin on original capital investment. In a freely competitive climate, the assured selling price of a given product has an important bearing in arriving at any commercial profitability calculations.

Adequate provision for depreciation and taxes has also to be made while estimating the economic viability of a project. Depreciation on account of plant and machinery, godowns, civil works, other administrative buildings; has to be invariably made as per the norms fixed by the Government from time to time to determine the operating profits. Similarly, taxes like sales tax, central sales tax, property tax etc., has to be shown in the current expenditure while income-tax may have to be deducted after determining the net profits.

While estimating the economic proposition of an investment project, due weightage to factors like price fluctuations, inflation, changes in government policy, adaptation of new technology etc., has also to be given to ensure its reliability. Thus, economic analysis serves as an important instrument to determine its economic viability.

4. Financial Analysis

Financial analysis of project is one of the acid tests in the process of scientific management, investment policy and decision making. It is carried out on the basis of a solid data supplied by the investor and his consultants. It is tabulated in various formats although there exists no universal stands for the purpose. The model formats designed by UNIDO and the planning commission in India are an attempt to cover comprehensively the information required for financial analysis and can be modified subject to actual conditions in which a project is required to be evaluated.

The funds are generally procured through two major sources viz., equity and debt. The equity comprises share capital held by the owners and the public. It does not carry any obligation of repayments. It is raised through issue of shares of various types to the public so far as a company form of organization is concerned. In case of a public corporation, the entire share capital is held by the Government itself. The debts are obtained by borrowings from institutional agencies, financing institutions, public and the like in form of debentures, bonds, deposits, etc. These are both secured and unsecured in nature and carry an obligation of repayments after a fixed period or at regular intervals in installments along with the interest accruing thereon. In addition to equity and debt, Government subsidies and grants facilitate promotion and development of projects in a specified area aiming at benefiting a specified sector of the society or leading to balanced regional development.

Coming to expenditure part, a project normally can be divided into three major phases. Generally, the first phase (pre-investment) does not consume much resource. In this phase, some amount of expenditure has to be incurred in the form of conducting surveys, feasibility studies, techno-economic surveys, consultancy, and other intangible expenses such as registration fee of the company, costs of licenses, trade marks, patents, etc.,. The second phase (construction) consumes maximum and is responsible to provide a basic edifice of the project. The capital requirements during this phase are of non-recurring nature and include costs on account of land, buildings (including community services), civil works, machinery and equipment, ancillaries, contingencies, etc. It is, however, from the third phase

(implementation) onwards that recurring expenditure on account of raw materials, fuel, utilities, administrative and operative costs, maintenance, interest liability, depreciation, etc., consume a lot of resources.

Lastly: the projections regarding the annual sales and gross/net income are made on basis of marketing analysis already carried out. Here, the expenses connected with selling, distribution, manufacturing process as well as general and administrative expenses have to be worked out separately for the various products. Similarly, a bread-up of the total earnings within and outside the country has to be maintained to depict a clear picture about the foreign exchange earnings as also minimizing dependence on imports of goods and services.

All the above data in terms of resource requirements, expenditure plan and the overall likely performance of a project is nicely tabulated in three basic documents namely:

- i) The balance sheet,
- ii) Income statement, and
- iii) Cash-flow statements.

A financial analyst heavily relies on these documents for the purpose of comparative appraisal. These statements constitute the financial profile whereby it becomes easier to evaluate the operational strategy, financial strategy and investment strategy of a given project.

A balance-sheet, a snap shot of an enterprise at a particular point of time, lists its assets as well as liabilities. The three kinds of assets, i.e., fixed, current and others include investment on account of land, buildings, machinery, cash, accounts receivable, inventories intended for sales, etc. Likewise, liabilities (current and long-term) consist of loans payable within a period of one year. An income statement illustrates about the actual operations of an enterprise usually for a period of one year. The statement gives a bird's eye view of the total sales, cost of goods sold, operating and other expenses, gross/net liability, etc. This statement also indicates the growth and healthy development of an enterprise in the sense that one at a glance is able to know the surplus amount available for distribution as dividend or transfer to reserves to plough-back reinvestments. The cash flow statements depict changes accruing in the cash position of the enterprise over a period of one year. In fact, cash acts as a fuel on which a project runs and has to be kept readily all the time if it is not to come to a grinding halt. A cash flow statement is very useful to (a) determine the amount of cash needed to start the enterprise; (b) plan for timing of loan funds; (c) ensure that if projected cash flows are met, cash will be available to meet payments as they become due. Thus, balance sheet, income statement and cash flow statement are the sheet-anchor in the realm of financial analysis of a project.

There are several techniques being used in evaluating the relative profitability of the projects. However, all the techniques cannot be acceptable for different types of projects in different situations. D.P.Herron, has listed most common evaluation methods as payout period, simple rate of return, interest rate of return (discounted cash flow), sinking fund, net present worth, net annual worth and average annual savings, and equivalent rate of return. The United Nations in its "Manual for Evaluation of Industrial Projects" has felt concerned that there is a good gap between theory and practice in project evaluation. The gap is so great that there is no common language. It further observes that while theory differs more and more elegant and sophisticated techniques, since these techniques are not applied, the gap continues to grow. The Manual mainly deals with a project's profitability from the point of view of the enterprise

on the one hand and of the country as a whole of the other. It also suggests different techniques for these two different sets of objectives.

Financial analysis based on commercial profitability

Commercial profitability in simple words implies the intended direct benefits which a project is likely to achieve at the prevailing market prices. This analysis includes both investment profitability analysis and financial analysis. The former aims at assessing the earning power of the resources deployed for the project without bothering for the sources of financing. The latter takes into view the financial features for the smooth implementation and operation of the project. It employs various methods for appraising an investment project, namely:

1. Simple Rate of Return
2. Pay Back Period
3. Net Present Value
4. Internal Rate of Return
5. Financial Ratios

Simple rate of return, is the ratio of net profits in a normal year to the initial investment. Pay back period technique represents time required to recover initial investment out of its savings and is calculated by dividing total investment by the annual net savings. The net present value, takes into account the entire life of project by discounting the future cash flows to their present value. Similarly, internal rate of return analysis presupposes that cash in hand today has more worth than cash to be obtained after sometime. Accordingly, this technique helps in determining cash to be received from various investments in future years by discounting it back to what it is worth today. Lastly, financial ratios technique facilitates analyzing the credit worthiness of a running enterprise.

5. Project Appraisal

Project appraisal is the final and crucial stage in realm of project formulation. At the outset, it may be clarified that the three terms suffixed with a project namely, "analysis, appraisal and evaluation" are not synonymous; these convey different meanings. For instance, analysis refers to breaking down the component of a project in terms of costs and benefits. Appraisal is analysis *ex ante*, i.e., although the project has not been put into operation or has not commenced its costs and benefits are estimated to arrive at the investment decision. On the contrary, in case of evaluation, it is analysis *ex-post*. The project, in this case, has already commenced and costs and benefits are arrived at to find out whether the investment decision has been profitable in terms of benefits *vis-à-vis* cost of the project. Thus, project appraisal is a tool to examine as to whether in the given situation, it would be most realistic, reliable and reasonable one to commit resources or not.

The project has to be appraised in relation to the feasibility of the technical, economic, financial, commercial, organizational, managerial, social, environmental and other aspects of the project by raising various pertinent questions. If it fulfils a major need or contributes to national/sectorial goals and is also practically desirable, it may be selected for implementation over a competing project which is not politically important.

All these details when put together in one document is known as project appraisal, pre-investment report, project report, feasibility report and the like. It may, however, be clarified that while feasibility report is just a preliminary exercise in the realm of project formulation, a pre-investment report is one of the well-conceived, comprehensive and planned document depicting the favorable as well as weak spots of the proposed investment decision. As such, significance of a feasibility report merely lies in between the project formulation and its appraisal/sanction stage. A pre-investment report has also to be differentiated with a Detailed Project Report. The latter is a post-investment decision report and is primarily based on the former at the time of going ahead with the implementation of the project concerned. A pre-investment report signifies "what" and "why" of the intended project while a detailed project report provides clues to all those pertinent questions such as "what, why, how, when and where" of the project.

Project appraisal thus, attempts to consolidate the results of exercise made at various levels, from different angles on various aspects of the project. In fact, it acts as an edifice for the implementation of the project in right earnest. It is through this report that the investor, the lending institutions, the policy making, advisory and regulatory agencies in the Government, the beneficiaries and the public at large, can review the desirability of going ahead with the project. It also helps them to join hands together, pool their scarce resources and ensure that the project is taken up for implementation within the constraints of time, costs and performance.

Bottlenecks

There are numerous factors which obstruct the exercise for an effective project formulation, such as:

- Project not fitted in overall socio-economic development of country.
- Project not in consonance with objectives of the organisation concerned.
- Frequent changes in a host of Government directives licensing procedures, import and export obligations, pricing controls and the like.
- Political statement in the country.
- Adoption and not adaptation of schemes prepared by various agencies.
- Non-preparation of detailed project reports.
- Manipulation of project report by giving wrong assumptions regarding the life of a project, cost structure, return on investment, social cost-benefit, etc.,
- Wrong selection of appropriate project site.
- Use of inappropriate process technology.
- Application of sophisticated technology leading to heavy investments right from the start.
- Selection of optimal size of plants without keeping an eye on market conditions.
- No planning of product-mix at the initial stage.
- Marketing analysis based on hunches and guess.
- Sudden changes in market conditions.
- Financial projections too much exaggerated.

- Difficulty in resource mobilization for the project.
- Underestimating project, cost.
- Underestimating project schedules.
- Inadequate assessment of raw materials.
- Application of modern management techniques in project formulation missing.
- Delay in collaborating with foreign collaborations for seeking technical assistance.
- Non-availability of professional and technical trained staff having ability to forecast problems and offer remedial measures.
- Frequent transfer of top management engaged in project formulation.
- Effects of project to combat environmental problems not given due importance.
- Promoters ability to take up new ventures not assessed in proper perspective.
- Over ambitious plans of promoters.
- Social traditions and taboos.

Activity – 1

What is meant by the economic analysis of a project?

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Activity – 2

How are the projects appraised?

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4.3 INVESTMENT PROFITABILITY ANALYSIS

Investment in a project shall be made only after ensuring that the project is commercially viable i.e., at least the minimum required financial returns will be obtained from the investment. Investment profitability analysis is, therefore, employed in project evaluation. Investment profitability analysis is the measurement of the profitability of the resources put into a project. This analysis also helps the, selection of the best project(s) when there are alternatives.

Important methods of investment profitability analysis include:

- i) Pay-back period
- ii) Average rate of return
- iii) Net present value
- iv) Internal rate of return

The pay-back period and simple rate of return are known as simple or static methods and the net present value and internal rate of return are called the discounted cash flow techniques.

4.3.1 PAY-BACK PERIOD

The pay-back period may be defined as the period required to recuperate the original investment outlay through the income earned by the project. The income earned in this context is depreciation plus profits after taxation.

If income earned is uniform in all the years,

$$\text{The payback period} = \frac{\text{Investment}}{\text{Income earned annually}}$$

If the amounts of annual earnings are not uniform, the pay-back period is found out by calculating the period required for the earnings to add up to the amount equivalent to the investment.

When a choice is to be made from among alternative projects using the pay-back criterion, the projects are ranked according to the pay-back period and the one with the shortest pay-back period is selected.

The most important merit of this method is that by selecting projects with the shortest pay-back period, the risks of uncertainties associated with distant future are avoided, like political and economic instabilities, product or technological obsolescence, etc.

The main weakness of the pay-back method is that it ignores the earnings beyond the pay-back period. Thus, when the pay-back criterion is applied for project selection, there are chances of choosing less profitable projects.

Problem - 1

From the following information pertaining to three projects, Calculate Pay Back Period and rank the projects for the investments.

Particulars	Project 'K'	Project 'B'	Project 'S'
Profit Before Tax (PBT)	Rs.35, 000 (Even)	Rs. 40,000 (Even)	1 st Year- Rs. 25,000 2 nd Year- Rs. 30,000 3 rd Year- Rs. 35,000 4 th Year- Rs. 40,000 5 th Year- Rs. 45,000
Project Life	8 Years	7 Years	5 Years
Initial Cost	Rs. 80,000	Rs. 90,000	Rs. 1,00,000
Depreciation	Straight line	Straight line	Straight line
Corporate Tax	40%	40%	40%
Solution			

Calculation of Cash Flow after Taxes for the three projects

Particulars	Project 'K'	Project 'B'
Profit before Tax (PBT)	35,000	40,000
Less: Depreciation	10,000	12,857
Profit after Depreciation but before tax	25,000	27,143
Less: Tax	10,000	10,857
Profit after Tax	15,000	16,286
Add: Depreciation	10,000	12,857
Cash Flow after Tax	25,000	29,143

Project 'S'	Year 1	Year 2	Year 3	Year 4	Year 5
Profit before Tax (PBT)	25,000	30,000	35,000	40,000	45,000
Less: Depreciation	20,000	20,000	20,000	20,000	20,000
Profit after Depreciation	5,000	10,000	15,000	20,000	25,000
But before tax					
Less: Tax	2,000	4,000	6,000	8,000	10,000
Profit after Tax	3,000	6,000	9,000	12,000	15,000
Add: Depreciation	20,000	20,000	20,000	20,000	20,000
Cash Flow after Tax	23,000	26,000	29,000	32,000	35,000

Calculation of Pay Back Period

In case of Even Projects = Original Investment / Annual Cash Flow after Tax

Therefore Project 'K' = $80,000 / 25,000 = 3.20$

Project 'B' = $90,000 / 29,143 = 3.08$

In case of Uneven Projects

Project 'S' - 1st Year = 23,000 -- 1

2nd Year = 26,000 -- 1

3rd Year = 29,000 -- 1

78,000 -- 3

As the next year cash flow is Rs. 32,000 where we need only Rs. 22,000 (Rs. 1,00,000 - Rs. 78,000). On the assumption that the cash flow is generated equally over the year the pay back period required to generate the balance Rs. 22,000 can be calculated as 0.61 ($22,000 / 32,000$). Therefore, the total pay back period for the Project 'S' is 3.61.

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From the above calculations we can infer that the pay back period for project 'K', 'B' & 'S' are 3.20, 3.08, and 3.61 respectively. The project has to be selected which has the shortest pay back period. Hence first rank is given to project 'B' and second rank is given to project 'K'

4.3.2 AVERAGE RATE OF RETURN

The average rate of return (ARR) has the following two definitions:

$$i) \text{ ARR} = \frac{\text{Average annual net profit}}{\text{Original Investment}} \times 100$$

$$ii) \text{ ARR} = \frac{\text{Average annual net profit}}{\text{Average investment}} \times 100$$

- i) Average annual net profit is the total net profit over the life of the project divided by the number of years of life of the project.
- ii) In the second method, instead of original investment, the average investment is considered. When the straight line method is used for depreciation, the average investment is one half of the original investment. Hence,

$$\text{ARR} = \frac{\text{Average annual net profit}}{\text{Original investment} / 2}$$

Under this method, projects are ranked on the basis of the average rate of return. Although return on investment is a relevant basis for project evaluation, the simple rate of return method suffers from the fundamental weakness of ignoring the time differences in the cash inflows.

Problem-2

From the following information pertaining to three projects, Calculate Accounting Rate of Return and rank the projects for the investments

Particulars	Project 'K'	Project 'B'	Project 'S'
Profit Before Tax (PBT)	Rs.35, 000 (Even)	Rs. 40,000 (Even)	1 st Year- Rs. 25,000 2 nd Year- Rs. 30,000 3 rd Year- Rs. 35,000 4 th Year- Rs. 40,000 5 th Year- Rs. 45,000
Project Life	8 Years	7 Years	5 Years
Initial Cost	Rs. 80,000	Rs. 90,000	Rs. 1,00,000
Depreciation	Straight line	Straight line	Straight line
Corporate Tax	40%	40%	40%

Solution

$$\text{A.R.R} = \frac{\text{Average Income}}{\text{Average Investment}} \times 100$$

$$\text{Where Average Income} = \frac{\text{Total income of all the years}}{\text{Number of years of the project}}$$

$$\text{Average Investment} = \frac{\text{Investment value at the beginning} + \text{Investment value at the end}}{2}$$

Project 'K'

$$\text{Total income of all the years} = 15000 \times 8 = 120000$$

$$\text{Number of years of the project} = 8 \text{ years}$$

$$\text{Investment value at the beginning} = 80,000$$

$$\text{Average Income} = \frac{120000}{8} = 15000.$$

$$\text{Average Investment} = \frac{80000}{2} = 40000$$

$$\text{A.R.R} = \frac{15000}{40000} \times 100 = 37.5\%$$

Project 'B'

$$\text{Total income of all the years} = 16286 \times 7 = 114002$$

$$\text{Number of years of the project} = 7 \text{ years}$$

$$\text{Investment value at the beginning} = 90,000$$

$$\text{Average Income} = \frac{114002}{7} = 16286$$

$$\text{Average Investment} = \frac{90000}{2} = 45000$$

$$\text{A.R.R} = \frac{16286}{45000} \times 100 = 36.19\%$$

Project 'S'

Total income of all the years = Rs. 45,000

Number of years of the project = 5 years

Investment value at the beginning = 100,000

$$\text{Average Income} = \frac{45000}{5} = 9000$$

$$\text{Average Investment} = \frac{100000}{2} = 50000$$

$$\text{A.R.R} = \frac{9000}{50000} \times 100 = 18\%$$

As the ARR of the Project 'K', 'B' & 'S' are 37.5%, 36.19% and 18% respectively, the project 'K' is to be selected first as it is generating a high accounting return and second preference will be given to project 'B'.

Discounted cash flow techniques

The discounted cash flow techniques help to make the financial evaluation of projects more realistic by considering the differences in the value of money due to the difference in the time of accrual of income.

It is quite obvious that a rupee earned today is worth more than a rupee earned one year from now because during the period of one year the money can earn a return.

Two important discounted cash flow (DCF) techniques used in project evaluation are described below:

4.3.3 NET PRESENT VALUE METHOD

The net present value method (NPV) of a project may be defined as the difference between the present values of its cash inflows and outflows. The present value of a rupee earned at different points of time in future is available, for different discount rates from the net present value tables. The net present value of an investment proposal is =

Total Discounted Cash Flows – Original/Initial Investment

Where Total Discounted Cash Flows = Annual Cash Flow after Tax \times Discounting Factor at given cost of capital.

If the net present value is more than zero or zero, the project is accepted; if not, it is rejected. Another way to express the acceptance criterion is to say that the project will be accepted if the present value of cash inflows exceeds the present value of cash outflows. The required rate of return is the return investors expect the firm to earn on the investment

proposal. If the firm accepts a proposal with a net present value greater than zero, the market price of the stock would rise.

$$NPV = \left(\frac{A_1}{(1+K)} + \frac{A_2}{(1+K)^2} + \frac{A_3}{(1+K)^3} + \dots + \frac{A_n}{(1+K)^n} \right) - C$$

OR

$$NPV = \sum_{t=1}^n \frac{A_t}{(1+K)^t} - C$$

Acceptance Rule:

Accept the project if

$$NPV \geq 0$$

Reject the project if

$$NPV < 0$$

Where K = discount rate of required rate of return.

A_n = cash in flows at different parts of time.

C = initial outlay.

Problem -3

From the following information pertaining to three projects, Calculate Net Present Value and rank the projects for the investments

Particulars	Project 'K'	Project 'B'	Project 'S'
Profit Before Tax (PBT)	Rs.35, 000 (Even)	Rs. 40,000 (Even)	1 st Year- Rs. 25,000 2 nd Year- Rs. 30,000 3 rd Year- Rs. 35,000 4 th Year- Rs. 40,000 5 th Year- Rs. 45,000
Project Life	8 Years	7 Years	5 Years
Initial Cost	Rs. 80,000	Rs. 90,000	Rs. 1,00,000
Depreciation	Straight line	Straight line	Straight line
Corporate Tax	40%	40%	40%

Solution

Here, Cost of capital = 10%

Project 'K'			Project 'B'			Project 'S'		
Annual cash Flow after Tax	cost of capital @10%	Discounted cash flow tax	Annual cash Flow after Tax	cost of capital @ 10%	Discounted cash flow	Annual cash Flow after tax	cost of capital @10%	Discounted cash flow
25000	5.335	133375	29143	4.868	141868	23,000	0.909	20,907
						26,000	0.826	21,476
						29,000	0.751	21,779
						32,000	0.683	21,856
						35,000	0.621	21,735
		<u>133375</u>			<u>141868</u>			<u>1,07,753</u>

Net Present Value = Total Discounted Cash Flow - Original Investment

$$\text{Project 'K'} = 133375 - 80,000 = 53,375$$

$$\text{Project 'B'} = 141868 - 90,000 = 51,868$$

$$\text{Project 'S'} = 1,07,753 - 1,00,000 = 7,753$$

The Projects 'K', 'B', & 'S' are having a net present value of Rs.53,375, Rs.51,868 and Rs.7,753 respectively. Hence the project 'K' is to be selected as it is having a high net present value and second rank is given to project 'B' which is having second best net present value.

4.3.4 PROFITABILITY INDEX

The profitability index, or benefit/cost ratio, of a project is the present value of future net cash flows over the initial cash outlay. It can be expressed as

$$\text{Profitability Index} = \frac{\text{Total Discounted Cash Flow}}{\text{Original Investment}} \times 100$$

$$PI = \frac{\sum_{t=1}^n \frac{A_t}{(1+K)^t}}{C}$$

As long as the profitability index is 1.00 or greater than 1, the investment proposal is acceptable. For any given Project, the net present value method and the profitability index give the same accept-reject signals. If we have to choose between mutually exclusive projects, the net present value measure is preferred because it expresses in absolute terms the expected economic contribution of the project. In contrast, the profitability index expresses only the relative profitability. For example the profitability index can be calculated for the above-solved problem.

Calculation of Profitability Index

$$\text{Project 'K'} = \frac{1,33,375}{80,000} \times 100 = 166.71$$

$$\text{Project 'B'} = \frac{1,41,868}{90,000} \times 100 = 157.63$$

$$\text{Project 'K'} = \frac{1,07,753}{1,00,000} \times 100 = 107.75$$

The Projects 'K', 'B', & 'S' are having a profitability index 166.71%, 157.63% and 107.75% respectively. Hence the project 'K' is to be selected as it is having a high profitability index and second rank is given to project 'B' which is having second best profitability index.

4.3.5 INTERNAL RATE OF RETURN

The internal rate of return (IRR) may be defined as the rate of discount that reduces the net present value of a project to zero. The net present value would be zero when the present value of the earnings from the project is equal to present value of the investment in the project. In other words, the internal rate of return method finds out the earnings rate that equates the present value of the streams of earnings to the amount of investment outlay.

In the internal rate of return method, the discount rate is unknown. But in the case of present value method the discount rate is given.

The IRR is usually found by the trial and error method. With a given discount rate, if the present value of the earnings from the project is greater than the investment outlay, a higher rate should be tried. If the present value of the earnings is less than the investment outlay, a lower rate should be used. The present values for different periods at different discount rates are available from the present value tables.

It is quite obvious that project with IRR lower than the actual cost of capital will not be acceptable. If a choice is to be made from alternative projects, the one with the highest IRR will be selected, provided, of course, this IRR is higher than the cut-off rate, i.e., and the actual cost of capital.

Internal Rate of Return:

$$C = \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} + \frac{A_3}{(1+r)^3} + \dots + \frac{A_n}{(1+r)^n}$$

$$C = \sum_{t=1}^n \frac{A_t}{(1+r)^t}$$

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

Where A_t = cash in flows at different time periods.

r = the discount rate (internal rate)

C = present value of initial outlay.

Acceptance Rule:

When r is internal rate of return and k is the cost of capital.

Accept the project if

$$r \geq k$$

Reject the project if

$$r < k$$

Problem - 4

From the following information pertaining to three projects, Calculate Net Present Value and rank the projects for the investments

Particulars	Project 'K'	Project 'B'	Project 'S'
Profit Before Tax (PBT)	Rs.35, 000 (Even)	Rs. 40,000 (Even)	1 st Year- Rs. 25,000 2 nd Year- Rs. 30,000 3 rd Year- Rs. 35,000 4 th Year- Rs. 40,000 5 th Year- Rs. 45,000
Project Life	8 Years	7 Years	5 Years
Initial Cost	Rs. 80,000	Rs. 90,000	Rs. 1,00,000
Depreciation	Straight-line	Straight line	Straight line
Corporate Tax	40%	40%	40%

Here, Cost of capital =10%

Solution

Rough Guide (Even Projects) = Original Investment / Cash flow after taxes

Rough Guide (Uneven Projects) = Average excess cash flow over investment/Average investment

The rough guide for the project 'K' turns to 3.20 which lies in between the corresponding discounting factors for 5 years is 3.274 at 16% which is a lower interest rate and 3.199 at 17% which is at higher interest rate. Hence the present value at lower interest rate amounts

to 81,850 (25000*3.274) and the present value at higher interest rate amounts to 79,975 (25000*3.199).

$$\begin{aligned} \text{Internal Rate of Return} &= \text{LR} + \frac{\text{PV (I) L} - \text{Original Investment}}{\text{PV (I) L} - \text{PV (I) H}} \times (\text{HR} - \text{LR}) \\ &= 16\% + \frac{81,850 - 80,000}{81,850 - 79,975} \times (17 - 16) \\ &= 16\% + 0.9867 = 16.9867\% \end{aligned}$$

The rough guide for the project 'B' turns to 3.08 which lies in between the corresponding discounting factors for 5 years is 3.127 at 18% which is a lower interest rate and 3.057 at 19% which is at higher interest rate. Hence the present value at lower interest rate amounts to 91,130 (29,143 x 3.127) and the present value at higher interest rate amounts to 89,090 (29,143 x 3.057).

$$\begin{aligned} \text{Internal Rate of Return} &= \text{LR} + \frac{\text{PV (I) L} - \text{Original Investment}}{\text{PV (I) L} - \text{PV (I) H}} \times (\text{HR} - \text{LR}) \\ &= 18\% + \frac{91,130 - 90,000}{91,130 - 89,090} \times (19 - 18) \\ &= 18\% + 0.553 = 18.553\% \end{aligned}$$

The rough guide for the project 'S' turns to 3.61 which lies in between the corresponding discounting factors for 5 years is 3.695 at 11% which is a lower interest rate and 3.604 at 12% which is at higher interest rate. Hence the present value at lower interest rate amounts to 1,04,796 and the present value at higher interest rate amounts to 1,02,022.

$$\begin{aligned} \text{Internal Rate of Return} &= \text{LR} + \frac{\text{PV (I) L} - \text{Original Investment}}{\text{PV (I) L} - \text{PV (I) H}} \times (\text{HR} - \text{LR}) \\ &= 11\% + \frac{1,04,796 - 1,00,000}{1,04,796 - 1,02,022} \times (12 - 11) \\ &= 11\% + 1.72 = 12.72\% \end{aligned}$$

From the above calculations we can infer that the internal rate of return for the project 'K', 'B' & 'S' are 16.98%, 18.55% and 12.72% respectively. The project has to be ranked according to highest IRR. Hence the project 'B' is to be rank first as it is having the highest IRR and second rank is given to project 'K'.

4.4 COMPARISON OF THE IRR APPROACH WITH NPV

Though both NPV method and IRR are of the same sequence, they are different from each

other in several aspects: The important points of difference between the two are as follows:

- i) NPV takes the interest rate as a known factor while IRR takes it as unknown factor.
- ii) NPV method seeks to find out the amount that can be invested in a given project so that it anticipates the earnings exactly sufficient to repay this amount with interest at the market rate. On the other hand IRR seeks to find the maximum rate of interest at which the funds invested in the project should be repaid out of the cash inflow arising out of project.
- iii) Both of the methods proceed on the assumption that cash inflows can be reinvested at the discounting rate.

Similarities between NPV and IRR

Both the methods will give the same result i.e., acceptance or rejection regarding an investment proposal in the following cases:

- Projects involving conventional cash flows i.e., when an initial outflow is followed by a series of inflows
- Independent investment proposals i.e., proposals where the acceptance of which does not precede the acceptance of other

The reason for the similarity in the results in the above cases is simple. In case of NPV the proposal is acceptable when NPV is positive. NPV will be positive only when actual return on investment is more than the cut-off rate. In case of IRR, a proposal is acceptable only when IRR is higher than the cut-off rate. Thus, both the methods will give consistent results. Since acceptance or rejection of proposals is based on the actual return higher than the cut-off rate.

Conflicting Results under NPV and IRR

NPV and IRR methods may give conflicting results in case of mutually exclusive results i.e., Projects where acceptance of one would result in non-acceptance of the other. Such conflict of result may be due to any one or more of the following results.

- Projects require different cash outlays.
- The projects have unequal life.
- The projects have different patterns of cash flows.

In such a position the result given by NPV method should be relied upon this is because, the objective of the company is to maximize the share holders wealth. IRR method is considered with the rate of return on investment rather than the total yield of the investment. Hence, it is not compatible with the goal of wealth maximisation. NPV method considers the total yield on investment. Hence, in case of mutually exclusive projects each having positive largest NPV will have the most beneficial effect on shareholders wealth.

In case of projects, requiring different cash outlays the problems can also be resolved by adopting Incremental Approach i.e., Modified IRR. According to this approach, in case of two mutually exclusive projects requiring different cash outlays, the IRR of Incremental outlay of

the project requiring the higher initial investment is calculated. In case this IRR is higher than the required rate of return. The project having greater non-discounting cash flows should be accepted otherwise, it should be rejected.

At a particular rate of return, NPV of the project becomes zero. It is a point where the TDCF of the project nullifies with the original investment on the project. IRR is a combination of cost of capital plus premium for the risk taken up for the project. Therefore, IRR should be more than cost of capital to take the projects under acceptable zone. If IRR is less than cost of capital, the projects may not be considered for investment proposals.

Activity - 1

Compare and contrast the NPV and IRR.

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Problem - 5

For each of the following project Calculate

- i) Pay back Period
- ii) Accounting Rate of Return
- iii) Net Present Value
- iv) Profitability Index
- v) Internal Rate of Return

Particulars	Project 'X'	Project 'Y'	Project 'Z'
Initial Cost	Rs. 50,000	Rs. 50,000	Rs. 50,000
Depreciation	Straight line	Straight line	Straight line
Project Life	8 Years	8 Years	8 Years
Salvage value	3,000	4,000	5,000
Annual cash flow (After tax but Before tax)	10,000	15,000	14,000

The Cost of Capital of the Project is 12%

Solution

Pay Back Period

Particulars	Project 'X'	Project 'Y'	Project 'Z'
Annual cash flow	10,000	15,000	14,000
Add: Depreciation	5,875	5,750	5,625
Annual Cash flow after tax	<u>15,875</u>	<u>20,750</u>	<u>19,625</u>

Calculation of Pay Back Period

Pay Back Period = Original Investment / Annual Cash Flow after Tax

$$\text{Project 'X'} = 50,000 / 15,875 = 3.14$$

$$\text{Project 'Y'} = 50,000 / 20,750 = 2.40$$

$$\text{Project 'Z'} = 50,000 / 19,625 = 2.54$$

From the above calculations we can infer that the pay back period of project 'X', 'Y' & 'Z' are 3.14, 2.40, and 2.54 respectively. Hence the project, which has the lowest pay back period, has to be selected. Therefore project 'Y' has to be rank first and project 'Z' has to be ranked second.

Accounting Rate of Return

$$\text{A.R.R} = \frac{\text{Average Income}}{\text{Average Investment}} \times 100$$

Project 'X'

$$\text{Total income of all the years} = 15,875 \times 8$$

$$\text{Number of years of the project} = 8 \text{ years}$$

$$\text{Investment value at the beginning} = 50,000$$

$$\text{Investment value at the end} = 3000$$

$$\text{Average Income} = \frac{15,875 \times 8}{8} = 15,875.$$

$$\text{Average Investment} = \frac{50,000 + 3,000}{2} = \frac{53,000}{2} = 26,500$$

$$\text{A.R.R} = \frac{\text{Average Income}}{\text{Average Investment}} \times 100$$

$$= \frac{15,875}{26,500} \times 100 = 59.90 \%$$

Project 'Y'

$$\text{Total income of all the years} = 20,750 \times 8$$

$$\text{Number of years of the project} = 8 \text{ years}$$

$$\text{Investment value at the beginning} = 50,000$$

$$\text{Investment value at the end} = 4,000$$

$$\text{Average Income} = \frac{20,750 \times 8}{8} = 20,750$$

$$\text{Average Investment} = \frac{50,000 + 4,000}{2} = \frac{54,000}{2} = 27,000$$

$$\text{A.R.R} = \frac{20,750}{27,000} \times 100 = 76.85\%$$

Project 'Z'

Total income of all the years = 19,625 x 8

Number of years of the project = 8 years

Investment value at the beginning = 50,000

Investment value at the end = 5000

$$\text{Average Income} = \frac{19,625 \times 8}{8} = 19,625$$

$$\text{Average Investment} = \frac{50,000 + 5000}{2} = \frac{55,000}{2} = 27,500$$

$$\text{A.R.R} = \frac{19,625}{27,500} \times 100 = 71.36\%$$

From the above calculations we can infer that the accounting rate of returns of projects 'X', 'Y' & 'Z' are 59.9, 76.85%, and 71.36% respectively. Hence the project, which has the highest ARR, has to be selected. Therefore project 'Y' has to be rank first and project 'Z' has to be ranked second.

Net Present Value

Project 'X'			Project 'Y'			Project 'Z'		
Annual cash flow after tax	Cost of capital @12%	Discounted cash flow	Annual cash flow after tax	Cost of capital @ 12%	Discounted cash flow	Annual cash flow after tax	cost of capital @12%	Discounted cash flow
15,875	4,968	78,867	20,750	4,968	1,03,086	19,625	4,968	97,497

Calculation of Net Present Value

Net Present Value = Total Discounted Cash Flow - Original Investment

$$\text{Project 'X'} = 78,867 - 50,000 = 28,867$$

$$\text{Project 'Y'} = 1,03,086 - 50,000 = 53086$$

$$\text{Project 'Z'} = 97,497 - 50,000 = 47,497$$

From the above calculations we can infer that the net present value of projects 'X', 'Y' & 'Z' are 28,867, 53,086 and 47,497 respectively. Hence the project, which has the highest NPV, has to be selected. Therefore project 'Y' has to be rank first and project 'Z' has to be ranked second.

Profitability Index

$$\text{Profitability Index} = \frac{\text{Total Discounted Cash Flow}}{\text{Original Investment}} \times 100$$

Calculation of Profitability Index

$$\text{Project 'X'} = \frac{78,867}{50,000} \times 100 = 157.73$$

$$\text{Project 'Y'} = \frac{1,03,086}{50,000} \times 100 = 206.17$$

$$\text{Project 'Z'} = \frac{97,497}{50,000} \times 100 = 194.99$$

From the above calculations we can infer that the profitability index of project 'X', 'Y' & 'Z' are 157.73%, 206.17% and 194.99% respectively. Hence the project, which has the highest profitability index, has to be selected. Therefore project 'Y' has to be rank first and project 'Z' has to be ranked second.

Internal Rate of Return

$$\text{Rough Guide (Even Projects)} = \text{Original Investment} / \text{Cash flow after taxes}$$

The rough guide for the project 'X' turns to 3.14 which lies in between the corresponding discounting factors for 8 years is 3.156 at 27% which is a lower interest rate and 3.075 at 28% which is at higher interest rate. Hence the present value at lower interest rate amounts to 50,102 (15875 x 3.156) and the present value at higher interest rate amounts to 48,816 (15875 x 3.075).

$$\begin{aligned} \text{Internal Rate of Return} &= \text{LR} + \frac{\text{PV (I) L} - \text{Original Investment}}{\text{PV (I) L} - \text{PV (I) H}} \times (\text{HR} - \text{LR}) \\ &= 27\% + \frac{50,102 - 50,000}{50,102 - 48,816} \times (28 - 27) \end{aligned}$$

$$= 27\% + 0.0793 = 27.0793\%$$

The rough guide for the project 'Y' turns to 2.40 which lies in between the corresponding discounting factors for 8 years is 2.431 at 38% which is a lower interest rate and 2.380 at 39% which is at higher interest rate. Hence the present value at lower interest rate amounts to 50,443 (20750 x 2.431) and the present value at higher interest rate amounts to 49,385 (20750 x 2.380).

$$\begin{aligned} \text{Internal Rate of Return} &= \text{LR} + \frac{\text{PV (I) L} - \text{Original Investment}}{\text{PV (I) L} - \text{PV (I) H}} \times (\text{HR} - \text{LR}) \\ &= 38\% + \frac{50,443 - 50,000}{50,443 - 49,385} \times (39 - 38) \\ &= 38\% + 0.0418 = 38.0418\% \end{aligned}$$

The rough guide for the project 'Z' turns to 2.54 which is the corresponding discounting factors for 8 years at **36%**.

From the above calculations we can infer that the internal rate of returns of project 'X', 'Y' & 'Z' are 27.07%, 38.04% and 36% respectively. Hence the project which has the highest IRR is to be selected. Therefore project 'Y' is ranked first and project 'Z' is ranked second.

4.5 LIMITATIONS OF INVESTMENT APPRAISAL TECHNIQUES

Capital budgeting techniques involve an entire range of data relating to the expected cash inflows, outflows, equipment life, human and material performance etc. Under such conditions of uncertainty, skillful management and judgment is very difficult. Sensitivity analysis and other advanced evaluation techniques cannot ensure best possible choice if data is erroneous. The bias in respect of estimation of cash inflows, outflows and inflation may complicate the evaluation further.

Only finance related variables are considered in this process. Certain factors cannot be measured in quantifiable terms like impact of investments on employee morale are not considered. Similarly, social, political, economic factors are not considered in this process. To this extent, this impairs the validity and acceptance of capital budgeting appraisal techniques.

All the difficulties underlying capital budgeting decisions discussed earlier, set limitations for these techniques.

Finally, the estimate of the useful or economic life of a project or asset is probably the most difficult of all, for it depends upon several environmental factors technological and marketing. An engineer's guess as to the useful life of a productive asset can be fairly reliable only if the rate of technological change and obsolescence can be properly estimated. The profitable career of a new product depends upon customer acceptance and competitor's reactions - both highly speculative phenomena. Certain statistical techniques based on probability are helpful in minimizing the errors of estimating under conditions of uncertainty, but they cannot eliminate uncertainty and, therefore, error entirely. The soundness of the

decision, therefore, would not only depend on the right choice (or combination) of appraisal technique, but also on sound common sense and judgment of the decision maker

4.6 SUMMARY

The profitability appraisal techniques for long term investment proposals can be broadly divided into traditional and modern techniques. Payback and Average Rate of Return methods constitute traditional techniques. The Internal Rate of Return and Net Present Value Methods constitute modern methods.

Under pay back method, pay back period is determined. Pay back period refers to the minimum period within which the original investment is recovered. Post pay back earnings are not considered in this method. Accounting or Average Rate of Return refers to the rate of return on proposal yields considering original investment and average annual profits. This may be calculated under different assumptions viz., annual profits before taxes or after taxes, before depreciation or after depreciation, etc. Average investment also is used as a substitute to original investment.

Both Payback and ARR do not consider time value of money.

The modern techniques also referred to as time adjusted rates and are based on time value of cash flows. The present value of future cash flows is determined for further analysis.

Internal Rate of Return is that rate of return which equates the present value of future cash flows and original investment.

Net Present Value is the excess of total present values of cash flows over and above the original investment

Present value index is based on considering total present value of cash flows and original investment. It is the relationship between present value of the cash inflows discounted at the desired rate and the cost of the investment. In general, discounted cash flow techniques provide the most reliable appraisals of alternative investment proposals. The use of present value tables makes these techniques reasonably simple to employ.

Certain limitations underlie all capital budgeting appraisals. However, the three basic factors of the quantitative analytical techniques—investment, return, and time are the results of estimates. Certain techniques like sensitivity analysis have been developed which help to narrow the margin of error of such estimates.

4.7 SELF ASSESSMENT QUESTIONS

I. Short Questions

1. Define Capital Budgeting.
2. What is the need for capital budgeting?
3. Name various methods of capital budgeting.
4. Write a note on capital budgeting process.
5. What is capital expenditure budget?

6. What are the limitations of capital budgeting?
7. Write a short note on Net present Value as a technique of capital budgeting.
8. Write a brief note on NPV and IRR.
9. What are the kinds of capital budgeting decisions?

II. Essay Questions

1. What is the capital budgeting decision such an important process? Why are capital budgeting errors so costly?
2. The novice to capital budgeting may interpret the term project to mean only a new investment in plant and equipment. Evaluate this assumption as it relates to the overall theory of the firm.
3. Would it be beneficial for firm to review its past capital expenditure and capital budgeting procedures? Why.
4. Are all investment projects interdependent? Suggest some projects that are relatively independent. What kind of firm is most likely to have independent projects?
5. How should working capital be treated in analyzing investment opportunities?
6. Why do we focus on cash flows rather than on actual profit in making our capital budgeting decisions? Why are we interested only in incremental cash flows rather than total cash flows?
7. Many firms continue to use obsolete machinery long after new more efficient equipment is available. Under what circumstances would this represent poor financial planning?
8. If depreciation is not cash flow expenses, does it affect the level of cash flows from a project anyway?
9. Why do we focus on cash flows rather than on actual profit in making our capital budgeting decisions? Why are we interested only in incremental cash flows rather than total cash flows?
10. Explain the merits and demerits of both traditional and modern techniques of Capital Budgeting.
11. Discuss the limitations of capital budgeting. Can you overcome these?

Problems

1. A project costs Rs.40,00,000 and yields annually a profit of Rs. 600000 after depreciation @ 15% but before tax at 50%. Calculate the pay back period.
2. A Company is considering two mutually exclusive investments. Both projects involve a cash outlay of Rs. 50000. Project X is estimated to produce after tax net cash inflows of Rs.10000 per year for 10 years; Project Y Rs.16,209.44 per year for 5 years.
 - i) Which project should be acceptable to the company at 10% cost of capital?

- ii) Is your decision affected if a) Cost of capital rises to 12% falls to 8%
- iii) Sketch the Net Present Value profile at 0%, 5%, 10%, 15%, and 20% rates of discount
- iv) Can you determine the value of IRR from the present value profile? If yes, what are its values for project X and project Y
3. A company is considering two mutually exclusive projects. Both require an initial cash outlay of Rs. 100000 each (with no salvage value) and have a life of 5 years. The company requires a rate of return of 10 and it pays a tax at a rate of 50%. The project will be depreciated on a straight line basis. The cash flows (before depreciation and tax) expected to be generated by the projects are as follows:

Year	1	2	3	4	5
Project A	40000	40000	40000	40000	40000
Project B	60000	30000	20000		

Calculate the net present value and the Internal Rate of Return for each project and suggest which project should be accepted and why.

4.8 FURTHER READINGS

1. James C Van Horne : **Financial Management and Policy**
2. John H Hampton : **Financial Decision Making**
3. M Y Khan and P K Jain : **Financial Management**
4. V.K. Bhalla : **Financial Management and Policy**
5. R.K. Sharma and Shashi K. Gupta : **Financial Management**
6. S. N. Maheswari : **Financial Management**
7. I.M. Pandey : **Financial Management**

4.9 KEY WORDS

- Capital Investment** : It is a process of making investment decisions in capital expenditures which is also called as capital budgeting
- Project Evaluation** : There are many methods which will be used to evaluate the project risk and expected returns. Some of the important ones are payback period, average rate of return, Net Present Value and Internal Rate of Return.

- Payback Period** : It is the time period that takes to recover the original investment made on the project. When more than one project/investment proposals are evaluated under this appraisal technique, a project which gives the investment back as early as possible will be opted.
- Discounted Pay Back Method** : It is an improvement over payback method. Under this method, the present value of all cash outflows and inflows are computed at an appropriate discount rate
- Post Pay Back Period** : This is also called as surplus life over pay back period. According to this method, the project which gives the greatest pay-back period may be accepted. This method can be employed successfully where the various projects under consideration do not differ significantly as to their size and the expected cash inflows are even throughout the life of the project.
- Net Present Value** : One of the important techniques of Discounted Cash Flows for capital Budgeting evaluation which seeks to determine whether the present value of estimated future cash inflows at management's desired rate of return is greater or less than the cost of the proposal.
- Internal Rate of Return** : That rate which equates the present value of the future cash inflows with the cost of the investment which produces them.
- Cost of Capital** : The cost of raising capital in the market, which may include interest on borrowed money or the relation of a company's earnings to the market value of its equity shares as the dividend payable to equity share holders is also defined as cost of capital on equity funds.
- Salvage Value/Scrap Value** : The residual value of a depreciable asset at the end of its useful life.
- Mutually Exclusive Projects** : Such decisions relate to proposals which compete with one another in such a way that acceptance of one automatically excludes the acceptance of the other.
- Obsolescence** : There are certain projects which have greater risk of obsolescence than others. In case of projects with high rate of obsolescence, the project with lesser payback period may be preferred than one which may have higher profitability but still longer pay-back period.

UNIT – 5 : RISK AND CAPITAL BUDGETING

Objectives

This unit aims at explaining the different approaches to evaluate the risk in the investment decisions.

After studying this unit, you should be able to:

- explain the concepts of certainty, risk and uncertainty;
- state the causes of risk and uncertainty in the project investment decisions; and
- describe various methods of accounting for risk in capital budgeting.

Structure

- 5.0 Introduction
- 5.1 Certainty, Risk and Uncertainty
- 5.2 Causes of Risk and Uncertainty
- 5.3 Procedure for Analysing Risk Investments
 - 5.3.1 Risk Adjusted Discount Rate Approach
 - 5.3.2 Certainty-Equivalent Approach
 - 5.3.3 Sensitivity Analysis
 - 5.3.4 Probabilistic Method: Single Project
 - 5.3.5 Decision Trees and Sequential Investment Decisions
- 5.4 Simulation Analysis
- 5.5 Summary
- 5.6 Self Assessment Questions
- 5.7 Further Readings
- 5.8 Key Words

5.0 INTRODUCTION

The capital budgeting techniques enable us to make rational decisions, under the conditions of complete certainty on the cash flows resulting from undertaking an investment. The condition of complete certainty implies that the estimated cash flow from the operation of the firm would occur as forecasted. Now, we must face the reality and the world we live in is of change and uncertainty, and financial managers know that they are not omniscient. For example, the invention of new method of production may render his proposed investment more or less obsolete; may erase or substantially reduce the anticipated net income of future years. To be sure, the business world has developed a number of methods of reducing uncertainty or otherwise shifting uncertainty completely. Therefore, the necessity of incorporating an uncertain future into capital budgeting techniques raises several questions: What exactly is this uncertainty?

5.1 CERTAINTY, RISK AND UNCERTAINTY

A decision-maker may be faced with conditions of certainty, risk and uncertainty. Certainty postulates that the decision-maker knows in advance the precise values that all the parameters that may affect the decision will take on. Risk postulates that the decision maker is aware of all possible future states of the economy and business, which may occur and have places a probability on the value of the occurrence of each of these states. Uncertainty postulates that the decision-maker may or may not be aware of all the possible states that affect the decision and may or may not be able to place a probability distribution on the occurrence of each.

The classical distinction between risk and uncertainty is that the risk or analysis accordingly assumes that the possible outcomes are known and the probabilities for each of the outcomes are assigned. Uncertainty indicates lack of confidence and the probability distribution may be not take place. However, the words risk and uncertainty are used interchangeably.

5.2 CAUSES OF RISK AND UNCERTAINTY

Risk and uncertainty in the project investment decisions are attributable to many possible sources. A brief description of some main causes is as follows:

i) Insufficient numbers of similar investments

In general, a firm will have only a few investments of a particular type. This means that there will be insufficient opportunity for the result of particular investment type to "average out", i.e., for the effect of unfavorable outcomes, to be virtually cancelled by favorable outcomes. This type of risk is dominant when the magnitude of the individual investment commitment is large compared to the financial resources of the firm.

ii) Bias in the data and its assessment

It is common that individuals making or reviewing economic analysis have biases of optimism or are unconsciously influenced by factors, which should not be a part of an objective study. A pattern of consistent optimism or pessimism on the part of an analyst should be recognized through analysis and review procedures.

iii) Changing external economic environment, invalidating past experiences

External environment undergoes changes resulting in invalidation of past experience. While the past information is often valuable, there is risk in using it directly without adjustment for expected future conditions.

iv) Misinterpretation of data

Misinterpretation may occur if the underlying factors behind the elements to be estimated are so complex that the relationship of one or more factors to the desired elements is misunderstood.

v) Errors of analysis

Errors can occur either in analysis of the technical operating characteristics of the project or in the analysis of the financial implications of a project.

vi) Managerial talent availability and emphasis

The performance of an industrial investment project or set of projects usually depends on the availability and application of managerial talent once the project has been undertaken. In general, management talent is a very limited resource within a firm. Hence, it follows that the results of some projects are going to suffer compared to the results of other project. Thus, there is risk due to lack of availability of needed managerial talent applied to investment projects.

vii) Salvageability of investment

Of prime consideration in judging risk is the relative recoverability of investment commitments in the case of liquidations of project. For example, an investment in a special purpose equipment which would have a high percentage salvage value if sold because of poor operating results of descriptive synonym is "bail-out ability."

viii) Obsolescence

Rapid obsolescence, change and progress are the characteristics of a dynamic economy. Not only do products become superceded, but also changes in process technology can render existing facilities obsolete.

Activity – 1

What are the causes of risk and uncertainty in the project investment decisions?

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5.3 PROCEDURE FOR ANALYSING RISKY INVESTMENTS

There are many approaches to the incorporation of risk into capital budget. Their applicability varies among the decision criteria and situations. Basically, there are two major competing methods for making risky long-term investment decisions: the risk adjusted discount rate approach and the certainty equivalent approach. We will investigate both of these methods and some other procedures used to evaluate risky long-term investment prospects, but we will concentrate first on the risk adjusted discount rate approach and the certainty equivalent approach since they represent fairly complete decision systems, most widely used by both theorists and practitioners, and are logically consistent with the firm's goal of shareholder's wealth maximization.

All the techniques of capital budgeting require the estimation of future cash inflows and cash outflows. The future cash flows are estimated, based on the following factors:

- i) Expected Economic Life of the Project
- ii) Salvage Value of the asset at the end of the economic life

- iii) Capacity of the project
- iv) Selling Price of the product
- v) Production Cost
- vi) Depreciation Rate
- vii) Rate of taxation
- viii) Future demand of the product.

But due to uncertainties about the future, the estimates of demand, production, sales, costs, selling price cannot be exact. For example, a product may become obsolete much earlier than anticipated due to unexpected technological developments. All these elements of uncertainty have to be taken into account in the form of foreseeable risk while taking a decision on investment proposals. It is perhaps the most difficult task while making an investment decision. But some allowances for the element of risk have to be provided.

The following methods are suggested for accounting for risk in Capital Budgeting:

- i) Risk-Adjusted Cut off Rate or Method of Varying discount Rate
- ii) Certainty Equivalent Method
- iii) Sensitivity Technique
- iv) Probability Technique
- v) Standard Deviation Method
- vi) Co-efficient of Variation Method
- vii) Decision Tree Analysis

5.3.1 RISK ADJUSTED DISCOUNT RATE APPROACH

The risk adjusted discount rate approach is based on the promise that the riskiness of a project may be accounted for by adjusting the discount rate (cost of capital). Relatively risky projects would have relatively high discount rates and relatively safe projects would be assigned relatively low discount rates.

When finance manager considers other possible investments besides the risk free government securities, it is necessary to adjust the cost of capital (discount rate) in the present value capital budgeting procedures to reflect additional risk such that:

The risk-adjustment premium added to the risk free rate (T) reflects the greater risk attached to this project than attached to a government debt obligation. As the risk increases, the risk-adjustment premium also increases and the risk-adjusted cost of capital to the project rises.

In order to get some feel for the size of the risk adjustment, the finance manager will again turn to the dispersion in the distribution of cash flows. As the dispersion increases, the risk also increases.

In a somewhat arbitrary fashion, the finance manager will determine the risk premium for the entire firm in comparison to the risk free rate. The next step is to divide the coefficient of variation of the project by the coefficient of variation of the firm's cash flows and decide if the project has a greater or lesser risk than the entire firm. If the coefficient of variation of the

project is less than that of the firm then the risk-adjusted discount rate for the project is less than that of the firm, and vice-versa.

Using the expected value of the cash flow distributions for each year in the project's life and the risk-adjusted discount rate, the finance manager will find the risk-adjusted net present value for the project. For example, if the funds borrowed for the business cost 10% and the risk premium expected from the business operations is 5%, then the risk adjusted rate of return will be $10\% + 5\% = 15\%$. Therefore, risk premium is based on investors attitude towards the risk.

The risk adjusted discount rate method can be expressed as follows:

$$NPV = \sum_{t=1}^n \frac{A_t}{(1+K^*)^t}$$

Where K^* is a risk adjusted discount rate.

$$K^* = i + P$$

i = Risk free rate.

P = The risk premium.

Problem - 1

Consider an investment project costing Rs.50,000 initially and expected to generate cash flows Rs.25,000, Rs.20,000, Rs.10,000 and Rs.10,000. Calculate NPV if cost of capital is 10%. Also calculate NPV if risk premium of 5% is added to the cost of capital.

Original Cash Flows	Discounting Factor at 10%	Discounting Cash Flows
25,000	0.909	22,725
20,000	0.826	16,520
10,000	0.751	7,510
10,000	0.683	6,830
		<u>53,585</u>

$$\text{Net Present Value} = \text{Total Discounted Cash Flows} - \text{Original Investment}$$

$$= 53,585 - 50,000 = 3,585$$

Original Cash Flows	Discounting Factor at 15%	Discounting Cash Flows
25,000	0.870	21,750
20,000	0.750	15,000
10,000	0.658	6,580
10,000	0.572	5,720
		<u>49,050</u>

Net Present Value = Total Discounted Cash Flows – Original Investment

$$= 49,050 - 50,000 = (-950)$$

5.3.2 CERTAINTY-EQUIVALENT APPROACH

Some financial theorists object to a risk adjusted discount rate to evaluate risky proposals. The objection goes like this. There are two important things to account for in the valuation process, the time value of money and risk attitudes. But these two concepts should be logically separated in the valuation process. Specifically, use of a discount rate that lumps together the risk free interest rate and a risk premium is wrong. That is, discounting for the futurity of cash flows should only include time value considerations and not risk consideration. Adding the risk premium into discount rate leads to compounding of risk over time, which is a questionable practice.

Proponents of this argument advocate an alternative evaluation method that avoids the problem of including a risk premium in the discount factor. This approach is called certainty equivalent approach. The decision rule associated with the certainty equivalent approach is to undertake the project if its certainty-equivalent NPV is greater than zero. For any of the other present value decision criteria, the rule is similarly altered to reflect the present value of the certainty-equivalent cash flows in relation the project's cost.

A common procedure for dealing with risks in capital budgeting is to reduce the forecast of cash flows to some conservative levels. If an investor according to his estimate expects a cash flow of Rs.60,000 initially he revises the estimation of cash flows to only Rs.40,000 which is a safe estimation.

The NPV under certainty equivalent approach is calculated as follows:

$$NPV = \sum_{t=1}^n \frac{\alpha_t A_t}{(1+i)^t}$$

Where A_t = The forecast of cash flow without risk adjustment.

α_t = The risk adjustment factor or certainty equivalent coefficient.

i = Risk free rate.

Solution

Therefore, a very simple method is to reduce the estimated cash flow by a factor Beta.

$$\text{Beta} = \frac{\text{Certain Cash Flows}}{\text{Uncertain Cash Flows}} = \frac{40,000}{60,000}$$

Uncertain cash flows are estimated based on certain factors like demand, price, advertising, cyclic fluctuations, market conditions and consistent performance of the company and competition.

Problem - 2

Consider a project, which costs Rs.6,000 and has a cash flow of Rs.4,000, Rs.3,000, Rs.2,000 and Rs.1,000 in four years and the associated beta factors are estimated to be 0.9, 0.7, 0.5 and 0.3 and the risk free discount rate is 10%. Calculate NPV.

Solution

Original Cash Flows	Certainty Equivalent Factor	Revised Cash Flow	Discounting Factor at 10%	Discounting Cash Flows (Rs.)
4,000	0.9	3,600	0.909	3,272.4
3,000	0.7	2,100	0.826	1,734.6
2,000	0.5	1,000	0.751	751.0
1,000	0.3	300	0.683	204.9
				<u>5,962.9</u>

$$\begin{aligned}\text{Net Present Value} &= \text{Total Discounted Cash Flows} - \text{Original Investment} \\ &= 5,962.9 - 6000 = (37.1)\end{aligned}$$

Risk adjusted discount rate versus Certainty - equivalent

The risk adjusted discount rate approach is an intuitively appealing method. It seems very logical to apply a higher discount rate to more risky proposals and lower discount rate to less risky proposals. Also, the theory behind determining the risk adjustment cost of capital is well developed and provides some concrete guidance about how to find risk adjusted discount rates. Thus the method is both plausible and operationally tractable. On the disadvantage side, the use of a risk adjusted discount rate clearly equates discounting for time with discounting for risk. This implies that risk necessarily increases with time since the discount factor for year $t+1$ is less than the discount factor for year t . Certainty equivalent proponents argue that in some years risk may be the same. Handling risk by increasing the discount rate necessarily implies that risk increases with time.

Because the certainty equivalent method can properly account for cash flow patterns that do not exhibit increasing risk with time, it is a more flexible model and has more generality. And this is the outstanding feature of the certainty equivalent approach. On the negative side, the certainty equivalent approach is not as intuitively appealing to as the risk adjusted discount rate method. It is more difficult to both understand and explain the certainty equivalent adjustment made in the numerator of the expected cash flows. Also, implementation of the approach is more difficult. As opposed to the risk adjusted discount rate approach, which in addition to expected cash flows, requires estimation of only one other parameter i.e., risk adjusted discount rate, while the certainty equivalent approach requires the analyst to estimate a certainty equivalent factor for each year.

In summary, both methods have good and bad features. The essence of the difference between the two methods is that the risk adjusted discount rate method accounts for risk by adjusting the discount rate in the denominator of the expected net present value formula, while the certainty equivalent approach accounts for risk by adjusting the expected cash flows in the numerator of the expected net present value formula.

Activity - 2

Distinguish between risk adjusted discount rate and certainty equivalent approach.

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5.3.3 SENSITIVITY ANALYSIS

Sensitivity analyses are performed when conditions of uncertainty exist for one or more parameters. The objectives of a sensitivity analysis are to provide the decision maker with information concerning the behavior of the measure of economic effectiveness. The term sensitivity analysis is derived from the desire to measure the sensitivity of a decision to changes in the values of one or more parameters.

Sensitivity analysis is not really a risk-reducing or risk measuring technique. It is a technique for evaluating the robustness of a given model by relaxing some of its assumptions.

5.3.4 PROBABILISTIC METHOD : SINGLE PROJECT

We shall review here two examples using probabilistic method for the analysis of investment decision. Both cases will be limited to the consideration of single-project decisions. The first case, by Hillier, utilize analytical techniques, while the second one Hertz, employs simulation. The constraint of single-project consideration, is theoretically acceptable under the following conditions;

- i) If the investment in consideration will constitute the only asset entering the firm's production function within its planning horizon, and
- ii) If the other assets possessed by the firm are considerably smaller than the one contemplated. Then, the other assets can be omitted from the analysis and the single asset technique will yield approximate results of practical value.

HILLIER'S MODEL

Frederick S Hillier proposed an approach for specifying information about an investment proposal in a more explicit manner. This approach is meant to appraise management of the variety of consequences involved in a decision; thus it is intended as a complement, rather than a substitute, to existing evaluation procedures.

Hillier combines the assumption of mutual independence and perfect correlation in developing a model to deal with mixed situations. The model enables the analysis of investment proposal in which some of the expected cash flows over time are closely related and others are fairly independent. To illustrate the model, suppose that a firm is considering the introduction of a new product with returns expected over the next five years. Because the product's market reception is uncertain, management feels that if initial receptions exceed expectations, receptions in later year also will exceed expectations in about the same proportion. We could say that if the periods are correlated, once it starts to deviate from the expected; it would continue to deviate again in the next period making the total deviation over the entire life of the project rather large, since the deviations would cumulate.

The decision makers should at least be aware of this possibility. The financial manager can make them aware of it by specifying the correlation coefficient (r) among the cash flows of the different periods:

When the correlation coefficient equals zero, the cash flow are independent between periods, and can use the simple mean standard deviation approach. When the correlation coefficient reaches one, the cash flows in the different periods are perfectly positively correlated so that as this period's cash flow deviates from its expected value, next period's cash flow will also deviate from its expected value by a proportional amount. If the cash flows are perfectly positively correlated, the effect of the deviations from the expected value causing relatively large deviation from the expected value for the entire project. We must also account for this in our calculations of the expected NPV and standard deviation.

HERTZ'S MODEL

It is an important contribution to evaluating risky investments David B. Hertz proposed the use of a simulation model to obtain the expected return and dispersion about this expected return for an investment proposal. It has enjoyed widespread acceptance in practice because of the analytical power it makes possible without the necessity for complex mathematics. It is especially adaptable to computation by digital computers. Indeed, computer languages have been developed especially to facilitate Monte Carlo simulation. The technique is sometimes descriptively called the method of statistical trials. It involves first, the random selection of an outcome for each variable (element) of interest, the combining of these outcomes with any fixed amounts, and calculation if necessary to obtain one trial outcome in terms to the desired answer (measure of merit). This, done repeatedly, will result in enough trial outcomes to obtain a sufficiently close approximation of means, variance, distribution shape, or other characteristic of the desired answer.

The key requisite of the simulation technique is that the outcomes of all variables of interest be randomly selected, i.e., that the probability of selection of all possible outcomes be in exact accord with their respective probability distributions. This is accomplished through the use of tables of random numbers and relating these numbers to the distributions of the variables. Random numbers are numbers which have been generated in such a way that there is an equal probability of any number appearing each time, regardless of what sequence is experienced at any prior time.

5.3.5 DECISION TREES AND SEQUENTIAL INVESTMENT DECISIONS

Decision trees, also commonly called decision flow networks and decision diagrams, are powerful means for depicting and facilitating the analysis of important problems, especially those that involve sequential decisions and variable outcomes over time. Decision trees have great usefulness in practice because they make it possible to look at a large complicated problem in terms of a series of smaller simple problems and they enable objective analysis and decision making which includes explicit consideration of the risk and effect of the future.

The name decision tree is descriptive of the appearance of a graphical portrayal, for it shows branches for each possible alternative of a given decision and branches for each possible outcome (event) which can result from each alternative. Such networks reduce abstract thinking to a logical visual pattern of cause and effect. When costs and returns are associated with each branch and probabilities are estimated for each possible outcome, then analysis of the network can clarify choices and risks.

In business, decision trees may be used to clarify problems involving a whole sequence of decision in which the alternative and their relative attractiveness at one stage depends on the decision taken at the stage before. In each case the consequence of the decision depends on the outcome of some chance event. The outcome of the chance event cannot be known at the time the decision is taken, though a probability distribution can subjectively be assigned to it. For example, the financial manager might have to decide between immediately launching a full scale project and undertaking small pilot project now with a second stage decision about going full scale to be made later. The small-scale pilot project, if successful could capture the market ahead of the competition. The question is to decide which alternative under the conditions of risk is more acceptable?

In such a situation, it is often more realistic to examine the future cash flows under different assumed conditions such as different levels of demand. That is, we can assume different conditions under which different possible outcomes might occur during the next period. We can make another set of different assumptions concerning the period after that, and so on. Then we can examine the possible outcomes in each period to evaluate the project.

How does one find his way through this maze and select the best sequence of decisions? The decision maker assigns probabilities and monetary values of each of the outcomes in the tree. Then, he calculates expected monetary values of each of the paths, and working from right to left, chooses that path (that set of decisions) that has the highest expected monetary value.

The systematic approach of decision tree analysis has its merits and demerits. Indeed, what is a pro to some analysis and decision-maker may well be a con to others. The following is a synthesis of often claimed advantages:

- i) **Makes uncertainty explicit:** The uncertainty which the analyst feels about estimates or projects is recognized and incorporated in the analysis.
- ii) **Promotes more reasoned estimating procedures** by requiring that estimates be given as probability distributions.
- iii) **Helps communication:** It facilitates the provision of inputs in an unambiguous quantitative manner from experts and analysts as needed and it provides these results to the decision-maker in a clear manner.
- iv) **Encourages consideration of whole problem:** The systematic approach forces the analyst or decision-maker to come to quantitative grips with the interactions between various facts of this problem.
- v) **Helps to determine need for data and study:** The systematic examination of the value of information in a decision context helps to suggest the gathering and compilation of data from new sources.
- vi) **Helps "sell" decision:** A hard and thorough analysis can be used to emphasize that a decision has not been made frivolously and to rally support for the decision.
- vii) **Stimulates generation of new alternatives:** Detailed decision analysis helps the decision-maker and his staff to think hard about new viable alternatives.
- viii) **Provides framework contingency planning:** Decision analysis not only results in an initial decision but it can be used as a basis for continuous re-evaluation of decision problem that has a distant time horizon.

The following are the disadvantages

- i) **Tends to exclude consideration of intangibles:** Because a well-done decision analysis is thorough, there is a tendency to place great reliance on the quantitative results.
- ii) **The clear basic questions are often difficult:** Often the decision-maker would rather take refuge in the fuzziness and complexity of real life situations than reveal preferences in a number of broken-down or starkly simple decision situations.
- iii) **Requires expert articulation of the thought process:** A decision-maker may be a great synthesizer of interconnected considerations through sub-conscious thinking, but he may be unable to give a verbal description of his thought process, thus making it appear that is much more restricted in the complexity of his analysis than is actually true.
- iv) **Decision analysis tends to lack compassion:** Persons who elect to get into formalized systematic analysis are so prone to attach numbers to everything that they tend to exclude many human and artistic qualities and therefore they inhibit creativity.

In this decision trees, cash flows are dependent. The realization of the estimated cash flows of the second year is subject to the realization of the estimated cash flow of the next year. It links events chronologically and forecasts probabilities and thus gives a systematic appearance of decision and thus forecasted results. The decision tree is then laid down showing the decision point (cash outlay) and decision branches. The forecasted cash flows regarding each decision branch are also shown along with the branch. Probabilities are also arising to each cash flow expected values of fixed returns are calculated. The total expected value for the decision is determined. Having determined the expected value of each decision, the results are analysed.

The points to be considered in a decision tree analysis are:

- Dependent Cash flows.
- More than one cash flow in a particular year.
- The second point is due to riskyness of the project.
- Whenever estimations are more than one in a single year.
- Probabilities need to be assigned to each and every possible outcome.

Activity – 3

What are the plus points of decision tree analysis?

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Problem - 3

X Ltd is considering the purchase of Plant 'P' and Plant 'Q' and their cash outlays are 20,000 and 40,000 respectively. The Plants are expected to have a life of 2 years each, without any Salving value. The cash flows and their respectable probabilities are given below:

1st YEAR

Plant 'P'		Plant 'Q'	
Cash Flow Estimation	Probability	Cash Flow Estimation	Probability
8,000	0.3	10,000	0.1
11,000	0.4	7,000	0.4
15,000	0.3	12,000	0.5

2nd YEAR

Plant 'P'		Plant 'Q'	
Cash Flow Estimation		Cash Flow Estimation	
8000	PROBABILITY	10,000	PROBABILITY
4000	0.2	8000	0.2
10,000	0.6	11,000	0.4
15,000	0.2	22,000	0.4
11,000	PROBABILITY	7,000	PROBABILITY
13,000	0.3	16,000	0.1
15,000	0.4	17,000	0.25
16,000	0.3	20,000	0.65
15,000	PROBABILITY	12,000	PROBABILITY
16,000	0.1	20,000	0.2
20,000	0.8	18,000	0.5
24,000	0.1	27,000	0.3

Assuming that 10% is the cost of capital, plot the above information for the two projects in the form of a decision tree and calculate their Net present values and select the Profitable Project.

Solution

Calculation of Net Present Value for Plant 'P'

Cash Flow		Discounted Cash flow @ 10%		Discounted Cash flow		Total Discounted cash flow (1yr+2yr)	Original Investment	Net Present value
1yr	2yr	1yr	2yr	1yr	2yr			
8,000	4,000	0.909	0.826	7,272	3,304	10,576	20,000	(9424)
8,000	10,000	0.909	0.826	7,272	8,260	15,532	20,000	(4468)
8,000	15,000	0.909	0.826	7,272	12,390	19,662	20,000	(338)
11,000	13,000	0.909	0.826	9,999	10,738	20,737	20,000	737
11,000	15,000	0.909	0.826	9,999	12,390	22,389	20,000	2,389

11,000	16,000	0.909	0.826	9,999	13,216	23,215	20,000	3,215
15,000	16,000	0.909	0.826	13,635	13,216	26,851	20,000	6,851
15,000	20,000	0.909	0.826	13,625	16,520	30,155	20,000	10,155
15,000	24,000	0.909	0.826	13,635	19,824	33,459	20,000	13,459

Calculation of Net Present Value for Plant 'Q'

Cash Flow 1yr	Discounted Cash flow @ 10% 2yr	Discounted Cash flow		Total Discounted cash flow (1yr+2yr)	Original Invest- ment	Net Present value
		1yr	2yr			
10,000	8,000	0.909	0.826	15,698	40,000	(24,032)
10,000	11,000	0.909	0.826	18,176	40,000	(21,824)
10,000	22,000	0.909	0.826	27,262	40,000	(12,738)
7,000	16,000	0.909	0.826	19,579	40,000	(20,421)
7,000	17,000	0.909	0.826	20,405	40,000	(19,595)
7,000	20,000	0.909	0.826	22,883	40,000	(17,117)
12,000	20,000	0.909	0.826	27,428	40,000	(12,752)
12,000	18,000	0.909	0.826	25,776	40,000	(14,224)
12,000	27,000	0.909	0.826	33,210	40,000	(6790)

Decision Tree for Plant 'P'

Year 0	Year 1		Year 2		Net Present value	Joint Proba- bility	Expected N.P.V
	Proba- bility	Cash flow	Proba- bility	Cash flow			
Decision Point Cash outlay 20,000	0.3	8,000	0.2	4,000	(9,424)	0.06	(565.4)
			0.6	10,000	(4,468)	0.18	(804.2)
			0.2	15,000	(338)	0.06	(20.3)
	0.4	11,000	0.3	13,000	737	0.12	88.4
			0.4	15,000	2,389	0.16	382.2
			0.3	16,000	3,215	0.12	385.8
	0.3	15,000	0.1	16,000	6,851	0.03	205.5
			0.8	20,000	10,155	0.24	2437.2
			0.1	24,000	13,459	0.03	403.7
							<u>2512.9</u>

The Expected Net Present Value of the decision tree is 2,512.9

Decision Tree for Plant 'Q'

Year 0	Year 1		Year 2		Net Present Value	Joint Probability	Expected N.P.V	
	Probability	Cash Flow	Probability	Cash Flow				
Decision Point Cash outlay 40,000	0.1	10,000	0.2	8,000	(24,032)	0.02	(480.6)	
			0.4	11,000	(21,824)	0.04	(872.9)	
			0.2	22,000	(12,738)	0.02	(254.7)	
	0.4	7,000	0.1	16,000	(20,421)	0.04	(816.8)	
			0.25	17,000	(19,595)	0.1	(1959.5)	
			0.65	20,000	(17,117)	0.26	(4450.4)	
	0.5	12,000	0.2	20,000	(12,752)	0.10	(1275.2)	
			0.5	18,000	(14,224)	0.25	(3556.0)	
			0.3	27,000	(6,790)	0.15	(1018.5)	
								<u>(14,684.6)</u>

The Expected Net Present Value of the decision tree is (14,684.6)

Interpretation

The net present value of the plant 'P' is Rs.2,512.9, whereas plant 'Q' has a negative net present value of Rs.14,684.6. Hence the plant 'P' should be selected as it is generating a positive net present value.

5.4 SIMULATION ANALYSIS

It is often not feasible to calculate the standard deviation of Net Present Value by mathematical analysis, in complex situations. In such a cases, simulation analysis may be employed to obtain the approximate distribution of Net Present Value with the help of simulation. The expected Net Present Value of Particular project can be better estimated in the parameters like cash in flow, cost of capital, project life, cash outflows are subject to change at a time. More than one parameter changes at a time and their impact on the expected Net Present Value will be better calculated with the simulation technique. Higher the simulation runs, higher is the accuracy in the estimation of Net Present Value and vice-versa.

It may be employed to obtain the approximate distribution of Net Present Value and from this simulative distribution of various parameters can be calculated. It is a flexible and mercantile pool in generating probability distribution of Net Present Values when analytical methods are not useful.

Problem - 4

From the following information of the Project 'X', calculate expected Net Present Value by performing 10 manual simulation runs. There is an uncertainty associated with the two aspects of the project. They are Annual Net cash inflows and the life of the Project. The Risk free rate of return of the project is 10% and the initial investment of the project is 13,000 and the following are the variables for the project.

Annual Cash Inflows		Project Life	
Value	Probability	Value	Probability
1,000	0.02	3	0.05
1,500	0.03	4	0.10
2,000	0.15	5	0.30
2,500	0.15	6	0.25
3,000	0.30	7	0.15
3,500	0.20	8	0.10
4,000	0.15	9	0.03
		10	0.02

Solution

Table showing corresponding between variables and two digit random numbers.

Annual Cash Inflow			Project Life				
Value	Probability	Cumulative Probability	Cumulative Intervals of two digit random variables	years	Probability	Cumulative Probability	Cumulative Intervals of two digit random variables
1,000	0.02	0.02	0.0 - 0.01	3	0.05	0.05	0.0 - 0.04
1,500	0.03	0.05	0.02 - 0.04	4	0.10	0.15	0.05 - 0.14
2,000	0.15	0.20	0.05 - 0.19	5	0.30	0.45	0.15 - 0.44
2,500	0.15	0.35	0.20 - 0.34	6	0.25	0.70	0.45 - 0.69
3,000	0.30	0.65	0.35 - 0.64	7	0.15	0.85	0.70 - 0.84
3,500	0.20	0.85	0.65 - 0.84	8	0.10	0.95	0.85 - 0.94
4,000	0.15	1.00	0.85 - 0.99	9	0.03	0.97	0.95 - 0.96
				10	0.02	1.00	0.97 - 0.99

Simulation Results

Simulation Runs	Annual Cash Inflows		Project Life		Discounted cash flow @10%	Discounted cash flow	Original invest- ment	Net Present value
	Ran dom No.	Correspond- ing value of A.C.F	Ran dom No.	Correspond- ing value of A.C.F				
1	53	3,000	97	9	5.759	17,277	13,000	4,277
2	66	3,500	99	10	6.145	21,507.5	13,000	8,507.5
3	30	2,500	81	7	4.868	12,170	13,000	(807)
4	19	2,000	09	4	3.170	6,340	13,000	(6,660)
5	31	2,500	67	6	4.355	10,887.5	13,000	(2,112.5)
6	81	3,500	70	7	4.868	17,038	13,000	4,038
7	38	3,000	75	7	4.868	14,604	13,000	1,604
8	48	3,000	83	7	4.868	14,604	13,000	1,604
9	90	4,000	33	5	3.791	15,164	13,000	2,164
10	58	3,000	52	6	4.355	13,065	13,000	65

Interpretation

From the above simulation exercise, the highest possible Net Present Value is occurred i.e. 8,507.5 in simulation run 2. Therefore; we conclude that the best out come possibility of the project is having 10 years of life with having Rs 3,500 as inflow.

Problem - 5 (Decision Tree)

'X' Ltd is considering plant 'P' and 'Q' and their cash outlays are Rs. 20,000 and Rs.40,000 respectively. The plant was expected to have a life of 2 years each without any salvage value. The cash flows and their respective probabilities are given below.

1st YEAR

Plant 'P'		Plant 'Q'	
Cash Flow Estimation	Probability	Cash Flow Estimation	Probability
10,000	0.4	7,000	0.2
12,000	0.2	10,000	0.2
20,000	0.4	15,000	0.6

2nd YEAR

Plant 'P'		Plant 'Q'	
Cash Flow Estimation	PROBABILITY	Cash Flow Estimation	PROBABILITY
10,000		7,000	
5,000	0.6	10,000	0.2
11,000	0.1	12,000	0.2
12,000	0.3	24,000	0.6

12,000	PROBABILITY	10,000	PROBABILITY
18,000	0.2	20,000	0.1
14,000	0.3	11,000	0.2
19,000	0.5	18,000	0.7
20,000	PROBABILITY	15,000	PROBABILITY
14,000	0.3	22,000	0.1
22,000	0.4	16,000	0.4
25,000	0.3	28,000	0.5

Assuming that 12% is the cost of capital plot the above information for the two projects in the form of a decision tree and calculate their Net present value's and select the Profitable Project.

Solution

Calculation of Net Present Value for Plant 'P'

Cash Flow		Discounted Cash flow @ 12%		Discounted Cash flow		Total Discounted cash flow (1yr+2yr)	Original Investment	Net Present value
1yr	2yr	1yr	2yr	1yr	2yr			
10,000	5,000	0.893	0.797	8,930	3,985	12,915	20,000	(7085)
10,000	11,000	0.893	0.797	8,930	8,967	17,897	20,000	(2103)
10,000	12,000	0.893	0.797	8,930	9,567	18,497	20,000	(1503)
12,000	18,000	0.893	0.797	10,716	14,346	25,062	20,000	5,062
12,000	14,000	0.893	0.797	10,716	11,158	21,874	20,000	1,874
12,000	19,000	0.893	0.797	10,716	15,143	25,859	20,000	5,859
14,000	14,000	0.893	0.797	12,502	11,158	23,660	20,000	3,660
14,000	22,000	0.893	0.797	12,502	17,534	30,036	20,000	10,036
14,000	25,000	0.893	0.797	12,502	19,925	32,427	20,000	12,427

Calculation of Net Present Value for Plant 'Q'

Cash Flow		Discounted Cash flow @ 12%		Discounted Cash flow		Total Discounted cash flow (1yr+2yr)	Original Investment	Net Present value
1yr	2yr	1yr	2yr	1yr	2yr			
7,000	10,000	0.893	0.797	6,251	7,970	14,221	40,000	(25,779)
7,000	12,000	0.893	0.797	6,251	9,564	15,815	40,000	(24,185)
7,000	24,000	0.893	0.797	6,251	19,128	25,379	40,000	(14,621)
10,000	20,000	0.893	0.797	8,930	15,940	24,870	40,000	(15,130)
10,000	11,000	0.893	0.797	8,930	8,767	17,697	40,000	(22,303)
10,000	18,000	0.893	0.797	8,930	14,346	23,276	40,000	(16,724)

15,000	22,000	0.893	0.797	13,395	17,534	30,929	40,000	(9,071)
15,000	16,000	0.893	0.797	13,395	12,752	26,147	40,000	(13,853)
15,000	28,000	0.893	0.797	13,395	22,316	35,711	40,000	(4,289)

Decision Tree for Plant 'P'

Year 0		Year 1		Year 2		
Proba- bility	Cash flow	Proba- bility	Cash flow	Net Present value	Joint Proba- bility	Expected N.P.V
		0.6	5,000	(7,085)	0.24	(1700.4)
0.4	10,000	0.1	11,000	(2,103)	0.04	(84.1)
		0.3	12,000	(1,503)	0.12	(180.3)
		0.2	18,000	5,062	0.04	202.5
	12,000	0.3	14,000	1,874	0.06	112.5
		0.5	19,000	5,859	0.10	585.9
		0.3	14,000	3,660	0.12	439.2
0.4	14,000	0.4	22,000	10,036	0.16	1605.7
		0.3	25,000	12,427	0.12	1491.2
						<u>2472.2</u>

The Expected Net Present Value of the decision tree is 2472.2

Decision Tree for Plant 'Q'

Year 0	Year 1 Proba- bility	Cash flow	Year 2 Proba- bility	Cash flow	Net Present value	Joint Proba- bility	Expected N.P.V
Decision Point Cash outlay 40,000	0.2	7,000	0.2	10,000	(25,779)	0.04	(1031.2)
			0.2	12,000	(24,185)	0.04	(967.4)
			0.6	24,000	(14,621)	0.12	(1754.5)
	0.2	10,000	0.1	20,000	(15,130)	0.02	(302.6)
			0.2	11,000	(22,303)	0.04	(892.1)
			0.7	18,000	(16,724)	0.14	(2341.4)
	0.6	15,000	0.1	22,000	(9,074)	0.06	(544.4)
			0.4	16,000	(13,853)	0.24	(3324.7)
			0.5	28,000	(4,289)	0.30	(1286.7)

The Expected Net Present Value of the decision tree is (12445.0)

Interpretation

The net present value of the plant 'P' is Rs.2,472.2 where as plant 'Q' has a negative net present value of Rs.(12,445.0). Hence the plant 'P' should be selected, as it is generating a positive net present value.

Problem - 6 (Simulation Analysis)

From the following information of the Project 'X' calculate expected Net Present Value by performing 10 manual simulation runs. There is an uncertainty associated with the two aspects of the project. They are Annual Net cash inflows and the life of the Project. The Risk free rate of return of the project is 8% and the initial investment of the project is 1,00,000 and the following are the variables for the project.

Annual Cash Inflows		Project Life	
Value	Probability	Value	Probability
12,000	0.30	5	0.30
20,000	0.20	6	0.05
10,000	0.15	7	0.10
50,000	0.15	4	0.10

28,000	0.15	3	0.15
40,000	0.02	9	0.03
18,000	0.03	10	0.02
		8	0.25

Solution

Table showing corresponding between variables and two digit random numbers.

Annual Cash Inflow			Project Life				
Value	Probability	Cumulative Probability	Cumulative Intervals of two digit random variables	year's	Probability	Cumulative Probability	Cumulative Intervals of two digit random variables
12,000	0.30	0.30	0.0 - 0.29	5	0.30	0.30	0.0 - 0.29
20,000	0.20	0.50	0.30 - 0.49	6	0.05	0.35	0.30 - 0.34
10,000	0.15	0.65	0.50 - 0.64	7	0.10	0.45	0.35 - 0.44
50,000	0.15	0.80	0.65 - 0.79	4	0.10	0.55	0.45 - 0.54
28,000	0.15	0.95	0.80 - 0.94	3	0.15	0.70	0.55 - 0.69
40,000	0.02	0.97	0.95 - 0.96	9	0.03	0.73	0.70 - 0.72
18,000	0.03	1.00	0.97 - 0.99	10	0.02	0.75	0.73 - 0.74
				8	0.25	1.00	0.75 - 0.99

Simulation Results

Simulation Runs	Annual Cash Inflows		Project Life		Discounted cash flow @10%	Discounted cash flow	Original investment	Net Present value
	Ran-dom No.	Correspond-ing value of A.C.F	Ran-dom No.	Correspond-ing value of A.C.F				
1	53	10,000	97	8	5,747	57,470	1,00,000	(42,530)
2	66	50,000	99	8	5,747	2,87,350	1,00,000	1,87,350
3	30	20,000	81	8	5,747	1,14,940	1,00,000	14,940
4	19	12,000	09	5	3,993	47,916	1,00,000	(52,084)
5	31	20,000	67	3	5,747	1,14,940	1,00,000	14,940
6	81	28,000	70	9	6,247	1,74,916	1,00,000	74,916
7	38	20,000	75	8	5,747	1,14,940	1,00,000	14,940
8	48	20,000	83	8	5,747	1,14,940	1,00,000	14,940
9	90	28,000	33	6	4,623	1,29,444	1,00,000	29,444
10	58	10,000	52	4	3,312	33,120	1,00,000	(66,880)

Interpretation

From the above simulation exercise, the highest possible Net Present Value is occurred i.e. 1,87,350 in simulation run 2. Therefore; we conclude that the best out come possibility of the project is having 8 years of life with having Rs 50,000 as inflow.

Problem - 7 (Risk Adjusted Rate of Return)

Consider an investment project costing Rs.40,000 initially and expected to generate cash flows Rs.15,000, Rs.20,000, Rs.10,000 and Rs.10,000. Calculate NPV if cost of capital is 10%. Also calculate NPV if risk premium of 5% is added to the cost of capital.

Original Cash Flows	Discounting Factor at 10%	Discounting Cash Flows
15,000	0.909	13,365
20,000	0.826	16,520
10,000	0.751	7,510
10,000	0.683	6,830
		<u>44,495</u>

$$\begin{aligned}\text{Net Present Value} &= \text{Total Discounted Cash Flows} - \text{Original Investment} \\ &= 44,495 - 40,000 = 4,495\end{aligned}$$

Original Cash Flows	Discounting Factor at 15%	Discounting Cash Flows
15,000	0.870	13,050
20,000	0.750	15,000
10,000	0.658	6,580
10,000	0.572	5,720
		<u>40,350</u>

$$\begin{aligned}\text{Net Present Value} &= \text{Total Discounted Cash Flows} - \text{Original Investment} \\ &= 40,350 - 40,000 = 350\end{aligned}$$

Problem - 8 (Certainty Equivalents)

Consider a project which costs Rs.16,000 and has a cash flow of Rs.14,000, Rs.13,000, Rs.12,000 and Rs.11,000 in four years and the associated beta factors are estimated to be 0.9, 0.7, 0.5 and 0.3 and the risk free discount rate is 10%. Calculate NPV

Solution

Original Cash Flows	Certainty Equivalent Factor	Revised Cash Flow	Discounting Factor at 10%	Discounting Cash Flows
14,000	0.9	12,600	0.909	11,453.4
13,000	0.7	9,100	0.826	7,516.6
12,000	0.5	6,000	0.751	4,506.0
11,000	0.3	3,300	0.683	2,253.9
				<u>25,729.9</u>

Net Present Value = Total Discounted Cash Flows – Original Investment

$$= 25,729.9 - 16,000 = 9,729.9$$

5.5 SUMMARY

The condition of complete certainty implies that each estimated cash flows from the operation of the firm would occur as forecasted. A decision maker may be faced with conditions of certainty, risk and uncertainty. Certainty postulates that the decision maker knows in advance the precise values that all the parameters that may affect the decision will take on. Risk postulates that the decision maker is aware of all possible future states of the economy, business and so on, which may occur and thereby affect relevant decision parameters and is able to place a probability on the value of the occurrence of each of these states. Uncertainty postulates that the decision maker may or may not be aware of all the possible states that affect the decision and may or may not be able to place a probability distribution on the occurrence of each.

Risk and Uncertainty in a project investment decisions are attributable to many possible sources such as (i) insufficient number of similar investments (ii) bias in the data and its assessment (iii) changing external economic environment, invalidating past experiences and (iv) misinterpretation of data

When risk is considered in capital budgeting decisions each project must be evaluated with respect to both its return and risk. An investor would obviously would like to earn a high rate of return, he will not consider that he has sustained a loss unless the return falls below this level. Risk can be measured by the area under the distribution of returns that lies below the target level.

Probability may be defined as a measure of someone's opinion about the likelihood that an event will occur. If an event is certain to occur, we say that it has a probability of one occurring. If an event is certain not to occur, we say that its probability of occurring is zero. All events have a probability of recurrence some what between zero and one. By convention, probabilities follow several rules.

Standard Deviation Provides a measure of the spread of the probability of distribution. The larger the standard deviation, the greater the dispersion of the distribution. It is calculated

by squaring the difference between each outcome and its expected value, weighing each value by its probability, summing over all possible outcomes, and taking the square root of this sum.

There are many approaches to the incorporation of risk into capital budget. Their applicability varies among the decision criteria and situations. Basically, there are two major competing methods for making risky long-term investment decisions: such as risk adjusted discount rate and certainty equivalents.

The market returns will include a factor for the uncertainty associated with the future rate of inflation. Shackle discards the notion of risk discounting in a favour of a concept called potential surprise. This assumes that decision makers conceive the consequences of their actions in terms of a measure that classifies their potential surprise at the occurrence of unexpected outcomes.

Frederick S Hillier proposed an approach for specifying information about an investment proposal in a more explicit manner. This approach is meant to apprise management of the variety of consequences involved in a decision: thus it is intended as complement, rather than a substitute, to existing evaluation procedures.

When the correlation coefficient equals zero, the cash flow are independent between period, and can use the simple mean standard deviation approach. When the correlation coefficient reaches one, the cash flows in the different periods are perfectly positively correlated so that as this period's cash flow deviates from its expected value, next period's cash flow will also deviate from its expected value by a proportional amount. If the cashflows are perfectly positively correlated, the effect of the deviations from the expected value causing a relatively large deviation from the expected value for the entire project.

Hertz Model is an important contribution to evaluating risky investments. He proposed the use of a simulation model to obtain the expected return and dispersion about this expected return for an investment proposal. It has enjoyed widespread acceptance in practice because of the analytical power it makes possible without the necessity for complex mathematics

Monte Carlo simulation is applied to capital budgeting. The major advantage of the simulation technique is that we now have normal distribution from which we can get a mean and standard deviation for use in other analysis or for use in our decision to accept or reject the project. The appealing characteristics of the distribution is that it incorporates all the areas that impact the NPV decision criterion with the subjective opinions of the experts in the area, yet it let us coordinate those diverse opinions into easily communicated and uniform measurements upon which a decision can be made.

Sensitivity analyses are performed when conditions of uncertainty exist for one or more parameters. The objective of a sensitivity analysis are to provide the decision-maker with information concerning (i) The behaviour of the measure of economic effectiveness due to errors in estimating various values of the parameters, and (ii) the potential for reversals in the preferences for economic investment alternatives.

Decision trees, also commonly called decision flow networks and decision diagrammes, are powerful means for depicting and facilitating the analysis of important problems, especially those that involve sequential decisions and variable outcomes over time.

5.6 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. To some degree, simulation and sensitivity analysis provide similar information to the financial analyst, although simulation is a more comprehensive form of analysis. Comment on the statement.
2. What is meant by utility? Do you feel that finance managers should be risk averse? Why or why not?
3. Compare and contrast between Risk Adjusted Rate of Return and Certainty Equivalents.
4. Describe the steps involved in the control of capital expenditure in a large organization
5. What do you mean by capital rationing?
6. Traditional methods of project appraisal are riskier than Discounted methods? Why?

II. Long Answer Questions

1. Why is risk analysis in Capital budgeting necessary? Explain.
2. What is the difference between risk and uncertainty? Are business problems those where risk or uncertainty is likely to be present?
3. What is the relationship between standard deviation and co-efficient of variation? Why do we need two measure of risk?
4. Discuss the capital budgeting techniques without probabilities.
5. Compare and contrast Hillier and Hertz Models.
6. Under what circumstances might the decision tree technique in capital budgeting analysis be useful?
7. When might two mutually exclusive projects having unequal lives be incomparable? How should this problem be dealt with?
8. How can either the average rate of return or the pay back period of an investments worth? What factors are usually used to justify the reciprocal of the payback period? In what situation it is justifiable?
9. Distinguish between decision criterion and performance measure.
10. When two projects of different economic lives are ranked according to their IRRs, the management implicitly assumes that the firm's reinvestment rate is at least as high as the IRR of the longer-lived project. Do you agree with this statement? Why or why not?

5.7 REFERENCE BOOKS

1. V.K. Bhalla : **Financial Management**, Anmol Publications Pvt. Ltd., 2002.

2. R.K. Sharma and Shashi K. Gupta : **Financial Management**
3. M Y Khan and P K Jain : **Financial Management**
4. James C. Van Horne : **Financial Management**
5. Prasanna Chandra : **Financial Management**
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5.8 KEY WORDS

- Random Numbers** : Numbers generated in such a way that there is an equal probability of any number appearing each time, regardless of what sequence is experienced at any prior time.
- Certainty** : Knowing in advance the precise values of all the parameters affecting the investment decisions.

BLOCK – III : FINANCING DECISION

This block deals with sources of finance, cost of capital and the capital structure. This block is organised into five units.

Unit 6 describes the types of financial needs of a firm viz., short-term and long-term.

Unit 7 discusses the significance of cost of capital and measurement of cost of various components of capital.

Unit 8 describes the capital structure and explains the determinants of capital structure and various approaches to capital structure.

Unit 9 explains the concepts of financial and operating leverages and examines the relationship between the two. It concludes with an assessment of the risk implications of financial leverage.

Unit 10 deals with nature and importance of leasing, types of lease and factors influencing 'lease or buy' decisions.

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UNIT – 6 : SOURCES OF FINANCE

Objectives

The objectives of this Unit are to:

- understand the different types of financial needs of a firm;
- identify the different types of short term and long term sources of finance; and
- learn the significance of debt and equity financing.

Structure

- 6.0 Introduction
- 6.1 Types of financial needs
- 6.2 Short term financing
 - 6.2.1 Trade Credit
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6.0 INTRODUCTION

The three important decisions a financial manager would take are financing, investing and dividend decisions. All these three are interlinked. To support a firm's investments, a firm must find the means to finance them. Financing of a firm means providing money for

investment in fixed assets and in working capital needed for day- to- day operations. Securing funds from proper sources is of prime concern to the finance manager.

Funds can be raised either from external sources or internal sources or from both. External sources include owned capital (share capital) and borrowed capital (debt). Internal sources include retained earnings, provision for depreciation and proposed dividend (for a short period).

6.1 TYPES OF FINANCIAL NEEDS

The financial needs of a company may be of a long term or a short term nature. During the time it takes the firm to produce goods and collect its revenues, it has the need for short - term credit to meet running expenses as they become due. Moreover, it may sell goods on credit and receive the proceeds from the sales in the future. Some firms may have funds to acquire the current assets. Some firms may issue long-term debts to meet its short-term financial needs. However, if the firm has put these funds to work elsewhere (i.e. fixed assets), it will have to obtain short term financing. Normally, a firm uses long-term financing for fixed assets, which are required by the firm for a long period and short-term financing for short-term requirements i.e. current assets, thus, following a matching concept. While the primary source of short-term financing is the commercial banking system, there are a variety of other additional sources of short-term finance.

6.2 SHORT-TERM FINANCING

Short-term funds are available quickly and inexpensively as the principal supplier of short-term funds is the banking system i.e., through its overdrafts and loans. The funds are for a short period i.e., less than one year. Small concerns depend upon the short-term financing as they find it difficult to raise long-term funds because of their lower average credit standing.

Short-term funds are easier to secure as the creditors advance these funds for a short period and generally assume less risk than on long-term loans. Short-term funds financing is more flexible than long-term financing as they can be secured as and when they are needed and repay them as soon as the need is over. The main disadvantage of short-term funds is the frequent maturity of principal.

The various sources of short-term financing are given below.

6.2.1 TRADE CREDIT

It is the most important source of short-term finance for small firms, especially retail establishments. The finance manager should be aware of the cost of this type of credit, as it is a very expensive source. Trade credit arises when a supplier sells goods and services but does not demand immediate payment. The purchaser is permitted to choose between immediate payment or payment at a future date. When the purchaser chooses for payment in future (short-term period), the terms of trade credit may be written as "2/10 net 30" which implies 2 per cent discount if paid within the first ten days or the net (full) price within 30 days. Here, the source of finance is the supplier who allows the buyer the use of the goods before having to pay for them.

It may appear that trade credit is free of cost. But, in reality it is not so. The cost of trade credit is the discounts that are foregone.

$$\text{Cost of trade credit} = \frac{\text{Discount \%}}{\text{Pay period} - \text{discount period}} = \frac{X}{360}$$

$X/360$ = term that converts the cost (X) to an annualized basis.

Pay period/discount period is the number of days the credit is extended.

An increase in the amount of the discount increases the cost of trade credit for the penalty is larger. Whereas, an increase in the payment - period, reduces the cost of trade credit. To induce the buyer to pay promptly, the supplier increases the discount.

An increase in the payment-period means that the buyer has the use of goods longer and thus cost of trade credit is less.

If possible, the payment should be made on the last day of the discount period and avail discount. The price that the seller is charging includes the cost of supplying the goods during the discount period. Therefore, the buyer should take full advantage of this 'free' use of the goods during the entire discount period. If the buyer is not able to pay by the end of the discount period, then, payment should be made on the last day of the credit period. Once the discount period is passed, the buyer has to pay the cost of the trade credit. If early payment is made, the buyer does not have the use of the credit for the entire period and the cost of trade credit is increased.

A firm should use the 'costly component' of trade credit only if the cost of trade credit is less than or equal to the cost of funds that may be obtained from the other sources.

The main advantages of trade credit are:

- It is very convenient
- It is a spontaneous source of financing
- No financial interrogation

6.2.2 FACTORING

Factoring accounts receivables involves the outright sale of accounts receivables to a factor or other financial institution. In short, it is the process of selling the accounts receivables at a discount. Higher the discount, higher will be the cost of using this source of short-term finance. The main advantage here is, the seller obtains immediate cash and is no longer concerned with collecting the accounts receivable. The risk of collecting accounts receivables is transferred to the buyer called factor. The factor puts a restriction that, the credit sales by the firm have to be approved by the factor. The factor may accept the accounts receivable only at a substantial discount.

The factor advances money to the extent of 60 to 80 per cent of the face value of receivables to the client and the balance at the end of the credit period or when the money is collected whichever takes place earlier. If the factor is on a 'recourse on bad debts', then, the client has to make payment to the factor if the customer fails to honor the debts when due.

6.2.3 BILLS OF EXCHANGE

Here, the seller of goods draws bills of exchange on the buyer for a specified amount payable at a specified date in future. It is accepted by the buyer or by a bank on behalf of the buyer. The bill along with the documents of title to goods, are then, discounted by the bank through the bill market and the amount is advanced to the seller immediately after deducting interest charge. The bill is usually accepted by a bank or by accepting houses who, specialize in this activity. The bill of exchange is more frequently used in overseas trade.

6.2.4 COMMERCIAL PAPER

Commercial paper is an unsecured promissory note with a fixed maturity. It is an unsecured short-term liability of a corporation. Generally, the period of credit is usually for 3 to 6 months. Only companies with exceptionally good credit, issue this type of promissory note, as there are no specific assets backing commercial paper. The commercial papers are issued to meet temporary needs for cash and the firms frequently refinance the commercial paper by issuing long-term debt or equity. Thus, commercial papers serve as a temporary source of funds prior to more permanent financing. The company issuing commercial paper should obtain a credit rating from any agency specified by the RBI and its shares must have been listed on one or more stock exchanges.

6.2.5 BANK LOAN

Retailers and whole sellers are primarily concerned with short-term assets (current assets) and bank financing is an appropriate means to finance these current assets.

The bank loans are individually negotiated. The negotiated package includes the size of the loan, the maturity date, the amount of interest, security requirement etc. The bank may demand that the firm maintains a minimum current ratio of 2:1 or place limitation on the ability of the firm to pay dividend etc.

The firm may borrow a specific amount of money or it may enjoy the line of credit i.e. the right to borrow upto a specific amount of funds. The credit line offers the borrower the flexibility to use the credit only when it is needed. Interest is paid only on the funds actually utilised.

The bank's best customers (the best credit risk) are charged 'the prime rate' while the other customers may be charged the prime rate plus a percentage. The prime rates are very volatile and fluctuates based on the demand for short-term money and the supply of credit. Sometimes, the bank may ask the borrower to maintain funds in the bank as a compensative balance.

The prime disadvantage to the firm is the extent to which the bank imposes restriction on the firm. But, this loan is much cheaper than alternative sources eg. trade credit.

Activity - I

Explain the short term sources of finance.

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6.3 LONG - TERM FINANCING

The expansion and growth of business necessitates the firm to raise funds on a long-term basis. The various sources of long-term financing are discussed below.

6.3.1 EQUITY

It is a major source of funds for any business. It represents the ownership capital of a firm. The equity holders are the residual owners as they receive what is left over in the business after meeting the claims of outsiders at the time of liquidation of the company. The remuneration for their investment in the company is in the form of dividends. From the point of view of both control and profitability they enjoy an advantage over the providers of other sources of funds. They are entitled to the surplus of the firm.

The equity is the costliest source of capital. The equity shareholders carry high risk as they are the residual owners. Hence, they expect a high rate of return and the cost of equity is high when compared to the other sources of funds. The return paid to them (dividend) is out of profits after tax.

Some companies grant their shareholders pre-emptive rights. This privilege gives the shareholders the right to maintain their proportionate share of ownership in the company. If the company wants to raise additional funds by issue of shares, it should first offer them to the existing shareholders in a fixed proportion at a price below the market price of the stock to induce purchasers of the new shares.

6.3.2 PREFERENCE SHARES

Preferred stock is in a sense superior to common stock. The preference share holders are given preference at the time of payment of dividends and in the event of winding up of the company, preferred stock is redeemed first before the equity shareholders receive any proceeds from the liquidator.

A fixed dividend is paid to the preference shareholders. They do not have the voting rights. If the preference dividends are not paid in any year, they get accumulated and are paid in the years of profits. But, they cannot go to the court of law for non-payment of preference dividends.

Preferred stock is redeemed at the end of a fixed period (Redeemable Preference Shares). The Preferred stock may also be perpetual. Preferred stock may also be convertible into equity stock of the company. It offers the investor a fixed income (dividend) and possible capital gains if the price of stock (into which preferred stock may be converted) rises in value.

In addition to the fixed rate of dividend, the shareholders participate in the surplus of a firm in a stated manner in case of Participating Preference Shares.

Because of fixed cost obligation, it has a favorable impact of leverage on equity earnings as long as the return on investment is greater than the fixed cost obligation. The cost of preference capital is cheaper than equity capital.

6.3.3 DEBENTURES

This is another major source of finance for companies. As against share capital, debentures mostly have an assurance of payment of interest and return of principal.

The firm may issue long-term debt, when the firm's internally generated funds (profits and depreciation) are insufficient to finance the expansion. Financing fixed assets by long-term debt offers the firm the advantage of financial leverage.

It is a liability to the firm and should be paid off by a specified date. A fixed rate of interest is paid to them and the interest is charged to profit and loss account. Hence, the firm enjoys a tax benefit on interest. Though the firm enjoys low cost on debt, it runs a high risk as failure of the firm to pay regular interest and repayment of loan leads to liquidation of the firm. The debenture holder can sue the company in case of default. Hence, the firm should use debt judiciously, only when it earns a rate of return higher than the cost of debt. The debenture holders are the creditors to the firm receiving interest for deposit of their money with the firm irrespective of profit or loss.

The firm does not have to sacrifice control on ownership and management of the firm. Debentures can be redeemed when a firm has surplus funds. A debenture can be converted at the option of the holders into an ordinary / equity shares of the firm in case of convertible debentures. Once converted, a holder of convertible debenture gives up his position as creditor to become an owner (shareholder). Convertibility reduces the firm's debt equity ratio thereby reducing the riskiness to the firm.

Most debentures in India are secured by mortgages / charges on the immovable properties of the company and a floating charge on its other assets.

6.3.4 PUBLIC DEPOSITS

Public deposits are the traditional source of finance for many companies. Companies accept deposits of money from the public for a specified period at a specified rate of interest with a provision for renewal. Public include shareholders, employees, ex-employees and general public. A minimum limit is, generally fixed by the firm and the amount above the minimum limit is accepted by the firm in multiples of amount specified by the firm.

The main advantage of this source is that, it eliminates the financial intermediaries. It is basically unsecured. The cost to the firm is less, as interest rate on public deposits is less than that of bank finance. The depositors do not have any say in the management of the firm.

For inviting deposits from the public, the firm has to give in the prescribed form and in the prescribed manner an advertisement containing information on the financial position of the company and a copy of it should be sent to the Registrar of companies for registration.

6.3.5 HIRE PURCHASE

This type of finance is used when fixed assets are to be purchased by the firms but immediately money is not available. Initially, a stipulated amount is paid when the asset is purchased and the balance is paid in specified installments at a given rate of interest. The ownership of the asset is passed on to the buyer only after the payment of final installment.

Interest element is an admissible charge against revenues in computing taxable income of the companies. Here, the cost of financing may be higher than that of other debt capital.

6.3.6 LEASE FINANCING

Leasing is a specialized means of acquiring the use of physical assets without acquiring ownership. Here, the owner of the asset i.e. lessor permits another party i.e., the lessee, to use the asset for a specified period of time in return for a specified payment i.e., lease rental. The terms and conditions like period of lease, amount, timing of payments to be made to the lessor, provision for payment of insurance, taxes, maintenance of expenses and provision for renewal of the lease or purchase of the asset at expiration etc. are provided in the lease agreement.

This may take several forms like sale and lease back arrangements, operating or service leases and straight financial or capital leases.

6.3.7 VENTURE CAPITAL

It is a long-term source of funds to finance hi-tech projects involving high risk having a strong potential of high profitability. It can be in the form of equity or debt or both. Investments are made in innovative projects with new technology with a view to commercialise the know - how through new products.

Here, the finance comes to the entrepreneur from the financier in the form of early stage financing which includes start up stage financing and a second round of financing which is required, when the project incurs loss or the project is unable to yield sufficient profits. Again, finance may come for expansion and growth.

The aim of the venture capitalist (financier) is to realize the investment with a high profit. The investor / promoter has the necessary technology, skill but, has no finance. Therefore, the venture capitalist comes forward to finance the hi-tech projects, new untried product or process, thus assuming a high degree of risk with the expectation of earning a high rate of return. The more successful the venture, the higher will be the profits earned by both the promoter and the financier through the sale of shares. The venture capital firm takes an active interest in guiding the assisted firm apart from providing funds.

Activity - II

What is venture capital?

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6.4 DEBT Vs EQUITY

Both debt and equity are long-term sources of funds used to finance permanent or fixed assets. The dissimilarities between these two sources of funds are as follows:

- The debenture holder is a creditor to the company whereas the equity holder is the owner of the company.

- The return paid to the debenture holder is in the form of interest, which is a charge on the profits of the company. In case of equity holder, the return is in the form of dividends, which is an appropriation of profits.
- As interest paid to the debenture holder is a charge on the profits, it is tax deductible. Whereas, dividends are from profits after tax, hence not tax deductible.
- The tax deductibility nature of interest makes the cost of debenture much lower than the cost of equity.
- Interest to the debenture holder is fixed and is to be paid compulsorily irrespective of profits or losses to the company. Whereas, dividends are not fixed and will be paid only when there is profit and even if there are profits, it is not compulsory to pay the dividends.
- Non-payment of regular interest and repayment of principal amount gives the debenture holder a right to sue the company. Whereas, the equity share holder do not have the right to sue the company. Therefore, the company carries a high financial risk in case of debt and no risk in case of equity.
- The debenture holders do not have any risk as they get a regular and fixed rate of interest and repayment of capital at the maturity period. Whereas, the equity holder carry a high risk as there is no compulsion on the part of the company to pay dividend and never in the life - time of the company, their capital will be repaid.
- Debenture holders have a floating charge over the assets of the company. Hence they are secured, whereas, the equity holders are unsecured.
- Equity holders have a voting right and it is they who manage and control the affairs of the company, while, the debenture holders do not have any voting rights.

6.5 LONG -TERM Vs SHORT-TERM SOURCES

- If the need for funds is for a long period, the firm should opt for long-term sources. Otherwise, it should go for short-term financing. This in fact, is based on matching concept i.e. matching the source with the purpose of finance. Use of long-term source for financing short-term assets will be costly as the funds will remain idle after the expiry of assets life.
- Short-term sources are riskier than the long-term sources as interest rates on short-term funds fluctuate widely.
- From the point of view of risk preference of lenders and borrowers, the cost of short-term source is lower than the cost of long-term sources as the chances of default are higher on long-term sources than on short-term sources.
- Borrowers prefer long-term funds to avoid the risk of renewal of short-term sources.

6.6 SUMMARY

All the financial decisions taken by a finance manager i.e. financing, investing and dividend decisions are interlinked. To support a firm's investment, a firm must find the means to finance them. The sources of funds can be external like share capital and debt or internal

like retained earnings. Similarly, the financial needs of a company may be for a long-term or short-term.

Generally, matching principle is used in financing the financial needs of a firm. Long-term funds are used for investment in fixed assets and short-term funds for short-term requirements i.e., current assets.

The various sources of short-term financing are trade credit, factoring, bills of exchange, commercial paper and bank loans. The sources of long-term financing are equity, preference shares, debentures, public deposits, hire purchase, lease financing and venture capital.

From the point of view of cost and flexibility in repayment, short-term funds are preferred, whereas, long-term funds are preferred from the point of view risk of renewal.

6.7 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. Discuss the features of short-term financing.
2. Explain the important sources of short-term financing.
3. Discuss the various sources of long-term financing.
4. Distinguish between short term and long-term sources of finance.

II. Long Answer Questions

1. Examine the advantages and disadvantages of equity financing.
2. What do you mean by venture capital? Explain its features and characteristics.
3. Examine the importance of trade credit as a source of finance.

6.8 FURTHER READINGS

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2. James C. Van Horne : **Financial Management and Policy**, Prentice – Hall of India Private Limited, New Delhi, 2002.
3. Bhalla, V.K. : **Working Capital Management : Text and Cases**, Anmol Publishing Pvt. Ltd., New Delhi, 2001.
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5. Hampton J.J. and Wagner, C.L. : **Working Capital Management**, John Wiley and Sons, 1989.

6.9 KEY WORDS

Trade Credit	:	Arises when a supplier sells goods and services but does not demand immediate payment.
Factoring	:	The process of selling the accounts receivables at a discount to the factor.
Commercial Paper	:	An unsecured promissory note issued by a firm having an exceptionally good credit record.
Equity	:	Represents the ownership capital of a firm.
Pre Emptive Rights	:	A privilege given to the existing shareholders to maintain their proportionate share of ownership in the company by offering them the shares in a fixed proportion at a price below the market price of the stock, when new shares are being issued by the company.
Lease Financing	:	A specialized means of acquiring the use of physical assets without acquiring ownership.
Venture Capital	:	A long-term source of funds to finance hi-tech projects involving high risk having a strong potential of high profitability.

UNIT – 7 : COST OF CAPITAL

Objectives

After studying this Unit, you should be able to:

- understand the significance of cost of capital;
- explain the concepts of cost of capital;
- compute the cost of various sources of capital; and
- understand the importance of weighted average cost of capital.

Structure

- 7.0 Introduction
- 7.1 Meaning and Definition of Cost of Capital
- 7.2 Significance of Cost of Capital
- 7.3 Concepts of Cost of Capital
 - 7.3.1 Future Vs. Historical Cost
 - 7.3.2 Specific Vs. Combined Cost
 - 7.3.3 Average Vs. Marginal Cost
 - 7.3.4 Explicit Vs. Implicit Cost
- 7.4 Measurement of Cost of Capital
 - 7.4.1 Cost of Debt Capital
 - 7.4.2 Cost of Preference Capital
 - 7.4.3 Cost of Equity Capital
 - 7.4.4 Cost of Retained Earnings
- 7.5 Weighted Average Cost of Capital
- 7.6 Marginal Cost of Capital
- 7.7 Summary
- 7.8 Self Assessment Questions
- 7.9 Further Readings
- 7.10 Key Words

7.0 INTRODUCTION

In the earlier units you have learnt about the capital budgeting decisions assuming that the cost of capital is known. In this unit, you will learn the cost of capital computation and its significance.

The investment decision of a firm is directly related to the financing decision, as the acceptance of investment proposals depends upon how those proposals would be financed.

Each source of capital has its own cost. The cost of capital is the most vital in financial decision making because, it is used as a decision criterion in capital budgeting decision. Under NPV method, all those projects that show a positive NPV are accepted using cost of capital as a discounting factor as it is the minimum rate of return to be earned on the projects. Under IRR method, the project will be accepted if its IRR is greater than the cost of capital. The market price of the stock will be maximized only when these acceptance rules are followed. The cost of capital thus represents a cut – off or the target or the hurdle rate for the allocation of capital to investment projects. It is the minimum rate of return that will maintain the market value per share at its current level. It is the return expected by the providers of funds to the firm.

Theoretically stated, the cost of capital is the minimum required rate of return, a project must earn in order to cover the cost of raising funds being used by the firm in financing of the investment proposal. In other words, the cost of raising funds is the minimum required rate of return of the firm in order to break-even.

7.1 MEANING AND DEFINITION OF COST OF CAPITAL

The cost of the capital of the firm is the minimum rate of return expected by its investors. It is the weighted average cost of various sources of finance used by the firm viz. debentures, preference share capital, equity share capital and retained earnings. The cost of capital is the most significant, difficult and controversial topic in finance. Yet it is one of the basic corner stones of the theory of financial management.

Definitions

In order to clarify the concepts of the cost of capital, let us see a few definitions.

Hunt, William and Donaldson

Cost of capital may be defined “as the rate that must be earned on the net process to provide the cost elements of the burden at the times they are due”.

Solomon Ezra

The Cost of Capital “is the minimum required rate of earnings of the cut-off rate for capital expenditures.”

GC Philippatos

The cost of capital “is the minimum required rate of return, the hurdle or target rate, the cut off rate or the financial standards of performance of a project.”

James C. Van Horne

The cost of capital “represents a cut off rate for the allocation of capital to investment of projects. It is the rate of return on a project that will leave unchanged the market price of a stock”.

Thus we see that the cost of capital is the minimum required rate of return from a proposed project which will leave the market price of the share unchanged.

There are **three aspects** of the concept of cost of capital:

- a) It is not a cost as such. It is the rate of return that it requires on the projects available. It is merely a hurdle rate.
- b) It is the minimum rate of return the firm must earn so that the market value of shares does not fall.
- c) A firm's cost of capital comprises three components:
 - i) Return at zero risk level
 - ii) Premium for business risk, which is determined by capital budgeting (b)
 - iii) Premium for financial risk, which arises on account of pattern of capital structure (f)Hence, Cost of Capital (K_0) = $r_0 + b + f$.

7.2 SIGNIFICANCE OF COST OF CAPITAL

Without the knowledge of the firm's cost of capital, the firm will have difficulties in two areas. Firstly, it will not be able to select correctly the cut off point for new capital budgeting decision / proposals. The cost of capital separates the proposals that maintain or increase the firm's NPV from those that may decrease it. Secondly, the firm will not have a complete picture when it is deciding which securities should be used to raise additional funds. Thus, the knowledge of cost of capital is useful to the management in deciding about the method of financing at a given point of time.

As per the wealth maximization objective, the funds raised by issuing shares or by retaining net earnings should be so utilized that the firm earns a return on them equal to the return expected by the shareholders. Otherwise, the market value of the share would fall and the shareholders overall wealth would be reduced. Similarly, the funds raised by the issue of fixed obligation sources like debentures or preference shares should be used only when they do not reduce the market value per share. The market value of a share remains unaffected if the firm earns, at-least, a rate of return on the projects financed by these funds equal to the cost of raising them. Thus, the cost of capital is simply the rate of return the funds used should produce to justify their use within the firm in the context of wealth maximization objective.

Activity - I

Explain the significance of cost of capital.

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7.3 CONCEPTS OF COST OF CAPITAL

The cost of capital is used in capital expenditure decisions to justify expenditures having long-term implications for the firm. Hence, it is necessary to know the various concepts of cost of capital before the computation of cost of capital is undertaken. The various concepts of cost of capital are given below.

7.3.1 FUTURE Vs HISTORICAL COST

Future costs are estimated costs of the future. In decision-making, the relevant costs are future costs i.e. the costs that are yet to be incurred. For example, while making the capital expenditure decisions, a comparison is made between the projects expected internal rate of return and the expected (future) cost of funds to finance the project. However, historical costs (the costs which have already been incurred) are significant to the extent they help in predicting the future costs and provide an evaluation of the past performance when compared with standard or pre-determined cost.

7.3.2 SPECIFIC COST Vs COMBINED COST

Capital is a necessary factor of production and it has a cost like any other factor. The cost of each component of capital like common shares, preference shares, retained earnings and debentures, is known as **component or specific cost of capital**. According to this concept, to accept or reject the investment projects, their profitabilities should be evaluated on different cost bases depending on the specific sources of funds used to finance particular projects. As a result, a project would be accepted if it were able to earn a return more than the cost of debt when the project is financed by debentures. In the next year, if it were financed with equity funds, the project would be rejected, if the cost of equity funds would be more than the return. This position contains a basic fallacy.

A firm's decision to use debt in a given period not only adversely affects its potential for using debt in future by lowering its equity base but also adds to the shareholders' risk. As a result, the price of the common stock will drop and low cost debt will become suddenly much more expensive, than it seemed at the time of issuing, because of reduction in the equity base. Similarly, a firm's decision to use equity would enhance the potential for borrowing in the future. Over a period of time, the firm will maintain a balance between debt and equity. Because of this connection between the various sources of financing, it is advisable to use cost of capital in a composite sense. The composite or combined cost of capital is an inclusive cost of capital from all sources of capital i.e. debt, equity, preference capital and retained earnings. It is a weighted average cost of capital.

7.3.3 AVERAGE COST Vs MARGINAL COST

An average cost refers to a combined cost of various sources of capital such as debentures, preference shares and equity shares. The average cost is the weighted average of the cost of each component of funds employed by the firm, the weights being the proportion of each source of funds in the total funds employed. The marginal cost of capital is the weighted average cost of new or incremental funds raised by the firm.

The main problem in this case is the assignment of appropriate weights to each component of capital.

7.3.4 EXPLICIT Vs IMPLICIT COST

When a firm uses a particular method of financing to raise funds, it involves a series of cash flows – starting with a cash inflow and subsequent cash outflows. The discount rate that equates the present value of the cash inflows with the present value of its cash outflows is the explicit cost of capital. The outflows may be the repayments of principal and the return for the funds raised.

Explicit cost of capital is the internal rate of return of financial opportunity and arises when the capital is raised. The implicit cost of capital arises when the firm considers alternative uses of funds raised. It is the opportunity cost. It may be defined as the rate of return associated with the best investment opportunity that will be foregone if the project presently under consideration by the firm were accepted. Cost of retained earnings is an opportunity cost or implicit cost in the sense that it is the rate of return at which the shareholders could have invested these funds had they been distributed to them. It may be noted here that except the retained earnings, all other sources of funds have explicit cost of capital. Further, in capital budgeting situations, it is only the explicit cost of capital which is relevant.

7.4 MEASUREMENT OF COST OF CAPITAL

The measurement of cost of capital refers to the process of determining the cost of funds to the firm. The cost of specific sources of funds is the basic input for measuring the overall cost of capital of the firm. There are four basic sources of long-term funds for a business firm. They are: i) long term debt; ii) preference capital; iii) equity capital; and iv) retained earnings. Though all of these sources may not be tapped by a firm for funding its activities, each firm will have some of these sources in its capital structure. Hence it is necessary to compute the cost of each source of capital to ascertain the composite cost of capital.

7.4.1 COST OF DEBT

Cost of debt is the rate of return expected by the lenders. It is that discount rate which equates the net proceeds of the debt issue with the present value of interest plus principal repayments and then adjusting the explicit cost obtained for the tax effect.

Before tax cost of debt (K_{db}) = Interest / Net proceeds

When the firm employs debt capital, it should ensure that common shareholders earnings are not diluted. To keep the earnings available to the common shareholders unchanged; the firm must earn at least, a return equal to the interest rate on the borrowed funds. If the firm earns less than the interest rate, the earnings available to the common shareholders would decrease and this in turn, affects the market price of the share adversely.

Normally, a new issue of debt will incur floatation costs in the form of legal fees, administrative expenses, brokerage, under writing commission etc. These costs will naturally reduce the proceeds to the firm, thereby raising the specific cost of debt. The higher the floatation costs, the higher will be the specific cost of debt raised.

Net proceeds = Principal amount – Floatation costs

Interest paid on debt is tax deductible. The higher the interest charges, the lower will be the amount of tax. The after tax cost of debt would be substantially less than the before tax cost.

After tax cost of debt (K_{da}) = $K_{db} (1-t)$

Where t = tax rate

The tax deductibility on interest will be available only when the firm is profitable and paying tax.

The bonds / debentures may be issued at par or at a premium or at a discount. When the debentures are repaid at maturity, they may be repaid at par or at premium or at a discount.

$$\text{Cost of redeemable debentures} = \frac{R + 1/n (RV - SV)}{Kdb \quad \frac{1}{2} (RV + SV)}$$

Where,

R = interest charges

N = number of years

RV = redeemable value

SV = price at which the debentures are issued or sale value of debentures

After tax cost of debentures would be: $Kdb (1-t)$

Perpetual Debt: The old debt instruments may be paid but replaced by the new debt. The cost of perpetual debt is computed by dividing the price at which bond is sold into fixed interest charges adjusted for tax effect.

$$\text{Cost of perpetual debt} = (1-t) R / P$$

Where, R = interest charges and P = price at which bond is issued

Illustration - 1

A company has 10% perpetual debt of Rs.50,000. The tax rate is 35%. Determine the cost of capital (before tax as well as after tax) assuming the debt is issued at (i) par, (ii) 10% discount and (iii) 10% premium.

Solution

i) Debt issued at par

$$\text{Before tax cost: } Kd(b) = I/SV = 5,000/50,000 = 0.1 \text{ or } 10\%$$

$$\text{After tax cost: } Kd(a) = Kdb(1-t) = .10(1-0.35) = 0.065 \text{ or } 6.5\%$$

ii) Issued at discount

$$\text{Sale Value} = 50,000 - 5000 \text{ discount} = \text{Rs. } 45,000$$

$$\text{Before tax cost: } Kd(b) = 5,000/45,000 = 0.1111 \text{ or } 11.11\%$$

$$\text{After tax cost: } Kd(a) = .1111 (1-0.35) = 0.0722 \text{ or } 7.2\%$$

iii) Issued at premium

$$\text{Sale Value} = 50,000 + 5,000 \text{ premium} = \text{Rs. } 55,000$$

$$\text{Before tax cost: } Kd(b) = 5,000/55,000 = 0.0909 \text{ or } 9.09\%$$

$$\text{After tax cost } Kd(a) = .0909 (1-0.35) = 0.059 \text{ or } 5.9\%$$

Illustration - 2

A company issues a new 10% debentures of Rs100 face value. The debenture is expected to be sold at 5% discount. It will also involve flotation costs of 5%. The company's tax rate is 35%. What would be the cost of debt?

Solution

$$\text{Sale Value} = 100 - 5 \text{ discount} - 5 \text{ flotation cost} = \text{Rs. } 90$$

$$K_d(a) = 1(1 - t)/SV = 10(1 - 0.35)/90 = 0.0722 \text{ or } 7.22\%$$

Illustration - 3

A company issues 12% debentures of Rs100 for an amount aggregating Rs.100,000 at 10% premium, redeemable at par after 10 years. The company's tax rate is 35%. Determine the cost of debt.

Solution

$$\begin{aligned} K_d(b) &= \frac{R + 1/n (RV - SV)}{(RV + SV)/2} \\ &= \frac{12 + 1/10 (100 - 110)}{(110 + 100)/2} \\ &= .10476 \text{ or } 10.476\% \end{aligned}$$

$$K_d(a) = K_d(b)(1 - t)$$

$$.10476 (1 - .35) = .0681 \text{ or } 6.81\%$$

Illustration - 4

A company has issued 15% debentures of Rs100 for Rs115, redeemable at a premium of 5% after 10 years. It will also involve flotation costs of 5%. The company's tax rate is 35%. Determine the cost of debt.

Solution

$$K_d(b) = \frac{15 + 1/10 (105 - 110)}{(105 + 110)/2} = 0.1349 \text{ or } 13.49\%$$

$$K_d(a) = .1349 (1 - .35) = .0877 \text{ or } 8.77\%$$

Activity –II

ABC Ltd. Issues 15% debentures of face value of Rs. 100 each, redeemable at the end of 7 years. The debentures are issued at a discount of 5% and the floatation cost is estimated to be 1%. Find out the cost of capital of debentures given that the firm has 50% tax rate.

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7.4.2 COST OF PREFERENCE SHARE CAPITAL

The return to the preference shareholders for their capital contribution is in the form of preference dividend. Payment of dividend on preference capital 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 a class of owners. Therefore, it is felt that dividend on preference capital does not constitute a cost. But this contention is not correct.

The cost of preference capital is a function of the dividend expected by investors. Preference capital is never issued with an intention of not paying dividend. Generally dividends are paid, though non-payment does not cause bankruptcy. Non-payment can be a serious matter from the shareholders' point of view. It may result in voting rights and control to the preference shareholders. Accumulation of preference dividend arrears may adversely affect the prospects of common shareholders for receiving any dividends because dividends on preference capital represent a prior claim on profits. The market value of common shares can be adversely affected if dividends are not paid to the preference shareholders and therefore to the equity shareholders. Therefore, dividends would be regularly paid to them except in case of losses or in case the firm is in a very tight cash position.

$$K_p = \text{Dividend} / \text{Price}$$

In case of redeemable preference shares, when maturity period is given, the cost of preference capital would be -

$$K_p = \frac{D + 1/n (RV - SV)}{1/2 (RV + SV)}$$

The cost of preference capital is not adjusted for taxes as dividends are paid from after tax profits. Further, dividends are not tax deductible. Therefore, the cost of preference capital is substantially greater than the cost of debt. Another reason for higher cost of preference capital than debt cost is due to higher risk assumed by the preference shareholders than the debenture holders.

Illustration - 5

A company issues 18% irredeemable preference shares of the face value of Rs.100 each. Flotation costs are estimated at about 5% of the expected sale price. What is the cost of preference, if preference shares are issued at (i) par; (ii) 10% premium; and (iii) 5% discount.

Solution

$$K_p = D/SV$$

Sale Value = 100 – 5 floatation cost = Rs. 95

- i) Issued at par: $18/95 = 0.189$ or 18.9%
- ii) Issued at 10% Premium: Sale Value = 100 + 10 premium
 $18/104.5 = 0.172$ or 17.2%
- iii) Issued at 5% discount: Sale Value = 100 – 5 discount = 95 – 4.75 floatation cost =
Rs 90.25
 $18/90.25 = 0.1994$ or 19.94%

Illustration - 6

A company issues 15% Rs10 Preference share at Rs.12 involving 10% floatation cost on estimated sale value. Calculate the cost of preference capital.

Solution

Sale Value = 12 – 1.20 floatation cost = Rs.10.80

Floataion Cost = 10% of 12 = Rs.1.20

$$K_p = 1.5/10.80 = 0.1388 \text{ or } 13.88\%$$

Illustration - 7

A company has issued 18% Preference shares of the face value of Rs100 each to be redeemed after 10 years. Floataion cost is expected to be 5%. Determine the cost of preference shares (kp).

Solution

$$\begin{aligned} K_p &= \frac{D + 1/n (Rv + SV)}{SV + RV/2} \\ &= \frac{18 + 1/10 (100 - 95)}{(100+95)/2} = 0.1897 \text{ or } 18.97\% \end{aligned}$$

7.4.3 COST OF EQUITY CAPITAL

The return expected by the equity shareholders is the cost of equity to the company. It is not legally binding on the company to pay dividends to the equity shareholders. The dividend rate is not fixed. However, the shareholders invest their money in common shares with an expectation of receiving dividends. The market value of the share depends on dividend expected by the shareholders. Therefore, the required rate of return, which equates the present value of the expected dividend with market value of the share, is the cost of equity capital. The

cost of external equity (new shares) is greater than the cost of retained earnings because of the presence of the floatation costs.

Management should strive to maximize the shareholders' welfare. The issue of new shares will have an effect on the existing shareholders as - (i) the new shareholders would be entitled to a share in all the future dividends along with the existing shareholders; and (ii) the new shareholders would be entitled to a pro rata share in the undistributed profits of the company and in the assets, in the event of winding up of the company.

The net results of these effects may be to lower the earnings per share and as a consequence, the market value per share may reduce. The minimum rate of return, which is required on the new investment financed by the new issue of common shares, to keep the existing market value of the share, is the cost of the new issue of common shares (external equity).

- a) **Dividends Model:** The price a company can obtain for its share depends upon the return expected by the shareholders. The return is made of the expected stream of dividends. When the dividends are expected to grow at a rate 'g' perpetually, the cost of the share would be -

$$K_e = (D/P_0) + G$$

Where, K_e = cost of equity

D = dividend per share

P_0 = price per share at the beginning of the year

G = growth rate

i.e. Dividend Yield + Growth Rate

Assumptions

- The market value is a function of the expected dividend
- The initial dividend is greater than zero
- The dividends grow at a constant rate 'g' forever
- Dividend pay out ratio i.e. dividend as a percentage of earnings, is constant

Under the condition of 100 per cent dividend payout, the dividend and earnings are not expected to grow. If the growth rate is zero, then, $K_e = D / P$

It is not possible for the company to realize the full market value of a share when a company issues new shares because, the company has to pay the floatation costs or costs of issue like underwriting commission, brokerage fees etc. The net proceeds of a share would be market price less floatation costs. In such a case, the cost of new equity would be -

$$K_e = (D / P(1-f)) + G$$

Where f = floatation cost

b) **Earnings Model:** It is felt that, the shareholders wealth is affected by the earnings of the company and not by the mere distribution of the earnings in the form of dividends. The entire earnings belong to the shareholders and hence the market value of the share is dependent on the earnings of the company. As per this view, the cost of equity would be -

$$K_e = \text{Earning per share} / \text{price per share}$$

But, in reality, the earnings price ratio does not reflect the true expectations of the common shareholders because the whole of the earnings may not be distributed as dividends to the shareholders.

The earnings model is used when the following conditions are satisfied.

- The earnings of the firm are stable and the growth rate is zero i.e., future earnings are equal to the current earnings.
- The firm does not employ debt.
- The retention rate is zero.

$$K_e = (D/P_0) + G$$

$$K_e = (E(1-b)/P) + 0$$

b = retention rate

$$\text{Since } D = E(1-b) \text{ and } g = 0, K_e = \text{EPS} / \text{MPS}$$

Where,

EPS = earnings per share

MPS = market price per share

A firm is said to be expanding not growing, if the investment opportunities available to it are expected to earn a rate of return equal to the cost of equity.

Illustration - 8

Suppose that dividend per share of a firm is expected to be Rs2.00 per share next year and is expected to grow at 5% per year perpetually. Determine the cost of equity capital, assuming the market price per share is Rs.28 and floatation cost Rs.3/- per share.

Solution

$$P_0 = 28 - 3 \text{ floatation cost} = \text{Rs. } 25$$

$$K_e = D_1/P_0 + g = 2/25 + 0.05 = 0.13 \text{ or } 13\%$$

Illustration - 9

From the under mentioned facts, determine the cost of equity shares of a company.

- i) Current market price of a share Rs120.
- ii) Cost of flotation per share on new shares 2%.

- iii) Dividend paid on the outstanding shares over the past five years.

Year	Dividend per share (Rs.)
1	10.00
2	10.50
3	11.25
4	11.75
5	12.25
6	13.50

- iv) Expected dividend on the new shares at the end of the current year is Rs.14.75/-

Solution

Estimation of growth rate in dividends

$$\text{Nth year's dividend} / \text{1st year's dividend} = 13.50 / 10.00 = 1.35$$

(Find compound factor 1.35 in Table A-1 in the 5th year) i.e., @ 6% interest (appr)

$$K_e = (14.75 / 120 (1 - 0.02)) + 0.06 = 0.1854 \text{ or } 18.54\%$$

7.4.4 COST OF RETAINED EARNINGS

The company is not required to pay any dividend on retained earnings. In fact, as the capital is not raised from outside the company, the company need not pay any cost to anyone. Hence, this source of finance is cost free. But, retained earnings involve an opportunity cost. The opportunity cost of retained earnings is the dividend foregone by the shareholders. Thus -

$$K_r = (D / P) + G$$

The cost of retained earnings is the return expected (dividend yield plus growth in dividends) by the common shareholders on their investment. In the absence of personal taxation and cost of new issue like brokerage costs and underwriting commission (floatation cost), $k_e = k_r$. This implies that if the dividend would have been distributed to the shareholders, they could have invested these dividends in the firms of similar risk and earned at least, a rate of return equal to cost of equity. Thus cost of equity is the opportunity cost of retained earnings when - (a) the shareholders do not pay any tax on dividends; and (b) incur no brokerage costs when investing the dividend received. However, even if these assumptions hold good, the cost of external equity will be higher than the cost of retained earnings because the latter do not involve any floatation costs. In reality, anyway, these assumptions do not hold good. The shareholders have to pay personal taxes on dividends received and brokerage costs are incurred when the dividends received are invested. As a result, the cost of retained earnings would be less than the cost of new shares. Thus -

$$K_r = K_e (1 - tp) (1 - b)$$

Where tp = personal tax and b = brokerage

Illustration - 10

Assuming the corporate tax rate of 35%, compute the after tax cost of the capital in the following situations:

- i) A perpetual 15% debentures of Rs.100/-, sold at the premium of 10% with no flotation cost.
- ii) A 12 year 12% debentures of Rs.1,000, redeemable at par, with 3.5% flotation cost.
- iii) A ten year 15% preference shares of Rs100, redeemable at premium of 5% with 3% flotation costs.
- iv) An equity share selling at Rs.50 and paying a dividend of Rs.10 per share, which is expected to be continued indefinitely, flotation cost Rs.2 per share.
- v) The same equity share (i.e., described in situation iv), if dividends are expected to grow at the rate of (a) 5%; (b) -5%.
- vi) An equity share, selling at Rs.150 per share, of a company that engages only in equity financing. The earning per share is Rs.25/- of which 60% is paid in dividends. The shareholders expect the company to earn a constant after tax rate of 12% on its investment of retained earnings.
- vii) The cost of equity capital of the company is 15%. The company wishes to finance its new investment project by retained earnings.

Solution

i) $K_d(a) = 15 (1 - 0.35) / 110 = 0.0886$ or 8.86%

ii) $K_d(b) = \frac{120 + 1 / 12 (1000 - 965)}{(1,000 + 965) / 2} = 0.1251$ or 12.51%

$K_d(a) = .1251 (1 - .35) = .0813$ or 8.13 %

iii) $K_p = \frac{15 + (105 - 97) / 10}{(105 + 97) / 2} = 0.156$ or 15.6%

iv) $K_e = 10 / 50 - 2 = 0.2083$ or 20.83%

v) $K_e = (10 / 50 - 2) + 0.05 = 0.258$ or 25.8%;

(b) $(10 / 50 - 2) - 0.05 = 0.158$ or 15.8%

vi) $G = br = 0.4 \times 0.12 = 0.048$; $k_e = (15 / 50) + 0.048 = 0.148$ or 14.8%

Dividend = 25 x 60 % = Rs. 15

vii) $K_r = 0.15$ or 15%

$K_r = K_e$ when there is no personal tax and no brokerage

7.5 WEIGHTED AVERAGE COST OF CAPITAL

When specific cost of capital is used, while accepting or rejecting a capital expenditure project, the profitability of the projects should be compared with the cost of specific source of funds used to finance the particular project. But, a firm's decision to use debt capital to finance its projects not only adversely affects its potential for using low cost debt in future, but, also makes the position of the existing shareholders more risky. The increased risk to the shareholders due to the use of debt will increase the cost of equity. Similarly, the firm's decision to use equity capital to finance its projects would enlarge its potential for borrowings in the future. Because of this connection between the methods of financing and their costs, the term cost of capital should be used in the composite sense. The composite or overall cost of capital is the weighted average of the costs of various sources of funds, weights being the proportion of each source of funds in the capital structure.

Steps

The following are the steps to calculate the weighted average cost of capital

- Calculate the cost of the specific sources of funds (cost of equity, preference, retained earnings and debt)
- Calculate the proportion of each source in the capital structure to get the weight
- Multiply the cost of each source by its proportion in the capital structure to get weighted cost
- Add the weighted costs of all sources of funds to get the weighted average cost of capital

In financial decision-making, the cost of capital should be calculated on an after tax basis. Therefore, the component costs used to measure the weighted cost of capital should be the after tax costs.

Weighted average cost of capital can also be calculated in the following way:

- Calculate the cost of the specific sources of funds (cost of equity, preference, retained earnings and debt)
- Multiply the component cost of each source of capital with the amount of funds raised from the respective source to ascertain the amount of cost
- Add the total amount of cost and the total capital
- Divide the total cost amount by the total capital amount and multiply with 100 to get the weighted average cost.

Book Value Vs Market Value Weights

The weighted average cost of capital can be computed by using book value weights or the market value weights. If there were a difference in the book value and market value, then, the weighted average cost of capital would differ depending upon the weights used. The weighted average cost of capital calculated based on the book value weights will be understated if the market value of the shares is higher than the book value and vice versa.

Theoretically, the market value weights should be preferred over the book value weights because, the market value reflects the expectations of the investors. But, the difficulty in using the market value weights is that the market values fluctuate very widely and frequently. The use of book value weights is preferred because of the following reasons:

- The firms set their capital structure targets 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 riskiness of the firms

Illustration - 11

A Firm's after-tax cost of capital of the specific sources is as follows:

Cost of debt	6%
Cost of preference shares	12%
Cost of equity funds	16%

Source	Amount (Rs.)
Debt	5,00,000
Preference capital	3,00,000
Equity capital	10,00,000
TOTAL	18,00,000

Calculate the weighted average cost of capital (K_0), using book value weights.

Solution

Source of funds	Amount (Rs.)	Specific cost	Total cost (Rs.)
Debt	5,00,000	0.06	30,000
Preference capital	3,00,000	0.12	36,000
Equity capital	10,00,000	0.16	1,60,000
TOTAL	18,00,000		2,26,000

$$K_0 = 2,26,000/18,00,000 = 0.1255 \text{ OR } 12.55\%$$

Illustration - 12

A company has on its books the following amounts and specific costs of each type of capital:

Type of capital	Book value	Market value	Specific costs %
Debt	5,00,000	4,50,000	4.0
Preference	2,00,000	1,50,000	6.0
Equity	7,00,000	15,00,000	12.0
Retained earnings	3,00,000		
TOTAL	17,00,000	21,00,000	

Calculate the weighted average cost of capital based on

- a) Book Values; and
- b) Market Values

Solution

Source of capital	Book value (Rs.)	Specific cost %	Total costs (Rs)
Debt	5,00,000	4.0	20,000
Preference	2,00,000	6.0	12,000
Equity	7,00,000	12.0	84,000
Retained Earnings	3,00,000	12.0	36,000
TOTAL	17,00,000		1,52,000

$$K_0 (BV) = 1,52,000/17,00,000 = 0.089 \text{ OR } 8.9\%$$

Source of capital	Market value (Rs.)	Specific cost %	Total costs (Rs.)
Debt	4,50,000	4.0	18,000
Preference	1,50,000	6.0	9,000
Equity + Retained Earnings	15,00,000	12.0	1,80,000
TOTAL	21,00,000		2,07,000

$$K_0 (MV) = 2,07,000/21,00,000 = 0.0985 \text{ OR } 9.85\%$$

7.6 MARGINAL COST OF CAPITAL

The weighted average cost of capital may be computed for the sources of finances already employed by the firm. The purpose of calculating this historical cost may be to evaluate the performance of management in raising funds by comparing it with some pre-determined standard cost of capital. In capital budgeting process, the firm is concerned with the selection of new projects. Therefore, the relevant cost to be worked with is, the cost of raising the new funds to finance the projects and not the historical cost, which has been incurred in the past. Thus, the weighted average cost of new or incremental capital should be used in capital expenditure decisions. The weighted average cost of new or incremental capital is known as the marginal cost of capital. Since the firm raises capital marginally to make a marginal investment in new projects, we need to work with the marginal cost of capital to the firm as a whole.

Strictly speaking, the marginal cost of capital may be defined as the cost of raising an additional rupee of capital. Since the capital is raised in substantial amount in practice, the marginal cost of capital is referred to the cost incurred in raising the new funds. The marginal cost of capital is derived when we calculate the weighted average cost of capital using the marginal weights. The marginal weights represent the proportion of funds the firm intends to employ. Thus, the problem of choosing between the book value weights and market value weights does not arise in the case of marginal cost of capital computation.

The rationale for using the marginal cost of capital as an investment criterion is to maximize the value of the common shares of the firm. In NPV method, the marginal cost of capital of the project can be used to determine its NPV. In IRR method, the marginal cost of capital should be used as the cut off rate.

Activity -III

Explain the concept of marginal cost of capital?

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7.7 SUMMARY

Capital, like any other factor of production, has a cost. A company's cost of capital is an average of the firms cost of debt, preferred stock, equity capital and retained earnings weighted by the proportion of each source in the total long term capital of the firm. It is the weighted average of the cost of the firm's sources of finance.

Cost of debt is adjusted for the tax factor to arrive at the post tax cost of debt as interest on debt is a tax deductible expense. The cost of preference is simply equal to its yield as the preference dividend is paid from after tax profits and hence it is not tax deductible. The cost of equity and retained earnings will be the same in the absence of personal tax and floatation costs. Otherwise, the cost of retained earnings will be lower than the cost of equity.

The proportions (weights) for the calculation of weighted average cost of capital may be based on book values or market values. Generally, market value proportions are recommended unless market values are not available or highly unreliable or distorted.

7.8 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. Explain the following cost concepts.
 - a) Explicit Vs. Implicit Cost
 - b) Future Vs. Historical Cost
 - c) Marginal Vs. Weighted Average Cost
 - d) Specific Vs. Combined Cost
2. Why is the cost of debt less than the cost of common stock?
3. Explain the procedure for calculating a firm's Weighted Average Cost of Capital.

II. Long Answer Questions

1. Explain how specific costs are calculated.
2. How would you handle the floatation costs in computing the cost of capital?

3. "Retained earnings are cost free". Discuss.
4. Discuss the procedure for determining the cost of equity capital in a growth firm.

Exercises

1. Suresh Ltd. Issues 8,000, 12% debentures of Rs. 100 each at a premium of 10 %. Floatation cost 2% of expected sale price. Calculate the cost of debentures if tax rate is 60%.

(Answer: 4.45 %)

2. A company issues 10,000, 15 % debentures of Rs. 100 each at a discount of 5%. Commission payable to brokers and under writers is Rs. 50,000. Debentures are redeemable after 5 years. Calculate before tax and after tax cost of debt assuming a tax rate of 50%.

(Answer: Kdb = 17.89 % and Kda = 8.95 %)

3. Your company's share is quoted in the market at Rs. 20 currently. Company pays a dividend of Re 1 per share and investor expects a growth rate of 5 % per year. Compute

- a) Company's cost of equity.
- b) If the anticipated growth rate is 6 % p.a., compute indicated market price per share.
- c) If the company's cost of capital is 8 % and anticipated growth rate is 5 %p.a., calculate indicated market price if dividend of Re 1 per share is to be maintained.

(Answer: (a) 10% (b) Rs. 25 (c) Rs. 33.33)

4. A Ltd. Intends to issue new equity shares. Its present equity shares are being sold in the market at Rs. 125 per share. The company's past record regarding payment of dividend is as follows.

10.70 %, 11.45 %, 12.25 %, 13.11 % and 14.03 %

The floatation costs are estimated at 3 % of the current selling price of the shares. Calculate (a) growth rate in dividends (b) cost of funds raised by issue of equity shares assuming that the growth rate as calculated under (a) above will continue for ever (c) cost of new equity shares.

(Answer: (a) 7 % (b) 19.01 % (c) 19.4 %)

Note: In case of bit (b), dividends = 14.03 % + 7% of 14.03%

5. The following is the capital structure of a firm together with specific costs of capital.

Sources of Finance	Book Value	Market Value	Cost
	Rs.	Rs.	%
Debentures	12,00,000	12,00,000	6
Preference Capital	2,00,000	2,00,000	12

Equity Capital	8,00,000	16,00,000	15
Retained Earnings	3,00,000		12
	<u>25,00,000</u>	<u>30,00,000</u>	

Calculate the weighted average cost of capital under (a) Book Value weights and (b) Market Value weights.

(Answer: (a) 10.08 % and (b) 10.76 %)

Note: Divide Market Value of Equity Capital into Equity and Retained Earnings in the ratio of 8:3 (Equity: Retained Earnings Book Values as Market value of equity is based on the total of equity and retained earnings book values)

6. A fertilizer company wishes to determine the weighted average cost of capital for evaluating capital budgeting projects. You have been supplied with the following information.

Balance Sheet

Liabilities	Rs.	Assets	Rs.
Current Liabilities	8,00,000	Sundry Assets	34,00,000
Debentures	8,00,000		
Preference Shares	4,00,000		
Equity Shares	10,00,000		
Retained Earnings	4,00,000		
	<u>34,00,000</u>		<u>34,00,000</u>

Anticipated external financing information is as follows.

- 20 years 10% debentures of Rs. 2,000 for value redeemable at 5% premium, sold at par, 2% floatation costs.
- 12% preference shares, sale price Rs. 100 per share, 2% floatation costs.
- Equity shares sale price Rs. 120 per share, floatation costs would be Rs. 5 per share.
- The corporate tax rate is 50% and its shareholders marginal tax bracket is 30%. The expected equity anticipated growth rate is 5% per year. The expected dividend at the end of current financial year is Rs. 10 per share.

Assume that the company is satisfied with its present capital structure and intends to maintain it.

Calculate the weight average cost of capital.

(Answer: 9.9%)

7. A company has the following capital structure.

12% Debentures Rs. 26,00,000

8% Preference Capital Rs. 10,00,000

(20,000 shares of Rs. 50 each)

Equity Capital Rs. 25,00,000

(50,000 shares of Rs. 50 each)

The equity shares are currently selling at Rs. 60 per share and are expected to get the dividend of Rs. 4 per share. Shareholders anticipate that the equity dividend will grow at the rate of 6% p.a. in the near future. The company has a tax rate of 60%. Find out weighted average cost of capital.

(Answer: 8.53%)

7.9 FURTHER READINGS

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7.10 KEY WORDS

- Future Costs** : The costs that are yet to be incurred.
- Historical Costs** : The costs which have already been incurred.
- Component or Specific Cost of Capital** : The cost of each component of capital.
- Composite or Combined Cost of Capital** : An inclusive cost of capital from all sources of capital.
- Marginal Cost of Capital** : The weighted average cost of new or incremental funds raised by the firm.

- Explicit Cost of Capital** : The discount rate that equates the present value of the cash inflows with the present value of its cash outflows.
- Implicit Cost of Capital** : The rate of return associated with the best investment opportunity that will be foregone if the project presently under consideration by the firm were accepted.
- Cost of debt** : The rate of return expected by the lenders.
- Cost of Capital** : The return expected by the providers of funds to the firm.

BRAOU

UNIT – 8 : CAPITAL STRUCTURE

Objectives

The objectives of this Unit are to:

- know the meaning of Capital Structure;
- identify the determinants of Capital Structure;
- understand the concept of optimum Capital Structure; and
- explain the different approaches to and theories of capital structure.

Structure

- 8.0 Introduction
- 8.1 Importance of Capital Structure
- 8.2 Determinants of Capital Structure
- 8.3 Optimum Capital Structure
- 8.4 Capital Structure Theories
 - 8.4.1 Net Income Approach
 - 8.4.2 Net Operating Income Approach
 - 8.4.3 Traditional View
 - 8.4.4 Modigliani Miller's Approach
- 8.5 Summary
- 8.6 Self Assessment Questions
- 8.7 Further Readings
- 8.8 Key Words

8.0 INTRODUCTION

Capital is the most important factor of production. The funds generated internally by the company may not be sufficient to run the company. Therefore, it would go public for raising the funds. The two principal sources of finance for a firm are ownership securities i.e., equity and preference shares, and creditorship securities i.e., debentures and / or bonds. A firm has to maintain a proper mix of these two securities in a manner that an ideal trade off is maintained between shareholders risk and return in maximizing their wealth. Thus the mix of sources of funds from which the long-term funds required by a business are procured is referred to as Capital structure.

The company has to plan for a proper capital structure. In case of unplanned capital structure, the firms fail in economizing the use of their funds. The firm should aim at an optimum capital structure. An optimum capital structure is obtained when the market value of the share is maximum or the average cost of capital is minimum or the marginal real cost of each source of funds is the same.

8.1 IMPORTANCE OF CAPITAL STRUCTURE

The important reason for the company to use debt in addition to share capital in its capital structure is to increase its earnings. The use of debt has the effect of increasing the returns on equity capital. But, the financial risk of the company increases. This has the effect of bringing the company into insolvency and also creating variations in the return to equity shareholders. Even though the management of every business realizes that there is certain amount of risk, yet, it is prepared to employ certain level of debt in the capital structure. If this level is exceeded, the tendency on the part of the investors to reduce the price they would pay both for the debt and equity capital would also increase. This in turn will have an unfavorable effect on the cost of capital. Therefore, an optimum capital structure is one that maximizes the market value of the securities in order to reduce or minimize the cost of capital. The return to the supplier of funds in a competitive market depends upon the degree of risk he is taking. Since the creditor has a prior claim to the equity shareholder in the matter of repayment of debt amount and interest, the latter gets a return only after satisfying the claims of the creditors. Therefore, the risk of the creditor is less than the owner and the cost of the business should be greater for equity funds than for debt. The cost here is the amount foregone. As a result, debt is cheaper source of funds than equity.

A point will be reached at which the firm will find the use of additional debt is be more expensive than the addition of equity shares. When the investors find that the risk is increased, they will demand higher rate of interest. High leverage will make the position of equity shares more firm and thereby the shareholder return will vary.

Financing with debt will generally result in higher earnings per share than financing by the additional shares upto a certain point; the increased earnings will result in an increase in the value per share.

The capital structure should be planned generally, keeping in view the interest of the shareholders as they are the ultimate owners of the company and also when the company lays down its objectives in terms of shareholders welfare, it is compatible with the interest of the other groups. Thus, while developing an appropriate capital structure, financial manager should aim at maximizing the long-term market price of the share. There would be a range of an appropriate capital structure within which there would not be a great difference in the market value per share.

8.2 DETERMINANTS OF CAPITAL STRUCTURE

A decision as regards capital structure is normally a continuous one and requires a great deal of caution. The initial capital structure should be designed very carefully and a target capital structure should be set and subsequent financing decision should be made with a view to achieve the target capital structure.

The following are the determinants of capital structure.

- **Leverage / Trading on Equity**

Trading on equity denotes the process of using funds on which a fixed rate of interest dividend is paid i.e. debt and preference capital and other long-term funds. When funds are raised by issue of equity only, there will be no trading on equity because, there is no limit as

regards the return on equity shares. A business is said to trade on equity, because, the creditors and preference shareholders are willing to advance funds to the business on the strength of the funds supplied by the equity shareholders who are called 'residual owners' and on the earning capacity of the business. The reason for trading on equity is to employ the senior funds at a rate of return higher than their cost to increase the return on the investment of residual owners. If the earnings are more, the equity shareholders gain and when the earnings are less, they lose because, the concern has to pay interest, which is more than the income from investments. Their investment serves as a protection for both income and the principal of the debenture holders. The equity shareholders receive nothing until the creditors are paid in full in case of liquidation. If the profits earned are not sufficient to meet the debenture interest and preference dividend, the deficiency has to be made good by equity shareholders. The main reason for the employment of debt is that, up to a certain point, debt is a less expensive source of funds than that of equity. As long as the interest cost of debt is lower, the equity shareholders are benefited.

The earnings per share also increase when the preference capital is used to acquire assets. But, the leverage impact is more pronounced in case of debt as the cost of debt is lower than the cost of preference capital and interest paid on debt is tax deductible.

Because of its effect on earning per share, financial leverage is one of the important considerations in planning capital structure. The companies with a high level of earnings before interest and tax (EBIT) can make profitable use of high degree of leverage to increase return on the equity shares. The firm maximizes earning per share (EPS) by using debt financing. Though the rate of preference dividend is equal to the rate of interest, EPS will be high in case of debt financing because, interest charges are tax deductible while preference dividends are not. With an increasing level of EBIT, EPS will increase at a faster rate with a high degree of leverage. However, if a company is not able to earn on its assets a rate of return higher than the interest rate or preference dividend rate, debt or preference financing will have an adverse impact on EPS. It is obvious that, under unfavorable conditions i.e. when rate of return on total assets is less than the cost of debt or preference capital, the EPS will fall with the degree of leverage.

If the possibility of earning a rate of return (on firms assets) more than or equal to the cost of debt is significant, a large amount of debt can be used by the firm in its capital structure to increase the EPS. This may have a favorable effect on market value per share. In most of the cases, EPS criterion will favor debt.

Trading on equity can be considered to be advisable only when conditions are prosperous, but, in times of recession and reduced profits, it is disadvantageous.

If trading on equity is not successful continuously for a number of years by a concern, it indicates that the company is not able to earn a good or reasonable return on its assets. In such a case, the concern will be unable to meet its obligations for payment of interest and dividend on debentures and preference shares respectively. This default on the part of the concern causes hardship to equity shareholders.

The creditors in case of default may seize the assets of the firm and dispose them off, in which case, equity shareholders may have to lose a part of their capital. In certain cases, the preference shareholders in case of default of payment of dividend by the company may acquire almost equal rights as equity shareholders. If the return on debentures and preference shares is in arrears, market value of equity shares will fall sharply.

Even if trading on equity is carried on successfully, the creditors may impose certain restrictions on the management in the matter of the amount of dividends, selling of assets or mergers with other companies.

The company should resort to borrowing in senior securities only when there is a reasonable stability in income to meet the payments to debenture holders. If funds are employed beyond that point, there is bound to be business failures. As the proportion of borrowing increases, the increased investment risk tends to increase the rate of interest paid on borrowed funds. Thus, the cost of debt is affected considerably. The company should not go beyond a standard as regards the issue of debentures. Proposed financing may not be possible if there are certain existing terms of contract. The management may also not like to issue further debentures for reasons of safety and conservative policy even though the business may be expanding.

- **Growth and stability of sales**

Companies having stable and increasing sales resort to debt financing without any difficulty. But, the companies that face fluctuations in sales are exposed to business risk and consequently the financial risk. Hence, cannot employ more debt.

- **Cash flow ability to service debt**

Conservatism is related to the fixed charges created by the use of debt or preference capital in the capital structure and the firm's ability to generate cash to meet these fixed charges. A firm is conservatively financed if it is able to serve its fixed charges under any reasonably predictable adverse conditions.

If the company employs more debt, fixed charges increase since the principal sum is to be repaid along with interest due thereon. If the future cash flows are not sufficiently generated to meet the fixed charges fully and further to leave a balance to be paid as dividend to preference shareholders and equity shareholders also, the company should not procure funds through borrowings. The greater and more stable the expected future cash flows of the firm are the greater will be the debt capacity of the company. The ratio of net cash flows to fixed charges may be calculated to find out the fixed charges cover.

- **Cost of capital**

The cost of a source of finance should be minimum. The cost is known on the basis of the return expected by the supplier of a particular source of finance. Expected return depends on the extent of risk, which is assumed by the various suppliers of finances. Usually debt is cheaper than equity because debenture holders assume less risk than equity holders. The rate of interest is fixed in case of debenture holders whereas the rate of dividend is not fixed in case of shareholders. More over, the interest payment is a legal obligation whereas dividend payment is not. And, lastly, the loan is repayable within a specified period, whereas, equity is to be returned only at the time of winding up of the company. Therefore, the debt is usually preferred to equity from the point of view of cost of capital. Preference capital is also cheaper than equity capital but debt is still cheaper as it involves tax advantage of deductibility of interest.

The cost of retained earnings is less than the cost of new issues (equity issues) because the personal taxes have to be paid by the shareholders on distributed earnings while no taxes are

paid on retained earnings and because no floatation costs are incurred when earnings are retained. Between the two sources of equity funds, retained earnings are preferred.

An effort should be made to minimize the overall or composite cost of capital, if finances are desired to be arranged from more than one source simultaneously.

- **Control**

The management of a company does not want to lose control over the affairs of the company. The existing management team not only wants to be elected to the board of directors but also manage the company without any outside interference. In case the company raises funds through issue of shares, the control of existing shareholders is diluted. This is not a very important consideration in case of a widely held company as the shares are scattered and the most of the shareholders may be interested in dividends and the price of shares and if they are not satisfied with the management of the company, they may sell their shares. Thus, to ensure control and to have confidence, management manages the company more efficiently.

Fear of sharing control and being interfered by others often delay the decision of closely held company to go public. To avoid the loss of control, companies may slow their rate of growth or issue preference shares or raise debt capital. However, the risk of loss of control can be minimized by wide distribution of shares in small quantities.

From the angle of control, debt use is recommended, as they do not have voting rights. But, debenture holders may put a lot of restrictions on companies to protect their interest and this may curtail the freedom of management to run the business. A very excessive amount of debt can also cause bankruptcy, which means a complete loss of control.

- **Flexibility**

Capital structure should be capable of being adjusted to the changed conditions. Whenever company requires funds, it should be able to raise them without any inconvenience and undue delay. If there is a flexibility in fixed charges, maintenance of debt-equity ratio, debt capacity, terms and conditions of issue and redemption, debt will always be preferred. Convertible debt or bonds offer great degree of flexibility in this regard.

From the point of view of fixedness of charges, a company should employ a greater proportion of equity capital than debt. This will make the capital structure of the company very conservative and it will not be able to take the advantage of financial leverage. In fact, other factors should be evaluated and there should be a balanced mix of debt and equity.

- **Size of the Company**

Small companies have to depend on owned capital as far as possible. Arranging long-term loans is hard nut to crack for them. On the other hand, large companies do not find much difficulty in raising long-term loans.

Small concerns face the problem of higher rate of interest and inconvenient and highly restrictive covenants in loan agreements. Issue of shares result in higher cost, greater danger of loss of control as shares are not widely scattered and dissident group of shareholders can be easily organized to get control of the company. Therefore, sometimes, small concerns limit the growth of their business to what can easily be financed by the retained earnings.

A large concern has a greater degree of flexibility in its capital structure. Because of its large size, its cost of distributing any kind of security is less than that of a small company.

- **Floatation Costs**

Cost of floating debt is less than the cost of floating an equity issue. Large issues involve less floatation costs comparatively, but large issues may not be advisable otherwise. If retained earnings increase owner's capital, there will be no floatation costs. But, floatation costs are not a significant consideration to decide about alternative forms of financing. They are incurred only when funds are raised.

- **Marketability / choice of investors**

Marketability, here means readiness of investors to purchase a particular type of security in a given period of time. It is not always a company's discretion, which prevails in the matter of deciding which source of finance to adopt. If the investors are not ready to buy preference shares, even when the company feels it as most appropriate source of financing for it, preference shares cannot be issued. Similarly, sometimes, debentures are not acceptable to the public. Therefore, market sentiments are very important.

If the share market is depressed, the company may not issue common shares, but issue debt and wait to issue shares till the share market recovers. During boom period in the share market, it may not be possible for the company to issue debentures successfully.

The internal conditions of a company may also dictate the marketability of securities. A highly levered company may find it difficult to raise additional debt. Similarly, when restrictive covenants in existing debt agreements preclude payment of dividends on equity shares, convertible debt may be the only source to raise additional funds.

- **Purpose of Financing**

If funds raised are to be utilized for productive purposes, debt may be a proper source of finance since interest on debt will not become a burden on the company. It will be met out of profits earned. If raised for unproductive purposes like construction of building for employees' residence, raising finance through debt is not advisable.

- **Period of Finance**

There should be a correct matching of the period of finance and source. If funds are required for 10 years, debt is preferred. As an alternative, redeemable preference shares may be issued, if considered more appropriate according to other considerations. If requirement is permanent, issue of equity shares is appropriate.

- **Legal Requirements**

Government has issued certain guidelines for the issue of shares and debentures. There are legal requirements according to Companies Act also. Recently issued guidelines in respect of issue of debentures have recommended a debt-equity ratio of 3:1.

- **Timing of Issue**

If interest rates are likely to fall, debt issue may be postponed. If issue of equity shares is not likely to be responded to by the public, such an issue may be deferred. Proper timing gives the best results to the company. At times, the company may not be able to raise funds through any source. It is in fact, the time of prosperity for the company and the optimistic attitude of investors in the market that can be considered to be the best one for raising funds.

8.3 OPTIMUM CAPITAL STRUCTURE

The company should use neither excessive equity nor excessive debt. There should be an appropriate capital structure where there is a desirable level of debt and equity to take the advantage of low cost debt funds and also at the same time, the risk is not too high for the company because of debt employment. The company should also not be too conservative and employ equity, but also assume certain level of risk. Thus, there should be an optimum capital structure where the market price of the share is maximum or the overall cost of capital is minimum at a particular level of capital structure.

An optimum capital structure should satisfy the conditions of profitability, solvency, control, flexibility and conservatism. But, these factors are contradictory to each other. Therefore, the above considerations cannot be simultaneously taken care of, to the fullest possible extent. More the profitability less would be the solvency position. From the control point of view, debt is preferred, whereas, from conservatism point of view, it is rejected and on the other hand equity is preferred. A proper balancing has to be done and a decision that is in the best interest of the business is to be made.

8.4 CAPITAL STRUCTURE THEORIES

The following approaches / theories explain the relationship between capital structure, cost of capital and the value of the firm.

Assumptions of capital structure theories

1. Only two sources of funds i.e. debt and equity are used by a firm
2. No corporate income taxes
3. Total assets / investment decisions of the firm are given and no change
4. Dividend pay out ratio is 100 per cent. No retained earnings
5. The firm's total financing remains constant. The degree of leverage can be changed by selling debt to repurchase shares or selling shares to retire debt
6. There is no growth in EBIT
7. All investors have the same subjective probability distribution of expected future operating income for a given firm
8. Business risk is constant and independent of its capital structure and financial risk

David Durand has advocated two theories in this connection – Net Income Approach and Net Operating Income Approach.

8.4.1 NET INCOME APPROACH

The capital structure decision is relevant to the valuation of the firm. A change in capital structure / financial leverage will lead to a corresponding change in the overall cost of capital as well as in the total value of the firm. If, therefore, the degree of financial leverage as measured by the ratio of debt to equity is increased, the weighted average cost of capital will decline, while the value of the firm as well as the market price of the equity share will increase. A decrease in the leverage will increase the overall cost of capital, reduces the value of the firm and the market price of the equity shares.

Assumptions

- As the use of debt does not alter the risk element, the equity capitalization rate and debt capitalization rate will remain unchanged.
- The debt capitalization rate is less than the equity capitalization rate
- Corporate income taxes do not exist

Example 1

Capital structure of a company consists of 6 % debentures of Rs. 10,000. Company expects a net income of Rs. 4000. Equity capitalization rate is 10%.

The total value of the company is:

	Rs.	
Net income	4,000	
Less debenture interest	600	
Earnings to shareholders	<u>3,400</u>	
Market value of equity share	$3,400 \times 100/10 =$	Rs. 34,000
Market value of debenture		<u>Rs. 10,000</u>
Total value of business		<u>Rs. 44,000</u>

Implicit overall cost of capital will be

Earnings x 100 / value of the company

$$4,000 \times 100 / 44,000 = 9 \% \text{ (appr.)}$$

The cost of debt has both explicit cost (interest rate) and implicit or hidden cost (increase in equity cost due to increase in debt)

Assume that the debt is increased by the firm from Rs. 10,000 to Rs. 25,000 and interest per cent on debt remains the same.

The total value of the company will be:

	Rs.	
Net income	4,000	
Less debenture interest	1,500	
Earnings to shareholders	<u>2,500</u>	
Market value of equity share	$2,500 \times 100/10 =$	Rs. 25,000
Market value of debenture		<u>Rs. 25,000</u>
Total value of business		<u>Rs. 50,000</u>

Implicit overall cost of capital will be

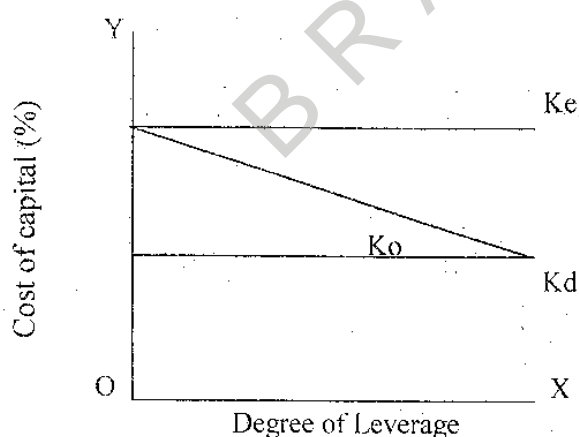
Earnings x 100 / value of the company

$$4,000 \times 100 / 50,000 = 8 \% \text{ (appr.)}$$

Thus, the value of the firm increases as the debt increases and average cost of capital decreases. The optimum capital structure would be at a point when the value of the firm is maximum and overall cost of capital is minimum. This approach signifies that a company can reduce the cost of capital and increase its total value by the use of debt.

If the firm uses no debt, the overall cost of capital will be equal to equity capitalization rate. The weighted average cost of capital will decline and will approach the cost of debt as the degree of leverage reaches one.

Figure 1



8.4.2 NET OPERATING INCOME APPROACH

This theory states that the market value of the firm is not affected by the capital structure changes. The market value instead, is found out by capitalizing the net operating income at the overall cost of capital (ko), which is a constant.

Assumptions

- The market capitalizes the value of the firm as a whole. Thus, the split between debt and equity is not important.

- Residual value of equity is determined by deducting total value of debt from the total value of the firm.
- The cost of equity changes based on risk perception. The use of less costly debt funds increases the risk to shareholders. This causes the equity capitalization rate to increase. Thus, the advantage of debt is off set exactly by the increase in equity capitalization rate.
- Cost of debt is constant. The advantage associated with the use of debt i.e. a cheaper source of funds in terms of explicit cost is exactly neutralized by the implicit cost represented by increase in cost of equity (ke). As a result, the real cost of debt and real cost of equity, according to net operating income approach are the same and equal K_o.

Example 2

EBIT	Rs. 2,00,000
Average cost of capital	10%
6% Debentures	Rs. 10,00,000

	Rs.
Market value of the firm will be $2,00,000 \times 100/10$	= 20,00,000
Market value of debt	= 10,00,000
Market value of equity shares	<u>= 10,00,000</u>

	Rs.
Net income	2,00,000
Less debenture interest	<u>60,000</u>
Earnings to shareholders	<u>1,40,000</u>

Cost of equity shares will be $1,40,000 \times 100 / 10,00,000 = 14\%$

Assume that the company increases debt from Rs. 10,00,000 to Rs. 15,00,000.

The value of the company will Rs. 20,00,000 unchanged.

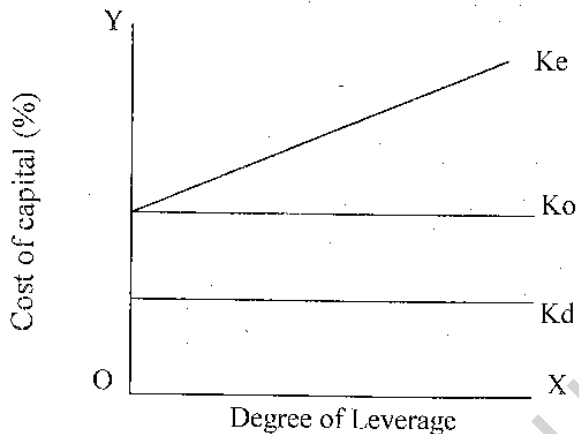
Market value of the firm	$2,00,000 \times 100/10$	= 20,00,000
Market value of debt		= 15,00,000
Market value of equity shares		<u>= 5,00,000</u>

	Rs.
Net income	2,00,000
Less debenture interest	<u>90,000</u>
Earnings to shareholders	<u>1,10,000</u>

Cost of equity shares will be $1,10,000 \times 100 / 5,00,000 = 22\%$

Thus, the equity capitalization rate increases with the degree of leverage; the total value of the company remains unchanged by the capital structure. As the average cost of capital (K_o) is constant, this approach implies that there is not any unique optimum capital structure. Therefore, according to this approach, all capital structures are optimum, since the market price per share does not change with the leverage. The total value of the firm does not change as the overall cost of capital is the same at all levels of capital structure.

Figure 2



8.4.3 TRADITIONAL VIEW

A compromise between Net Income Approach and Net Operating Income Approach is the Traditional view. According to this view, the value of the firm can be increased or cost of capital can be decreased by the judicious mix of debt and equity. Cost of capital decreases within the reasonable limit of debt and then increases with leverage. Thus, optimum capital structure exists and occurs when cost of capital is minimum or value of firm is maximum.

First Stage

K_e , the rate at which shareholders capitalize their net income, remains constant or slightly rises with debt. When it increases, it does not increase fast enough to offset the advantage of low cost debt (K_d). The cost of debt remains constant or rises negligibly since the market views the use of debt as a reasonable policy. As a result, value of the firm increases, K_o falls with increasing leverage. The statement 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, which existed on equity before debt financing.

Second Stage

Once the firm has reached a certain degree of leverage, increases in leverage have a negligible effect on the value or the cost of capital of the firm because increase in the cost of equity due to added financial risk offsets the advantage of low cost debt. Within that range or at the specific point, value of the firm will be maximum or cost of capital will be minimum.

Third Stage

Beyond the acceptable limit of leverage, value of the firm decreases and K_o increases with leverage because, investors perceive a high degree of financial risk and increase equity capitalization rate by more than to offset the advantage of low cost debt.

The overall effect of three stages is to suggest that K_o is a function of leverage. First, it declines with leverage and after reaching a minimum point or range, starts rising.

Figure 3

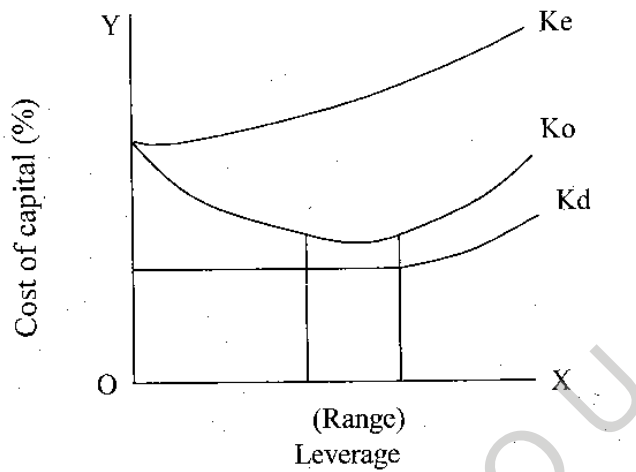
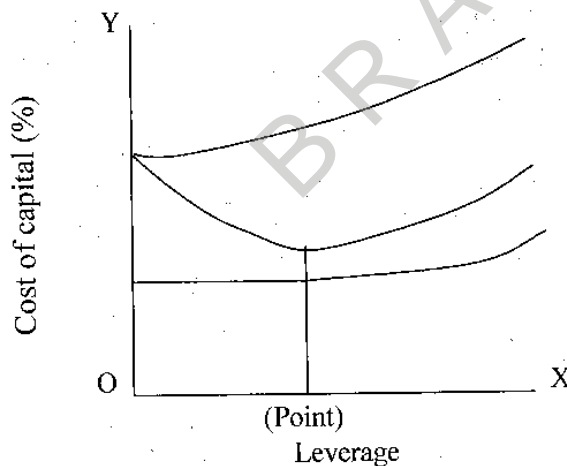


Figure 4



Criticism

- Modigliani Miller criticizes the assumption of K_e unaffected by leverage up to some reasonable limit.
- Market value depends upon EBIT and risk attached to it. The form of financing does not change EBIT and risk. It can simply vary the way in which EBIT and risk are distributed between equity and debenture holders. Firms with identical EBIT and risk but differing in modes of financing should have the same total value.

But, optimum capital structure existence can be supported on two counts i.e. tax deductibility of interest charges and market imperfections.

8.4.4 MODIGLIANI MILLER'S (MM) APPROACH

The above approach is identical with NOI approach. In the absence of taxes, a firm's market value and cost of capital remain invariant to capital structure changes.

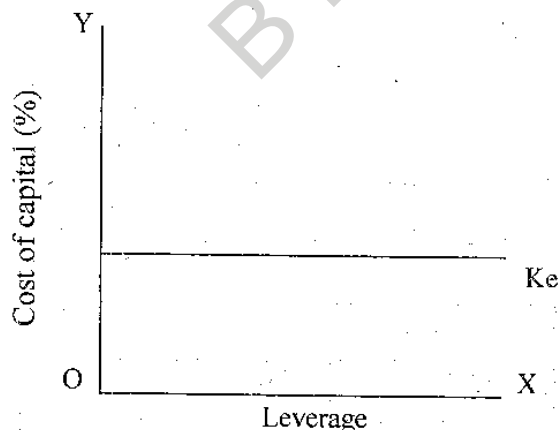
Assumptions

- Perfect Capital Markets: Securities are infinitely divisible. Investors are free to buy or sell securities. They can borrow on the same terms and conditions as firms can, without any restrictions. No transaction costs (cost of buying and selling) exist. Investors behave rationally and information available to them is perfect.
- Dividend pay out ratio is 100 %
- No corporate taxes. Relaxed later
- Firms belong to homogeneous risk class
- Investors have the same expectation of firms NOI (EBIT) with which to evaluate the value of any firm.

Proposition - I

For firms in the same risk class, total market value is independent of debt equity combination and is given by capitalizing the expected NOI by the rate appropriate to that risk class. Since the cost of capital is deferred as the expected NOI divided by the total market value of the firm and since MM conclude that total market value of the firm is unaffected by financing mix, it follows that K_0 is independent of capital structure and is equal to capitalization rate of equity.

Figure 5



Arbitrage Process

Thus, two firms identical in all the respects except for their capital structure cannot have different market value or different cost of capital. Arbitrage (switching) will take place to enable investors to engage in 'personal leverage' or 'home made leverage' as against the 'corporate leverage' to restore equilibrium in the market.

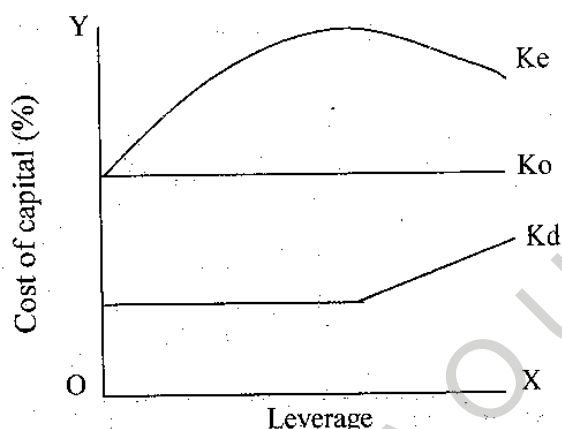
When two firms 'un levered firm' (U) and 'levered firm' (L) have the same expected NOI but do not have same market values ($V_u \neq V_l$), investors at the margin would sell the shares of

over valued firm, borrow additional funds on their personal account and invest in under valued firm in order to obtain same return for smaller investment outlay. This process will continue till $V_u = V_l$.

Proposition - II

The crucial part of MM approach is K_o will not rise even if very excessive use of leverage is made, if K_d is constant. But, K_d will increase with leverage beyond a certain acceptable level of debt. MM says that even if K_d increases, the K_o will be constant because, K_e increases at a declining rate and may even turn down eventually. Arbitrage process will work and that as K_d increases, some investors become risk seekers, whereas before they avoided risk.

Figure 6



Criticism

- Firms and individuals can borrow and lend at same rate of interest does not hold good. Firms have a higher credit standing and borrow at lower rates of interest. If the cost of borrowings to an investor is more than the firm's borrowing rate, then equalization process will fall short of completion.
- Personal leverage substitution for corporate leverage is not correct. If a levered firm goes bankrupt, all investors stand to lose to the extent of the amount of purchase price of their shares. But, if an investor creates personal leverage, in the event of firm's insolvency, he would lose not only his principal investment in the shares of an levered company but also liable to return the amount of personal loan.
- The existence of transaction costs interferes with the working of arbitrage. It would become necessary to invest greater amount in order to earn same returns.
- Corporate income taxes do exist. Interest charges are tax deductible. Cost of borrowings funds to the firm is less than the contractual rate of interest. The very existence of interest charges give the firm a tax advantage which allows it to return its equity and debt holders a larger stream of income than it otherwise could have. Thus, the total returns to debt and equity holders from un-levered firm are less than that of levered firm. Hence, the total market value of levered firm should tend to exceed that of un-levered firm for this very reason.

8.5 SUMMARY

Capital Structure refers to the mix of sources from which long-term funds required by a business are planned. Optimum Capital Structure is obtained when market value per share is maximum or average cost of capital is minimum or the marginal real cost of each source of funds is the same.

Capital Structure is affected by various factors like leverage, growth and stability of sales, cash flow ability to service debt, cost of capital, control, flexibility, size of the company, floatation costs, marketability, purpose and period of finance, legal requirements, timing of issue etc.

There are mainly two theories of capital structure – one, which states that, there is an optimum capital structure and another states that there is no optimum capital structure. David Durand proposed Net Income Approach (Optimum Capital Structure) and Net Operating Income Approach (No Optimum Capital Structure). Traditional Approach is an intermediate approach, a compromise between, Net Income Approach and Net Operating Income Approach. M.M. Approach is identical with Net Operating Income Approach. All these approaches are based on certain assumptions. The existence of Optimum Capital Structure can be supported on two counts viz., tax deductibility of interest charges and market imperfections.

8.6 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. What do you mean by Capital Structure?
2. What do you understand by Optimum Capital Structure?
3. Explain the importance of Capital Structure.

II. Long Answer Questions

1. Discuss the various determinants of Capital Structure.
2. "Every Capital Structure is as good as the other Capital Structure". Examine the statement.
3. Discuss in detail, the theories advocated by David Durand with regard to Capital Structure.
4. What does Traditional Approach state?
5. Discuss the irrelevance theory of MM with regard to Capital Structure.

8.7 FURTHER READINGS

1. Bhalla, V.K. : **Working Capital Management : Text and Cases**, Anmol Publishing Pvt. Ltd., New Delhi, 2001.
2. Rustagi, R.P. : **Financial Management : Theory, Concepts and Problems**, Galgotia Publishing Company, New Delhi, 2000.

3. Hampton J.J. and Wagner, C.L. : **Working Capital Management**, John Wiley and Sons, 1989.
4. James C. Van Horne : **Financial Management and Policy**, Prentice – Hall of India Private Limited, New Delhi, 2002.
5. Gitman, L. J. : **Principles of Management Finance**, Harper and Row, New York, 1976.

8.8 KEY WORDS

- Capital Structure** : Refers to the mix of sources from which the long-term funds required by a business are procured.
- Optimum Capital Structure** : Refers to Capital Structure where market value per share is maximum or average cost of capital is minimum.
- Leverage / Trading on Equity** : Denotes the process of using funds on which a fixed rate of interest / dividend is paid (debentures and preference shares) based on the strength of the funds supplied by the equity shareholders.
- Cash Flow Ability** : The ability of the company to generate cash to meet its fixed charges.
- Cost of Capital** : The return expected by the supplier of the particular source of finance.
- Marketability** : Readiness of investors to purchase a particular type of security in a given period of time.

UNIT – 9 : LEVERAGE ANALYSIS

Objectives

After studying this Unit you should be able to

- describe the concept of leverage;
- understand the meaning of business risk and financial risk;
- analyse the types of leverages; and
- compute operating leverage, financial leverage and combined leverage.

Structure

- 9.0 Introduction
- 9.1 Meaning of Leverage
- 9.2 Types of Risk
- 9.3 Classification of Leverage
- 9.4 Operating Leverage
- 9.5 Break-Even Analysis
- 9.6 Financial Leverage
- 9.7 Combined Leverage
- 9.8 Summary
- 9.9 Self Assessment Questions
- 9.10 Further Readings
- 9.11 Key Words

9.0 INTRODUCTION

The finance manager while analyzing cost-volume-profit of his organization and before the finalisation of the capital structure of his undertaking should know the meaning of two important terms in the area of financial management. They are:

- a) Leverage; and
- b) Risk.

Before discussing the concept of leverage in the area of finance, let us go through the general meaning of the term leverage.

9.1 MEANING OF LEVERAGE

The word 'leverage' is derived from the word 'lever'. Lever means a rigid bar used to exert a pressure or sustain a weight at one point of its length by the application of a force at a second, and turning at a third on a fulcrum. It indicates the action of a lever or the mechanical advantage gained by it.

In the area of finance, however, leverage is used differently. In Finance leverage means the ability of a firm to use fixed costs assets or funds to magnify the return to its owners. Let us now learn some definitions of leverage.

S.C. Kuchhal, leverage may be defined as “meeting fixed cost or paying a fixed return for employing resources or funds.”

James Van Horne “Leverage is the employment of an asset or funds for which the firm pays a fixed cost or fixed return.”

J.E. Walter, “Leverages may be defined as percentage return on equity to percentage return on capitalization.”

Ezra Soloman, “Leverage is the ratio of net returns on shareholders’ equity and the net rate of return on total capitalization.”

9.2 TYPES OF RISK

Risk may be defined as a hazard from a specific cause or source which may result in a loss. In business risk indicates the degree of uncertainty involved in getting the return expected from the use of fixed cost assets or funds. Risk is of two types - Business Risk, and Financial Risk.

1. **Business Risk** : It is also called non-financial risk and is associated with the normal day to day operations of the firm.
2. **Financial Risk** : It is created by the use of fixed-cost securities (that is, debt and preference shares). Looking at the two categories in a source and uses context, business risk represents the chance of loss and variability of return created by a firm’s use of funds. Financial risk is the chance of loss and the variability of the owners returns created by a firm’s sources of funds.

9.3 CLASSIFICATION OF LEVERAGES

Leverages are classified into three types. They are:

1. Operating leverage,
2. Financial Leverage; and
3. Combined Leverage.

Activity 1

What do you understand by ‘leverage’? Explain risks in business.

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9.4 OPERATING LEVERAGE

The operating leverage may be defined as "the tendency of the operating profit to change disproportionately with sales". The degree of operating leverage depends on the proportion of fixed and variable costs. The company is said to have a high degree of operating leverage if it employs a greater amount of fixed costs and a small leverage if it employs a greater amount of fixed costs and a small amount of variable costs. On the contrary if the company employs a greater amount of variable costs and a smaller amount of fixed costs, it is said to have a low degree of operating leverage. Hence, there will be no operating leverage in the absence of fixed operating costs.

Calculation of operating Leverage

In the calculation of operating leverage we require information relating to the number of units sold, price per unit, total revenue, total costs with the division into fixed and variable costs. The Degree of Operating Leverage (DOL) may be defined as "percentage change in operating profit that results from a percentage change in sales volume".

$$\text{Degree of Operating Leverage} = \frac{Q(S-V)}{Q(S-V) - F}$$

Where,

Q = Number of units sold

S = Selling price per unit

V = Variable cost per unit

F = Fixed cost for the period.

If the value of DOL is equal to 1, then it implies that there is no operating leverage. As such the value of degree of operating leverage must be greater than 1.

$$\text{DOL} = \frac{\% \text{ change in operating profit}}{\% \text{ change in sales volume}}$$

$$\text{DOL} = \frac{Q(S-V)}{Q(S-V) - F} > 1$$

$$\text{DOL} = \frac{\text{Contribution}}{\text{Operating profit}} > 1$$

Let us now discuss the break-even analysis, cost-profit volume analysis (C-V-P analysis) and margin of safety.

9.5 BREAK-EVEN ANALYSIS

Break-even analysis is a specific method of presenting and studying the inter relationships between costs, volume and profits. (Hence, it also known as Cost-Volume-Profit Analysis – C.V.P. Analysis). It is an important tool of financial analysis whereby the impact on profit of the changes in volume, price, costs and mix can be found out with a certain amount of accuracy. A business is said to break-even when its total sales are equal to its total costs. Break-even point is a point of no profit or no loss. At this point contribution is just sufficient to recover the fixed costs. Break-even point can be calculated in units or sales. It can be calculated with the help of any of the following formulae.

$$1. \text{ B.E.P. (in units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$= \frac{\text{Fixed Cost}}{\text{Selling Price per unit} - \text{Variable cost per unit}}$$

$$2. \text{ B.E.P. (Sales)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}} \times \text{Selling price}$$

$$3. \frac{\text{Fixed Cost}}{\text{Total Contribution}} \times \text{Total Sales (Or)} = \frac{F \times S}{S - V}$$

$$4. \frac{\text{Fixed Cost}}{\text{Variable Cost per unit}} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

$$\frac{\text{Fixed Cost}}{\text{Selling price per unit}}$$

$$5. \text{ B.E.P.} = \frac{\text{Fixed Cost}}{\text{Fixed Costs} + \text{net profit}} \times \text{Sales}$$

At break-even point the desired profit will be zero. Where the volume of output sales is to be calculated so as to earn a desired amount of profit, the amount of desired profit has to be added to the fixed cost.

Units to earn a desired profit = $\frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Contribution per unit}}$

Sales to earn a desired profit = $\frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V Ratio}}$

Illustration - 1

From the following particulars calculate the Break-even point in terms both quantity and value.

Production in units 10,000

Sales price	Rs.5.00 per unit
Variable costs	Rs.20,000
Fixed costs	Rs.12,000

Solution

Calculation of Break-Even point.

Break-Even point (in terms of quantity) :

$$= \frac{\text{Fixed expenses}}{\text{Selling price per unit} - \text{Variable cost per unit}}$$

$$= \frac{\text{Rs.12,000}}{5.00 - 2.00} = 4,000 \text{ units.}$$

Break-even point in quantity = 4,000 units.

Break-even point in value = Break-even point in quantity X Selling price per unit
 = 4,000 units X Rs.5.00 = Rs.20,000

Note : Variable cost per unit = Rs.20,000 ÷ 10,000 units = Rs.2.00

PROFIT/VOLUME RATIO

The profitability of business operations could be found out by calculating the profit-volume ratio (P/V ratio). It is the ratio of contribution to sales. It is also known as marginal income ratio, contribution - sales ratio or variable, profit ratio. The ratio can be shown in the form of a percentage also.

$$\begin{aligned} \text{P/V Ratio} &= \text{Contribution} \div \text{Sales (OR) Sales} - \text{Variable cost} \div \text{Sales} \\ &= C \div S \text{ or } S - V \div S \text{ or} \\ &= F + P \div S \\ &= 1 - \text{Variable costs} \div \text{Sales} \end{aligned}$$

The ratio can also be shown by comparing the change in contribution to change in sales, or in change in profit to change in sales. Any increase in contribution, obviously, would mean increase in profit, as fixed expenses are assumed to be constant at all levels of production.

$$\begin{aligned} \text{P/V Ratio} &= \text{Change in Contribution} \div \text{Change in Sales} \\ &= \text{Change in profit} \div \text{Change in Sales.} \end{aligned}$$

The importance of P/V ratio lies in its use for evaluating the profitability of alternative products or proposals. A higher ratio shows greater profitability. Management should, therefore, try to increase P/V ratio by widening the gap between the selling price and the

variable costs. This can be achieved by increasing sale price, or reducing variable costs or switching over to more profitable products.

Illustration - 2

A company producing a single article sells at Rs.20 each. The marginal cost of production is Rs.12 each and fixed cost is Rs.8,000 p.a. Calculate (i) P/V ratio, (ii) Sales required to break-even.

Solution

i) Calculation of P/V Ratio :

	Rs.
Fixed cost	8,000
Selling price per unit	20
Margin cost per unit	12

$$\begin{aligned} \text{P/V Ratio} &= \frac{\text{Sales} - \text{Margin cost}}{\text{Sales}} \times 100 \\ &= \frac{20 - 12}{20} \times 100 = 40\% \end{aligned}$$

$$\text{P/V Ratio} = 40\%$$

ii) Sales required to Break Even

$$= \frac{\text{Fixed cost}}{\text{P.V. Ratio}} = \frac{8,000}{40\%} = 8,000 \times \frac{100}{40} = \text{Rs.}20,000$$

$$\text{Sales required to break-even} = \text{Rs.}20,000.$$

Illustration - 3

The following figures relating to Sales and Profits of a company are of two periods.

	Sales (Rs.)	Profit (Rs.)
Year ending 31-12-2001	1,00,000	15,000
Year ending 31-12-2002	1,20,000	23,000

Calculate (a) P.V. ratio (b) Fixed cost, (c) Break-even point.

Solution

$$\begin{aligned} 1. \text{ P.V. Ratio} &= \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 \\ &= \frac{8,000}{20,000} \times 100 = 40\% \end{aligned}$$

$$\begin{aligned} 2. \text{ S (P.V. Ratio)} &= \text{F} + \text{P}; 1,00,000 (40/100) = \text{F} + 15,000 \\ 40,000 &= \text{F} + 15,000; 40,000 - 15,000 = \text{F}; 25,000 = \text{F}. \\ \text{F} &= \text{Rs.}25,000 \end{aligned}$$

$$3. \text{ BEP Sales} = \frac{\text{F}}{\text{P.V. Ratio}} = \frac{25,000}{40\%} = 25,000 \times \frac{100}{40} = \text{Rs.}62,500$$

$$4. S (\text{P.V. Ratio}) = F + P; S (40/100) = 25,000 + P;$$

$$50,000 = 25,000 + P = 50,000 - 25,000 = P; 25,000 = P$$

$$P = \text{Rs.}25,000$$

$$S (\text{P.V ratio}) = F + P, S (40/100) = 25,000 + 20,000$$

$$S (40/100) = 45,000; S = 45,000 \times 100/40 = \text{Rs.}1,12,500.$$

MARGIN OF SAFETY

Total Sales minus the sales at break-even point is known as the margin of safety. Lower Break-even point means a higher margin of safety. Margin of safety can also be expressed as percentage of total sales. The formula is :

$$\text{Margin of Safety} = \text{Total Sales} - \text{Sales at BEP (OR) Profit} \div \text{P/V ratio}$$

$$\text{Margin of Safety (as percentage)} = \text{Margin of Safety} \div \text{Total Sales} \times 100$$

Higher margin of safety shows that the business is sound. Even when sales substantially come down the business may earn profit. Lower margin of safety, means that when sales come down slightly profit position may be affected adversely. Thus, the margin of safety can be used to test the soundness of a business. In order to improve the margin of safety, a business can increase selling price (without affecting demand, of course) reducing fixed or variable costs and replacing unprofitable products with profitable ones.

Illustration - 4

From the following information calculate: (a) P.V. Ratio (b) Break Even Point (c) Margin of Safety

	Rs.
Total Sales	3,60,000
Selling Price per unit	100
Variable cost per unit	50
Fixed Costs	1,00,000

d) If selling price is reduced to Rs.90, by how much is the margin of safety reduced?

Solution

a) Break-even point

$$\text{Break-even point} = \text{Fixed Costs} \div \text{Selling Price per unit} - \text{Variable cost per unit.}$$

$$\text{Break even point} = 1,00,000/100-50 = 1,00,000/50 = 2,000 \text{ units.}$$

$$\text{Break even sales} = 2,000 \text{ units @ Rs.100 per unit}$$

$$= \text{Rs.}2,00,000$$

b) **P.V. Ratio** = $S - V/S \times 100$
 = $3,60,000 - (3,600 \times 50) / 3,60,000 \times 100$
 = $1,80,000 / 3,60,000 \times 100 = 50\%$

c) **Margin of Safety** = Actual Sales - Break-even sales
 = $Rs.3,60,000 - 2,00,000 = Rs.1,60,000$

d) **If selling price is reduced to Rs.90, the Margin of Safety is reduced by**

Margin of Safety = Actual Sales - Break even sales
 = $Rs.3,60,000 - (2,500 \text{ units} \times 90)$
 = $Rs.3,60,000 - 2,25,000 = Rs.1,35,000$

Illustration - 5

A manufacturer has supplied the following information relating to one of his product.

Total Variable costs	Rs. 30,000
Total Sales	Rs. 60,000
Units sold	20,000 units
Total fixed costs	Rs. 18,000

Calculate

- Contribution per unit
- Break-even point
- Margin of Safety
- Profit
- Volume of sales to earn a profit of Rs.24,000

Solution

a) **Contribution** = $S - V$; $C = 60,000 - 30,000 = Rs.30,000$

Contribution per unit = $30,000 / 20,000 \text{ units} = 1.50 \text{ p.}$

b) **BEP Sales** = $F \times S / S - V = 18,000 \times 60,000 \div (60,000 - 30,000) = Rs.36,000$

c) **Margin of Safety** = Actual Sales - BEP Sales
 = $60,000 - 36,000 = Rs.24,000$

d) **Profit** = $S - V = F + P$; $60,000 - 30,000 = 18,000 + P$
 = $30,000 = 18,000 + P$; $30,000 - 18,000 = P$
 = $12,000 = P$; $P = Rs.12,000$

e) **Volume of Sales to earn profit of Rs.24,000**

$$\text{P.V. ratio} = C/S \times 100; 30,000/60,000 \times 100 = 50\%$$

$$S (50/100) = 18,000 + 24,000$$

$$S (50/100) = 42,000; S = 42,000 \times 100/50 = \text{Rs.}84,000$$

$$\text{Units} = \text{Sales Amount} \div \text{Selling Price} = 84,000 \div \text{Rs.}3 = 28,000 \text{ units.}$$

Illustration - 6

The Sales and profits during two periods are as under :

Period I : Sales Rs.20 lakhs; Profit Rs.2 lakhs

Period II : Sales Rs.30 lakhs; Profit Rs.4 lakhs.

Calculate (a) P/V ratio (b) Break-even point (c) Sales required to earn a profit of Rs.5 lakhs (d) Profit when sales are Rs.50 lakhs, and (e) Margin of safety at a profit of Rs.2.5 lakhs.

Solution

$$\text{a) P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100$$

$$= \frac{2,00,000}{10,00,000} \times 100 = 20\%$$

$$\text{Fixed Expenses} = S \times \text{P.V. Ratio} = F + P$$

$$\text{Rs.}20,00,000 \times 20\% = F + \text{Rs.}2,00,000$$

$$\text{Rs.}4,00,000 \times 20\% = F + \text{Rs.}2,00,000$$

$$\text{Rs.}4,00,000 - \text{Rs.}2,00,000 = F$$

$$F = \text{Rs.}2,00,000$$

$$\text{b) Break-even point} = \frac{F}{\text{P.V. Ratio}} = \frac{2,00,000}{20\%}$$

$$\text{Rs.} 2,00,000 \times 10/100 = \text{Rs.} 10,00,000$$

$$\text{c) Sales (P/V Ratio)} = F + P$$

$$S \times 20/100 = \text{Rs.} 2,00,000 + \text{Rs.} 5,00,000$$

$$S \times 20/100 = \text{Rs.} 7,00,000$$

$$S = \text{Rs.} 7,00,000 \times 100/20 = \text{Rs.} 35,00,000$$

$$\text{d) Sales} \times \text{P.V. Ratio} = F + P$$

$$S \times 20/100 = \text{Rs.} 2,00,000 + P$$

$$\text{Rs. } 50,00,000 \times 20/100 = \text{Rs. } 2,00,000 + P$$

$$\text{Rs. } 10,00,000 = \text{Rs. } 2,00,000 + P$$

$$\text{Rs. } 10,00,000 - \text{Rs. } 2,00,000 = P$$

$$P = \text{Rs. } 8,00,000$$

$$\text{e) Margin of Safety} = \frac{\text{Profit}}{\text{P.V. Ratio}}$$

$$= 3,50,000/20\% = \text{Rs. } 3,50,000 \times 100/20 = \text{Rs. } 17,50,000$$

Illustration - 7

The following figures relate to a company manufacturing a varied range of products.

	Total Sales Rs.	Total Cost Rs.
Year ended 31 st March, 2001	22,23,000	19,83,600
Year ended 31 st March, 2002	24,51,000	21,43,200

Assuming stability in prices, with variable cost carefully controlled to reflect pre-determined relationships, and an unvarying figure for fixed costs, calculate :

- profit/volume ratio, to reflect the rates of growth for profit and sales; and
- any other cost figures to be deducted from the data.

Solution

	Sales Rs.	Cost Rs.
2001	22,23,000	19,83,600
2002	24,51,000	21,43,200
Difference	<u>2,28,000</u>	<u>1,59,600</u>

$$\text{Variable cost (\% of Sales)} = 1,59,600/2,28,000 \times 100 = 70\%$$

(or in other words, variable cost is 70 paise per Re. 1.00 of sales)

$$\text{Variable cost for the year 2001} = 22,23,000 \times 70/100 = \text{Rs. } 15,56,100$$

$$\text{Variable cost for the year 2002} = 24,51,000 \times 70/100 = \text{Rs. } 17,15,700$$

$$\text{a) P/V ratio} = (S-V/S) \times 100$$

$$2001 = 6,66,900/22,23,000 \times 100 = 30\%$$

$$2002 = 7,35,300/24,51,000 \times 100 = 30\%$$

b) Other cost figures :

i) Fixed Cost (Total Cost – Variable cost)

$$2001 = \text{Rs.}19,83,600 - 15,56,100 = \text{Rs.}4,27,500$$

$$2002 = 21,43,200 - 17,15,700 = \text{Rs.}4,27,500$$

ii) Fixed cost % of Sales :

$$2001 = 4,27,500/22,23,000 \times 100 = 19\% \text{ (approx)}$$

$$2002 = 4,27,500 /224,51,00 \times 100 = 17\% \text{ (approx)}$$

iii) Break-even point = F/P.V. ratio = Rs.4,27,500/30% = Rs.14,25,000

iv) Margin of Safety :

$$2001 = 22,23,000 - 14,25,000 = \text{Rs.}7,98,000$$

$$2002 = 24,51,000 - 14,25,000 = \text{Rs.}10,26,000$$

BREAK-EVEN CHART

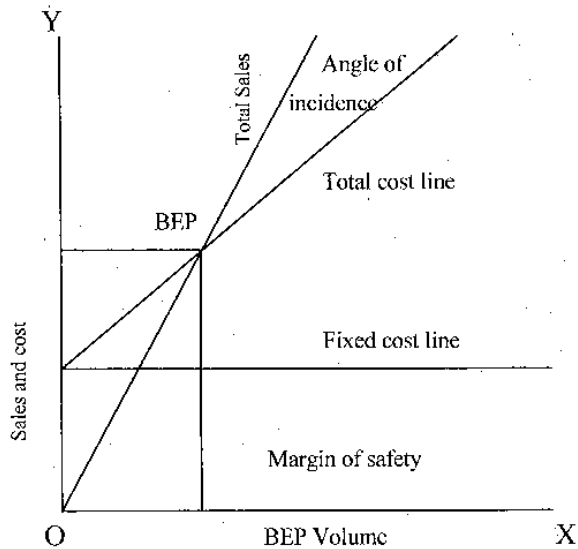
The break even point can also be shown graphically through the break-even chart. The break-even chart shows the profitability or otherwise of an undertaking at various levels of activity and as a result indicate the point at which neither profit nor loss is made. It shows the relationship, through a graph between cost, volume and profit. The break-even point lies at the point of intersection between the total cost line and the total sales line in the chart.

Break-even charts are often used to depict the following:

1. Cost-volume profit relationships and break-even point
2. Profit volume ratio and margin of safety
3. The impact of change in the level of sales on likely costs and profit
4. Profit appropriations and expense analysis.
5. For controlling profits and level of activity by comparing the budgeted with actual sales and profit
6. For deriving the figures of optimum output.

Angle of Incidence

It is an angle at which sales line cuts the total costs line. A high angle denotes high rate of profit while a low angle reflects poor rate of return. Obviously management must plan for high angle of incidence which can only be when variable costs bear a low proportion of cost of sales.



If the angle is large, the firm is said to be making profits at a high rate or vice versa. A large angle of incidence together with a high margin of safety indicate sound business conditions. Therefore, the management's aim will be to have as large an angle as possible; because this shows a high rate of profit once the fixed costs are met. A narrow angle, on the other hand would show that even after absorbing the fixed costs the rate of profit is comparatively low. In other words, it indicates that the variable costs form a large part of the total costs.

Illustration - 8

A manufacturing enterprises produces and sells 10,000 units per annum. The selling price per unit is Rs.200 and the variable cost per unit is Rs.70. The fixed operating costs are Rs.5,00,000 calculate the operating leverage.

Solution

	Rs.
Sales	20,00,000
Less : Variable Cost contribution	7,00,000
	13,00,000
Less : Fixed Operating costs	5,00,000
Operating Profit	8,00,000

$$\begin{aligned} \text{Operating Leverage} &= \text{Contribution} \div \text{Operating Profit} \\ &= 13,00,000 \div 8,00,000 = 1.625 \end{aligned}$$

Illustration - 9

The installed capacity of a company's factory is 500 units. Actual capacity used is 300 units. Selling price per unit is Rs.15. Variable cost per unit is Rs.7 per unit. Calculate the operating leverage in each of the following three situations.

- i) When fixed costs are Rs.500
- ii) When fixed costs are Rs.1,000
- iii) When fixed costs are Rs.1,500

Solution

Computation of Operating Leverage

	Situation I	Situation II	Situation III
Total Sales (300 units @ Rs.15)	4,500	4,500	4,500
Less : Total Variable Cost (300 X 7)	2,100	2,100	2,100
Contribution	2,400	2,400	2,400
Less : Fixed Cost	500	1,000	1,500
Operating Profit	1,900	1,400	900
Operating Leverage = $\frac{\text{Contribution}}{\text{Operating Profit}}$	$2,400 \div 1,900 = 1.3$	$2,400 \div 1,400 = 1.7$	$2,400 \div 900 = 2.7$

It is evident from the above example that the degree of operating leverage increases with every increase in fixed cost in the total cost structure of the company. It shows that if sales volume increases by one per cent, the operating profit would increase by 2.7 per cent. This involves a greater amount of risk, because if sales happen to decrease by one per cent the operating the operating profit will come down by 2.7 per cent. Thus, higher the operating leverage, the higher would be the operating profit and higher would be the risk. Higher margin of safety provides greater shock absorbing capacity to the company. Since operating leverage and margin of safety have negative correlation, a higher operating leverage would indicate a lower margin of safety, and vice-versa.

Utility of Operating Leverage

The operating leverage shows the impact of change in sales on the operating profits. If a company has a high degree of operating leverage, a small change in sales will bring a large change in operating profits. Operating profit here means "Earning Before Interest and Tax" (EBIT). Thus, the operating leverage will increase at a faster rate than the increase in sales. Likewise, the operating profits of such a company will also fail at a faster rate than the increase in sales.

Generally, business undertakings do not like to operate under conditions of a high degree of operating leverage. This is a very risky situation because a small decrease in sales can excessively damage the organisation's efforts to increase its profits.

Activity 2

What is C-V-P Analysis? Give the formulae for calculating operating leverage.

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9.6 FINANCIAL LEVERAGE

Financial Leverage is also known as "Trading on Equity". Since financial leverage reflects the use of funds at a fixed financial cost with the possibility of increasing the return to the equity shareholders, the question as to whether the financial leverage is favourable or unfavourable, will depend on its effect upon earnings per share to equity shareholders. If the effect on earning per share is positive leverage is said to be favourable. On the other hand, if the effect on EPS is negative, the leverage is said to be unfavourable.

The object of using financial leverage is to finance incremental asset acquisition with relatively cheaper source of finance i.e., debt and thereby magnify the returns to the equity owners. However, increased leverage reduces commercial flexibility and increases the probability of financial risk. Choosing the appropriate level of debt involves a trade-off among these operating factors. The optimum debt level is that which maximizes the total value of firm, equity and debt together.

From the shareholders point of view, financial leverage may be favourable or unfavourable. The leverage will be considered as favourable so long as the company earns more on the assets compared to the fixed cost paid for their use. On the contrary, unfavourable leverage occurs when the company does not earn as much as the cost of funds. Thus, financial leverage may have favourable or unfavourable effect on the company's total earnings before interest and taxes (EBIT) as well as on earnings per share (EPS).

Computation of Financial Leverage

The financial leverage indicates the change in taxable income (profit before tax) as a result of change in the operating income or profit (earning before interest and taxes), The financial leverage can be calculated using the following formula.

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT}}$$

EBIT = Earning Before Interest and Taxes

PBT = Profit Before Taxes (EBIT – Interest)

The degree of financial leverage indicates the percentage change in taxable profit (PBT) as a result of percentage change in operating profit (EBIT). It should be noted that **financial leverage cannot exist if the quotient as per the above formula is not more than one**. The following illustration helps us in understanding the changes in the degree of financial leverage in different financing situations.

Illustration - 10

XYZ, Company Ltd. has a choice of the following three financial plans. You are required to calculate the financial leverage in each case. Also explain the reasons for changes in the leverage these situations.

(Rs. in lakhs)

	Financial Plan I	Financial Plan II	Financial Plan III
Equity Capital	4,000	2,000	6,000
Debt	4,000	6,000	2,000
Operating Profit (EBIT)	800	800	800
Interest @ 10% on Debt	400	600	200

Solution**Computation of Financial Leverage**

(Rs. in lakhs)

	Financial Plan I	Financial Plan II	Financial Plan III
Equity capital	4,000	2,000	6,000
Debt	4,000	6,000	2,000
Total Capital	8,000	8,000	8,000
Operating Profit (EBIT)	800	800	800
Interest on Debt	400	600	200
Profit Before Tax (PBT)	400	200	600
Financial Leverage = EBIT/PBT	$800 \div 400 = 2$	$800 \div 200 = 4$	$800 \div 600 = 1.33$
Degree of Financial Leverage	$800 \div 400 \times 100 = 200\%$	$800 \div 200 \times 100 = 400\%$	$800 \div 600 \times 100 = 133\%$

Illustration - 11

X Industries Ltd., has Equity share capital (Share of Rs.10 each) Rs.1,00,000; Debentures Nil; Earnings before interest and tax (i) 10,000 (ii) 20,000 (iii) 30,000, Income Tax 50%. Calculate the return to shareholders and earnings per shares.

Solution

	(i)	(ii)	(iii)
Earning before Interest and Tax	10,000	20,000	30,000
Less : Interest	-	-	-
	10,000	20,000	30,000
Less : Tax @ 50%	5,000	10,000	15,000
	5,000	10,000	15,000
Return on equity capital	5%	10%	15%
Earning per share	0.5	1.0	1.5

Interpretation: It can be seen from the above example that when the total capital remained the same, the capital structure differed in all these three situations. Similarly, the EBIT in all the three situations is the same, still financial leverage is varying. Financial leverage in case of Plan I is 2. It means 100 per cent change in operating profit resulted in 200 per cent change in the taxable profit. A high financial leverage means high fixed financial cost followed by high financial risk. The degree of financial leverage is much higher in financial plan II i.e., 400 per cent, than the financial plan I.

Thus, the high fixed financial burden of interest leads to financial risk to the company. As such increase in fixed financial cost requires necessary increase in EBIT level. If a company

fails to do so, it may be technically forced to go into liquidation. Although, the financial plan III has lower financial leverage, it may put the company into financial trouble if its EBIT shows a decline.

High and Low Leverages

If the Return on Investment (ROI) exceeds the rate of interest on debt, it is a favourable financial leverage and vice versa. If ROI is exactly equal to the rate of interest on debt, there is no financial leverage and EPS will not be affected. High financial leverage is not good as it indicates the large content of fixed interest charges and in the same way low financial leverage is disadvantageous as it brings down EPS. Let us go through the following situations.

1. **Risky situation:** High operating leverage combined with high financial leverage will indicate risky situation.
2. **Normal situation:** The normal situation is one where one leverage will be higher and the other will be lower. For example, the company may go for low operating leverage and higher financial leverage and vice versa.
3. **Ideal Situation:** In an ideal situation both the operating and financial leverages are low.

In fact, a high degree of financial leverage will also lead to wide fluctuations in shareholders' earnings. Further it results in more than proportionate change in the operating profits even due to a small change in sales. Also a high degree of financial leverage will result in a more than proportionate change in earnings per share (i.e., EPS) even on account of minor change in operating profits (i.e., EBIT). Thus, a company with a high degree of financial leverage and a high degree of operating leverage will ultimately face the problems of inadequate liquidity or insolvency. On the other hand, a low degree of operating and financial leverages is an indicative of the cautious policy followed by the management, but the company will be losing many profit earning opportunities. Thus, the finance manager should make all possible efforts to reach an ideal situation and combine the operating and financial leverages in such a way as would suit its risk bearing capacity.

Illustration - 12

A company needs Rs.12 lakhs for the installation of a new factory which would yield an annual EBIT of Rs.2,00,0000. The company has the objective of maximizing the earnings per share. It is considering the possibility of issuing equity shares plus raising a debt of Rs.2,00,000, Rs.6,00,000 of Rs.10,00,000. The current market price per share is Rs.40 which is expected to drop to Rs.25 per share if the market borrowings were to exceed Rs.7,50,000. Cost of borrowings is indicated as under :

Upto Rs.2,50,000	10% p.a.
Between Rs.2,50,000 and Rs.6,25,000	14% p.a.
Between Rs.6,25,001 and Rs.10,00,000	16% p.a.

Assuming a tax rate of 50%, work out the EPS and the scheme which would meet the objective of the management.

Solution

Statement Showing the EPS Under Different Schemes

(Figures in Rupees)

	Plan I	Plan II	Plan III
Debt	2,00,000	6,00,000	10,00,000
Earnings before interest and tax (EBIT)	2,00,000	2,00,000	2,00,000
Less : Interest	20,000	74,000	1,37,500
Earnings before tax (EBT)	1,80,000	1,26,000	62,500
Less : Tax at 50%	90,000	63,000	31,250
Profits after tax (PAT)	90,000	63,000	31,250
Earnings per share (EPS) (PAT/No. of Shares)	3.60	4.20	3.91

Preference: Plan II is to be preferred since the EPS is the highest under this scheme. Under this scheme the borrowings is also well within the limit. Plan III gives an EPS of Rs.3.91 for a price of Rs.25. But the bigger problem here is both the debt and equity are high.

Working Notes

1. Calculation of Interest

		Rs.
Scheme I	Borrowings Rs.2 lakhs @ 10%	20,000
Scheme II	Borrowings Rs.6 lakhs :	
	Upto Rs.2.5 lakhs @ 10%	25,000
	On Rs.3.5 lakhs @ 14%	49,000
		74,000
Scheme III	Borrowings Rs.10 lakhs:	
	Upto Rs.2.5 lakhs @ 10%	25,000
	On Rs.3.75 lakhs @ 14%	52,500
	On Rs.3.75 lakhs @ 16%	60,000
		1,37,500

$$2. \text{ No. of shares} = \frac{\text{Amount of Equity Capital}}{\text{Current Market Price per share}}$$

$$I = 10,00,000 \div 40 = 25,000$$

$$II = 6,00,000 \div 40 = 15,000$$

$$III = 2,00,000 \div 25 = 8,000$$

Illustration - 13

Three financing plans are available to Maruthi Udyog, which needs Rs.10,00,000 for construction of a new plant. Maruthi wants to maximize EPS. Currently, the equity share is

selling at Rs.30 per share. The EBIT resulting from the plant operation is Rs.1,50,000 per year. Maruthi's marginal tax rate is 50%. Amount can be borrowed at the rates indicated below:

Upto Rs.1,00,000 at 10% p.a.

Over Rs.1,00,000 to Rs.5,00,000 at 14% p.a.

Over Rs.5,00,000 at 18% p.a.

The three financing plans are as follows :

Plan I : Use Rs.1,00,000 debt : Expected EBIT = Rs.2,50,000

Plan II : Use Rs.3,00,000 debt : Expected EBIT = Rs.3,50,000

Plan III : Use Rs.6,00,000 debt : Expected EBIT = Rs.5,00,000

Determine the EPS for these three plans and indicate the financing plan which will result in the highest EPS.

Solution

Calculation of EPS in different Plans

	Plan I Rs.	Plan II Rs.	Plan III Rs.
EBIT	2,50,000	3,50,000	5,00,000
Interest	(-) 10,000	(-) 38,000	(-) 84,000
EBT	2,40,000	3,12,000	4,16,000
Taxes	1,20,000	1,56,000	2,08,000
EAT	1,20,000	1,56,000	2,08,000
No. of shares	30,000	30,000	30,000
EPS	Rs.4.00	Rs.5.20	Rs.6.93

Thus, Plan III is preferable as its EPS is highest (Rs.6.93).

Limitations of Financial Leverage : The following are the limitations of financial leverage.

- 1) It fails to take cognizance of implicit cost of debt.
- 2) In the calculation of financial leverage the assumption that the cost of debt remains constant is not correct. With the increase of debt, the interest rate on debt also will increase because of increased risk of the firm.

9.7 COMBINED LEVERAGE

It is also known as **Total leverage** or **Composite Leverage**. It reflects the degree to which a firm has fixed operating cost and fixed financing cost. The combined effect of operating leverage and financial leverage measures the total risks involved.

As explained above operating leverage measures the percentage change in operating profit as a result of percentage change in sales. Whereas the financial leverage measures the percentage change in taxable profits or earning per share (EPS) due to percentage change in

operating profit i.e., EBIT. The operating leverage explains the degree of operating risk, financial leverages are closely concerned with the company's capacity to meet its fixed cost obligation, their combined effect will measure the company's financial strength. Composite leverage, therefore, explains the relationship between sales revenue and taxable income (PAT). It helps the management in finding out the percentage change in taxable income as a result of percentage change in sales.

Computation of Combined Leverage

The degree of combined effect of operating and financial leverage can be computed as follows:

$$\begin{aligned} \text{Combined Leverage} &= \text{Operating Leverage} \times \text{Financial Leverage} \\ &= C/OP \times OP/PBT = C/PBT \end{aligned}$$

Where, C = Contribution (i.e., Sales – Variable Cost)

OP = Operating profit or EBIT

PBT = Profit Before Tax but after interest.

Degree of Combined Leverage =

Degree of Operating Leverage X Degree of Financial Leverage (Or)

$$CL = DOL \times DFL$$

If both operating leverage and financial leverage are high, then degree of combined leverage will also be high. High combined leverage implies a very risky situation. In fact, a firm having high operating leverage should have a low financial leverage.

Illustration - 14

Calculate operating leverage and financial leverage under Situations A, B and C and Financial plans I, II and III respectively from the following information relating to the operation and capital structure of XYZ Co. Also find out the combinations of operating and financial leverage which give the highest value and the least value.

Installed Capacity	1,200 units
Actual Production & Sales	800 units
Selling Price per unit	Rs.15
Variable cost per unit	Rs.10

Fixed Cost

Situation A	Rs.1,000
Situation B	Rs.2,000
Situation C	Rs.3,000

Financial Plan

	I	II	III
	Rs.	Rs.	Rs.
Equity	5,000	7,500	2,500
Debt	5,000	2,500	7,500

Cost of Debt 12% p.a.

Solution

Calculation of Operating Leverage

	Situation A	Situation B	Situation C
	Rs.	Rs.	Rs.
Sales	12,000	12,000	12,000
Less : Variable cost	8,000	8,000	8,000
Contribution ©	4,000	4,000	4,000
Less : Fixed Cost	1,000	2,000	3,000
Operating Profit	3,000	2,000	1,000
Operating Leverage (C/OP)	1.33	2	4

Calculation of Financial Leverage

Particulars	Plan I Rs.	Plan II Rs.	Plan III Rs.
Situation A			
Operating Profit	3,000	3,000	3,000
Less : Interest	600	300	900
Earnings before tax (EBT)	2,400	2,700	2,100
Financial Leverage	1.25	1.11	1.43
Situation B			
Operating Profit	2,000	2,000	2,000
Less : Interest	600	300	900
Profit before tax	1,400	1,700	1,100
Financial Leverage	1.43	1.18	1.82
Situation C			
Operating Profit	1,000	1,000	1,000
Less : Interest	600	300	900
Earnings before Tax	400	700	100
Financial Leverage	2.5	1.43	10

Calculation of Combined Leverage

Highest Value	Situation C and Plan III	$4 \times 10 = 40$
Lowest Value	Situation A and Plan II	$1.33 \times 1.11 = 1.476$

Illustration - 15

Calculate the Degree of Operating Leverage (DOL), Degree of Financial Leverage (DFL) and the Degree of Combined Leverage (DCL) for the following firms and interpret the results.

Firms	X	Y	Z
Output (Units)	60,000	15,000	1,00,000
Fixed cost (Rs.)	7,000	14,000	1,500
Variable cost per unit (Rs.)	0.20	1.50	0.02
Interest on borrowed capital (Rs.)	4,000	8,000	Nil
Selling Price per unit (Rs.)	0.60	5.00	0.10

Solution

Calculation of Leverages

	X	Y	Z
Output (Units)	60,000	15,000	1,00,000
S.P. Unit (Rs.)	0.60	5.00	0.10
Less : Variable cost/unit (Rs.)	0.20	1.50	0.02
Contribution/Unit (Rs.)	0.40	3.50	0.08
Total Contribution (Rs.)	24,000	52,500	8,000
Less : Fixed Cost (Rs.)	7,000	14,000	1,500
EBIT/Operating Profit	17,000	38,500	6,500
Less : Interest	4,000	8,000	Nil
PBT	13,000	30,500	6,500
Degree of Operating Leverage = Contribution/EBIT	24,000/17,000 = 1.41	52,500/30,500 = 1.36	8,000/6,500 = 1.23
Degree of Financial Leverage = EBIT/PBT	17,000/13,000 = 1.31	38,500/30,500 = 1.26	6,500/6,500 = 1.00
Degree of combined leverage = Contribution/PBT	24,000/13,000 = 1.85	52,500/30,500 = 1.72	8,000/6,500 = 1.23

Interpretation: As seen above, High operating leverage combined with high financial leverage will constitute risky situation. Firm Z's operating leverage is 1.23 but its financial leverage is not high. Hence, for our purpose, a low operating leverage combined with a low financial leverage should be considered. As such, low operating leverage combined with high financial leverage should have given us the ideal situation. Thus, firm Z's position is slightly better.

Usefulness to Finance Manager

The above calculations show the extent of risk and hence these are useful to the Finance Manager when the operating leverage is low and financial leverage is high, EPS will be maximum. Both operating and financial leverages should be neither too high nor too low.

Activity 3

a) Explain the procedure for the computation of financial leverage.

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.....
.....

b) What is the ideal situation for the maximization of company's EPS with minimum risk?

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.....
.....

9.8 SUMMARY

The operating and financial leverages are the two important quantitative tools in the hands of financial experts to measure the return to the shareholders and the market price of the shares. The financial leverage is considered superior as it indicates the market price of the shares. The finance manager is always anxious to increase the market price of shares by increasing the networth of the company. For this purpose the manager resorts to 'trading on equity' which helps in increasing the company's operating profits. He will also try to increase the company's operating profits, so as to increase the market price of its shares. However, a company cannot go on indefinitely raising fixed cost capital. If a company goes on employing higher proportion of debt capital, the marginal cost of each subsequent debt will also go on increasing because each subsequent lender will demand higher rate of interest. Further, the company's inability to offer sufficient assets and security to each subsequent lender will also prove a serious limitation to employing further debt capital.

As such, a proper combination of operating and financial leverages is necessary for the company's growth with optimal risk. Although a right combination of these leverages is a very big challenge for the finance manager, he should strive to balance these leverages as they have tremendous acceleration and deceleration effect on the company's operating profit and earning per share.

9.9 SELF-ASSESSMENT QUESTIONS

I. Short Answer Questions

1. Define Leverage?
2. Explain different type of risks.
3. What is Operating Leverage? How do you calculate it?
4. What is combined leverage?

II. Long Answer Questions

1. Illustrate the effect of increasing capital turnover ratio on net profit and operating leverage.
2. Explain the method of the calculating financial leverage with suitable examples.

3. "Both operating and financial leverages should be neither too high nor too low" Explain.
4. What is meant by the term "leverage"? With what type of risk is leverage generally associated?
5. How can breakeven analysis be used in financial leverage planning?
6. Define the term operating leverage. What type of effect occurs when the firm uses operating leverage?

EXERCISES

1. From the following details available in the books of Fenolex Ltd., calculate operating leverage.

Existing capacity	1,200 units
Present capacity	800 units
Selling price per unit	Rs.20
Variable cost per unit	Rs.12

Fixed Cost :

Situation X	Rs. 800
Situation Y	Rs. 2,000
Situation Z	Rs. 2,400

[Answer: Operating Leverage : X : 1.14; Y : 1.45; Z : 1.6]

2. Western Ltd. has estimated that for a new product its break-even point is 2,000 units if the item is sold for Rs.14 per unit; the cost accounting department has currently identified variable cost as Rs.9 per unit. Calculate the degree of operating leverage for sales volume of 2,500 units and 3,000 units. What do you infer from the degree of operating leverage at the sales volumes of 2,500 units and 3,000 units and their difference if any?

[Answer: Operating Leverage : Rs.5, Rs.3]

3. Calculate operating and financial leverage from the following information:

Interest	Rs. 5,000
Sales	Rs. 50,000 (1,000 units)
Variable cost	Rs. 25,000
Fixed cost	Rs. 15,000

[Answer: (i) Operating Leverage = 2.5; (ii) Financial Leverage = 2]

4. Calculate the degree of operating leverage, financial leverage and combined leverage for the following firms.

	B	Q	R
Output (Units)	3,00,000	75,000	5,00,000

Fixed Cost (Rs.)	3,50,000	7,00,000	75,000
Unit Variable cost (Rs.)	1.00	7.50	0.10
Interest expenses (Rs.)	25,000	40,000	Nil
Unit Selling price (Rs.)	3.00	25.00	0.50

[Answer: Operating Leverage =2.40; 2.14; 1.60;

Financial Leverage : 1.11; 1.07; 1.00;

Combined Leverage : 2.67; 2.29; 1.60]

5. From the following information relating to the operation and capital structure of AT & T company for producing additionally 800 units.

Selling Price per unit	Rs. 30
Variable cost per unit	Rs. 20

Fixed Cost :

Situation A	Rs. 2,000
Situation B	Rs. 4,000
Situation C	Rs. 6,000

Financial Plan

	I	II	III
	Rs.	Rs.	Rs.
Equity	10,000	15,000	5,000
Debt	10,000	5,000	15,000

Cost of Debt 12%

Calculate operating leverage and financial leverage in situation A, B and C and financial plans I, II, III respectively. Also find out the combination of operating and financial leverages which give the highest value and least value. How are these calculations useful to the finance manager of a company

9.10 FURTHER READINGS

1. Hampton J.J. : **Financial Decision Making**, Prentice Hall of India Pvt. Ltd., New Delhi, III Edition.
2. Philippatos G.C. : **Financial Management - Theory and Practice**, Holden Day Inc., San Francisco, First Edition
3. Weston J. Fred and Brigham E.F : **Managerial Finance**; The Dryden Press, Illinois, Fifth Edition
4. Woolf, Tanna and Karam Singh : **Financial Management**, MacDonald and Evans, Plymouth, First Edition

5. Bhalla, V.K. : **Financial Management and Policy**, Anmol Publications, New Delhi.
6. Pandey, I.M. : **Financial Management**, Vikas Publications, Delhi.
7. Rustagi, R.P. : **Financial Management**, Galgotia Publishing Company, Delhi.

9.11 KEY WORDS

- Financial Leverage** : Refers to the use of debt in the financing of a firm. It denotes the presence of fixed-return securities in the capital structure of the firm.
- Operating Leverage** : Is the use of fixed costs in operations. A high operating leverage factor indicates the presence of automated production process.
- Leverage Factor** : Refers to the ratio of long-term debt to total assets.
- Capital Structure** : Is the long-term financing plan of a firm. It covers debentures, preference shares, other fixed-return securities, long-term loans, equity shares and reserves and surplus.
- Financial Structure** : Is the total financing plan of a firm which, beside all components of capital structure, also includes short-term debt.
- Degree of Operating Leverage** : Is the percentage change in net operating income in response to a percentage change in sales (volume or value).
- Degree of Financial Leverage** : Is the percentage change in net income available to equity investors in relation to changes in earnings **before** interest and taxes.
- Degree of Combined Leverage** : Is the percentage change in net income after interest and taxes in response to percentage variations in sales (volume or value).
- Risk** : Includes both operating risk (as given by the degree of operating leverage) and financial risk (as reflected by the degree of financial leverage) and is evaluated by a statistical measure known as coefficient of variation.

UNIT - 10 : LEASING

Objectives

After studying this Unit you should be able to :

- understand the meaning and essentials of leasing;
- classify the leasing into financial lease and operating lease;
- find out the advantages of leasing to the lessor and lessee in addition to acquiring knowledge on the limitations of leasing; and
- take decisions on various issues like leasing or buying and lease financing vs. loan financing.

Structure

- 10.0 Introduction
- 10.1 Lease : Meaning
- 10.2 Essentials Elements of Leasing
- 10.3 Types of Leasing
- 10.4 Advantages of Leasing
- 10.5 Leasing and Accounting Treatment
- 10.6 Leasing and Tax Benefits
- 10.7 Lease or Buy Arrangements
- 10.8 Lease Financing Vs. Loan Financing
- 10.9 Summary
- 10.10 Self Assessment Questions
- 10.11 Further Readings
- 10.12 Key Words

10.0 INTRODUCTION

Leasing is a big business. Any asset imaginable, from computer sets to jumbo aircraft to buildings, can be acquired through leasing. Leasing has blossomed into the biggest single provider of fixed-rate finance to corporate India.

Leasing industry in India was pioneered in 1973 when for the first time 'Leasing Company of India' was set up in Madras. For almost seven years in the country, this company was the sole leasing company. In 1980 another leasing company known as "20th Century Leasing" came into existence. Both these leasing companies were promoted by qualified professionals from the city bank.

Thereafter, a virtual explosion in the leasing industry was noticeable. In 1981 four organizations, viz., Shetty Investment and finance, 'JayBharat Credit and Investment', 'Motor

and General Finance' and 'Sundaram Finance' joined the leasing business essentially for taking tax advantage. Subsequently companies like ICICI, SBI Capital markets, IDBI etc. entered leasing industry. At present, there are about 300 leasing companies in the country.

10.1 LEASE : MEANING

A lease is a contract whereby an owner (lessor) grants the use of property to a second party (lessee) for rental payments. It is a commercial arrangement, whereby an equipment owner or manufacturer permits the equipment user the right to use the equipment in return for a rental. The concept of 'leasing' has different aspects, namely, legal, accounting, fiscal, economic and marketing aspects. Of these, the legal and tax implications are the most important ones. The terms of lease depends on the nature of the equipment, nature of industry, type of lease etc.

The instrument of lease recites the right of the lessor and lessee and governs the use of property, the possession of which is being transferred to the tenant for a specific (limited) period. The net effect of a lease is to make the lessee – the tenant, an active operating agent of the property. The period of lease is usually based on the mutual consent of lessor and lessee. It may vary from a day to several years. Again a lease may or may not provide for the renewal after the expiry of its term. The rent may be made payable by the lessee at a flat rate, in monthly, quarterly, or annual instalments. In some cases, rental may be so graded that for the first few years low amounts is payable and thereafter as the time goes by a higher amount is required to be paid. In other situations, rent may be reduced with the passage of time

Thus, leasing involves

- i) Financing an investment in purchase of a capital asset, equipment, plant, machinery etc;
- ii) Taking risks of investment and lending it out for use by another party; and
- iii) Participating in the risks of enterprise indirectly through the lessee to whom the machinery/plant is lent.

Hire Purchase Vs. Leasing : In case of hire purchase, the contract provides automatic transfer of ownership of the assets to the lessee (hirer) at the end of stipulated period whereas in the case of lease financing, the ownership stays with the lessor unless he opts to sell it off to the lessee at the end of lease agreement.

Let us now go through the essential elements of a lease agreement.

10.2 ESSENTIALS ELEMENTS OF LEASING

The following are the essential elements of leasing.

1. Parties to the contract

In every lease agreement there will be two parties. They are : the owner and the user, called the lessor and the lessee respectively.

Lessor : The lessor comprises one or more banks or finance companies with sufficient profits to take the full tax advantage of the depreciation charges and investment allowances allowable on the asset. The lessor provides the additional funds not provided by the lender and purchase of the asset. The lessor receives only a very small cash flow from the lease payments as the major proportion of the lease payments is paid out as interest and repayment of the principal to the lender. However, as the lessor receives the tax benefits of ownership, the lessor is prepared to accept a low return on the funds it provides.

Lessee : The lessee enters into a normal lease agreement agreeing to lease the asset for a specific period of time and to make specified lease payments. Usually, the period of the lease is shorter than the economic life of the asset.

Broker : A leverage lease is organized and managed by a broker. Once the broker has found a company interested in acquiring an asset by means of a leverage lease, he has to find two other parties to participate in the financing of the asset; a lender prepared to lend long-term debt funds to a lessor which then adds sufficient on its own funds to the borrowed funds in order to purchase the required asset. Apart from arranging the parties to, and the terms of, in the leverage lease the broker will also handle the legal documentation and keep accounts for all parties during the term of the lease. In return the broker receives a certain percentage of the cost of the asset as fee.

Lender : The lender's role is performed by one or more institutional lenders which lend a major proportion of the cost of the asset to the lessor. The lender will receive interest and principal payments paid out of the lease payments. While the interest rate will approximate the current rate on long-term mortgages, the precise rate charged depends upon the credit standing of the lessee. The lender receives a registered first mortgage over an asset leased as well as a first charge over the lease payments received from the lessee.

2. **Asset** : The asset, property or equipment to be leased, is the subject-matter of a contract of lease financing. The asset may be an automobile, plant and machinery, equipment, computers and buildings, factory, a running business, aircraft, ship and so on. The asset must, however, be of the lessee's choice suitable for his business needs.
3. **Term of Lease** : The term of lease is the period for which the agreement of lease remains in operation. Every lease should have a definite period otherwise it will be legally inoperative. The lease period may sometimes stretch over the entire economic life of the asset or a period shorter than the useful life of the asset. The lease may be perpetual, with an option at the end of lease period to renew the lease for the further specific period.
4. **Lease Rentals** : The consideration which the lessee pays to the lessor for the lease transaction is the lease rental. The lease rentals are so structured as to compensate the lessor for the investment made in the asset (in the form of depreciation), the interest on the investment, repairs etc., by the lessor, and servicing charges over the lease period.

Activity – 1

1. State the type of equipments that can be leased.

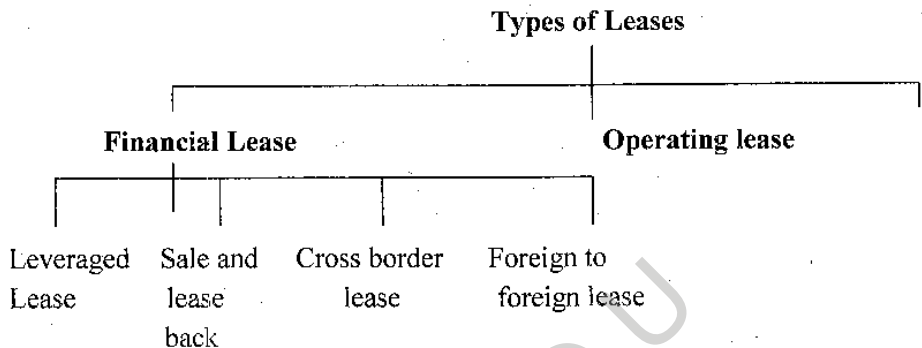
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2. Name any three companies which are in leasing business in India.

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10.3 TYPES OF LEASING

The ever growing complexity of the law and the diverse circumstances of the “lessees” and “lessors” lead to different types of leases. These leases have come into picture in various parts of the world and are practised according to the convenience of the lessor and lessee. Broadly, leases can be categorized as follows



1. Financial Lease

A financial lease is a non-cancellable contract. The lease period is usually shorter than the useful life of the asset being leased. During the life of the contract all of the cost of the property plus financing and servicing charges should be recovered through periodic payments. The lease assumes complete financial responsibility for the leased asset; and, if operated successfully, the lessor or owner will recover the original investment.

In finance lease, lessor transfers the risk and rewards incident to the ownership of the equipment to the lessee, but the title may or may not be transferred to the lessee. Rentals are payable in instalments so as to cover the cost of the equipment plus a reasonable interest on funds invested in the purchase or manufacture of the equipment. Thus, finance lease involves financing the equipment purchase and lending it out to the lessee for use with or without the transfer of ownership immediately.

In this kind of “lease agreement” the leasing company will act simply as a financial institution. The lessee will specify the equipment needed and act as the lessor’s agent in the matters of ordering, inspecting and maintaining it. The lessor is simply interested in the equipment as its legally owned asset. The lessor will raise the money, accept the invoice from the supplier and pay accordingly.

Features of Financial Lease: A finance lease is structured to include the following features.

1. The lessee (the intending buyer) selects the equipment according to his requirements, from its manufacturer or distributor,

2. The lessee negotiates and settles with the manufacturer or distributor, the price, the delivery schedule, installation, terms of warranties, maintenance and payments etc.
3. The lessor purchases the equipment either directly from the manufacturer or distributor or from the lessee after the equipment is delivered ,
4. The lessor leases out the equipment to the lessee. He retains the ownership while lessee is allowed to use the equipment,
5. A finance lease may provide a right or option, to the lessee, to purchase the equipment at a future date. However, this practice is rarely found in India.
6. The lease period spreads over the expected economic life of the asset. The lease is originally for a non-cancellable period called the primary lease period during which the lessor seeks to recover his investment along with some profit. During this period cancellation of lease is possible only at a very heavy cost. Thereafter, the lease is subject to renewal for the secondary lease period, during which the rentals are substantially low,
7. The lessee is entitled to exclusive and peaceful use of the equipment during the entire lease period provided he pays the rentals and complies with the terms of lease,
8. As the equipment, is chosen by the lessee, the responsibility of its suitability, the risk of obsolescence and the liability for repair, maintenance and insurance of the equipment rest with the lessee.

Types of financial lease : The finance lease agreements can be further sub-divided into the following classes :

- a) **Leveraged Lease :** In this case, lessor which is the leasing company provides the equity capital, while the banks and financial institutions provide the loan funds in the form of term-loans for the purchase of leased assets. The lessee is the beneficiary of the agreement;
- b) **Sale and Lease Back :** In this case, the company owning an asset sells it to a leasing company and gets it back on lease from the leasing company. In this process, the lease facilitates the freeing of funds for the company to use for other purposes;
- c) **Cross Border Leases :** These are international leases with the lessor supplying the equipment placed in one country and the lessee hailing from another country. The lease agreement incorporates the terms of the use of the equipment supplied by the lessor to the lessee;
- d) **Foreign to Foreign Lease :** In this case, there are three parties, the manufacturer or supplier in one country, lessor in another country and the lessee who is the beneficial user in a third country. The advantages or disadvantages of this type of lease would depend mostly on the prevailing tax provisions and the tax status of the company.

2. Operating Lease

An operating lease is one which is not a finance lease. In an operating lease, the lessor does not transfer all the risks and rewards incidental to the ownership of the asset and the cost of the asset is not fully amortised during the primary lease period. The lessor provides services (other than the financing of the purchase price) attached to the leased asset, such as maintenance, repair and technical advice. For this reason, operating lease is also called 'service lease.' The lease rentals in an operating lease include a cost for the 'services'

provided, and the lessor does not depend on a single lessee for recovery his cost. Operating lease is generally used for computers, office equipments, automobiles, trucks, telephones etc.

In operating lease; all the risks and rewards incidental to ownership are not transferred to the lessee but involves only short term hire of the equipment with the ownership resting with the lessor. Such short-term operating leases are prevalent in the use of motor cars, computers, aircraft, ships etc.

Operating lessors usually confine their activities to a particular specialized area and purchase a large number of similar types of machines. They are then able to offer attractive terms by reflecting economies of scale in the rentals. These include purchase discounts, higher sale proceeds, and savings in maintenance and reconditioning costs. As in the case of financial lease, various circumstances have led to different kinds of operating lease writing

Financial Lease vs. Operating Lease

A lease is classified as a finance lease if it transfers substantially all the risk and rewards incidental to ownership. Title may or may not eventually be transferred. A lease is classified as an operating lease if it does not transfer substantially all the risks and rewards incidental to ownership.

Since the transaction between a lessor and lessee is based on a lease agreement common to both parties, it is appropriate to use consistent definitions. The application of these definitions to the differing circumstances of the two parties may sometimes result in the same lease being classified differently by the lessor and the lessee. Whether a lease is a finance lease or an operating lease depends on the substance of the transaction rather than its form. Examples of situations which would normally lead to a lease being classified as a finance lease are :

- a. The lease transfers ownership of the asset to the lessee by the end of the lease term;
- b. The lessee has the option to purchase the asset at a price which is expected to be sufficiently lower than the fair value at the date of option becomes exercisable such that, at the inception of the lease, it is reasonably certain that the option will be exercised;
- c. The lease term is for the major part of the economic life of the asset even if title is not transferred;
- d. At the inception of the lease, the present value of the minimum lease payments amounts to at least substantially all of the fair value of the leased asset; and
- e. The leased asset is of a specialized nature such that only the lessee can use it without major modifications being made.

10.4 ADVANTAGES OF LEASING

Leasing is advantageous both to the lessor and lessee. Before discussing these advantages to these parties in particular let us understand the advantages of leasing in general.

1. **Financial benefits :** The lessee does not have to pay the cost of the asset outright. If the cost of buying versus cost of lease is weighed, the company incurring losses, may prefer to have low cash outflow at present and may resort to lease finance;

2. **Flexibility of lease :** Leasing is more convenient for assets to be used for short periods and for companies who find it difficult to get loans from banks and financial institutions. The leasing and payments of rentals can be synchronized with the cash inflows of the company;
3. **Risk of obsolescence :** The lessee can pass on the risk of obsolescence to the lessor which is more suitable for such appliances as subject to high technological obsolescence like computers and electronic equipment;
4. **Need for maintenance and specialised services :** If the lessee has to depend on the manufacturer or supplier for service and maintenance as in the case of aircraft, ships, photocopiers etc., it is more convenient to the lessee to lease and pass on these risks to the lessor which can provide these specialized services.

Advantages to Lessor : The following are the advantages of leasing to the lessor.

1. **Early returns :** The lessor gets quick returns in the form of lease rentals as compared to investment in other projects which have a longer gestation period.
2. **Higher profitability :** Lease improves profitability due to tax benefits.
3. **Tax benefits :** The greatest advantage for the lessor is the tax relief by way of depreciation. If the lessor is in high tax bracket, he can lease out assets with high depreciation rates and, thus, reduce his tax liability substantially. Besides, the rentals can be suitably structured, to pass on some tax benefit to the assessee.
4. **Increased sales :** It is a marketing strategy for capital intensive goods like plant and machinery and provides a competitive edge for sale of the product by the manufacturer. Lease financing through third parties has helped manufacturers to increase their sales. The lessors are also in a position to demand certain concessions from the manufacturers.
5. **High security :** The lessor's interest is fully secured since he is always the owner of the leased asset and can take repossession of the asset if the lessee defaults. As against it, realizing an asset secured against a loan is more difficult and cumbersome.
6. **Trading on equity :** Lessors usually carry out their operations with greater financial leverage. That is, they have a very low equity capital and use a substantial amount of borrowed funds and deposits. Thus, the ultimate return on equity is very high.

Advantages to Lessee : The following are advantages of leasing to the lessee.

1. **Financing of capital goods :** Leasing provides 100% finance for the cost of equipment while in the case of bank borrowing or instalment sale, it is subject to initial payment or margin requirement from the lessee.
2. **Easy source of finance :** Leasing provides one of the easiest sources of medium term and long-term financing. It does not require any mortgage of the assets because the ownership of asset leased remains with the lessor and is not transferred to the lessee. Moreover, various restrictive provisions imposed in term loan financing are avoided.

The initial cost of raising finance through leasing is also much lower than that of raising long-term loans.

3. **Enhanced liquidity** : Leasing preserves and improves the cash position and liquidity of the company. Sale and leaseback arrangement enables a firm to improve its liquidity position by realizing cash from the sale of fixed assets and retaining the economic use of the same. Thus, the lessee can salvage its working capital crisis through lease financing.
4. **No ownership changes** : It neither changes the equity ownership nor dilutes the equity, nor adversely affects the debt equity ratio of the company.
5. **Provides gearing** : It achieves gearing and provides a hedge against inflation and helps the tax planning.

Disadvantages of Leasing

The following are the disadvantages of leasing to the lessee.

1. **Loss of ownership** : The main drawback of lease is that ownership remains vested with lessor.
2. **More expensive** : Long-term leasing is generally more expensive to the lessee.
3. **Disadvantage during inflation** : During the period of inflation the real estate values may increase during the lease period. In such case, the benefit of capital gain will be enjoyed by the lessor. The lessee loses the advantages of such appreciation in the value of asset.
4. **Asset alterations not possible** : As the lessee is not the owner of the asset, he cannot make any substantial changes in the asset. Contrary to it, in case of outright purchase the buyer can modify or alter the asset to increase its utility.
5. **Loss of salvage value** : An asset generally has certain salvage value at the expiry of the useful life. As the lessee does not become the owner of the asset, he cannot realise the salvage value at the expiry of the lease rather he has to return the asset to the lessor.

10.5 LEASING AND ACCOUNTING TREATMENT

An appropriate method of accounting is necessary for income recognition for the lessor and asset disclosure for the lease. Recognising the need for a proper accounting system for lease transactions, IAS-17, on Account for Leases was issued in 1982. The ICAI issued a guidance note in 1988 which favoured the adoption of IAS-17 in the long run but recommended for the interim period a set of accounting guidelines in the context of the state of leasing industry in India and the income-tax framework. However, due to court intervention its recommendatory character was kept in abeyance. After judicial pronouncement, the ICAI Revised Guidance and notes was issued in September, 1995. The Reserve Bank of India constituted a study group on the guidance note and on its recommendations made it compulsory on the leasing companies:

According to the IAS-17, in case of operating lease, the lease has to allocate the aggregate lease rental over the lease term on straight line basis or any other systematic basis which better reflects the pattern of the timing of the benefit of the use of the equipment to the lessee (user.)

According to the IAS-17, finance lease should be shown in the balance sheet of lessee as an asset to properly account for the economic resources and as a liability to reflect the level of its obligations. It stipulates that -

- i) the asset and liability should be recorded at the inception of the lease at an amount equal to the fair market value of the asset or the present value of the minimum lease payment whichever is lower.
- ii) the lease rentals should be apportioned into interest and capital components using the effective rate of interest. Actual method or any other acceptable approximation (e.g., sum of the years digits).
- iii) the interest/finance charge should be expensed.
- iv) the leased asset should be depreciated in line with the depreciation policy of the firm in respect of owned asset. It must be fully depreciated over the lease term or the useful life, of the asset whichever is shorter.

As regards the lessor, the IAS-17 guidelines require that a finance lease should be recorded as a receivable in his books equal to the net investment in lease; that is, gross investment in lease **minus** unearned finance income. The unexpired finance income should be allocated according to effective rate of interest method to the relevant accounting period.

According to ICAI's AS-19, (issued in January, 2001) the lessee should recognize the finance lease as an asset and a liability at an amount equal to the lower of the fair value of the leased asset or the present value of the minimum lease payments using the interest implicit in the lease/incremental borrowing rate of the lessee as the discount factor. The lease payments should be apportioned between finance charge and the reduction in the outstanding liability. The finance charge should be allocated to periods during the lease term so as to produce a constant periodic rate of interest on the remaining balance of the liability for each period. The depreciation policy for a leased asset should be consistent with that for owned assets. The asset should be fully depreciated over the lease term or its useful life whichever is shorter.

Operating Lease : In case of operating lease, it gives the lessee the right to use the leased assets over a period of time but it does not give the lessee all the benefits and risks that are associated with the assets. As regards operating leases, lease payments should be recognized as an expense in the statement of profit and loss on a straight line basis over the lease term or another systematic basis to represent the time pattern of the users' benefit.

In the Books of the Lessee : The lease rentals must be allocated to each accounting period in a manner that reflects the time pattern of the benefit to the user (lessee). The implication from the reporting view point is that any excess of lease rentals paid over the accrued amount should be treated as pre-paid lease rental and vice versa. Thus, the lease rentals are to be treated as a charge to the profit and loss account.

In the books of Lessor : The leased asset should be treated as depreciable asset and the lease rentals as income. For a manufacturer, dealer-lessor, there is no realized selling profit as the lease is not sale. The rental income exclusive of receipts for services, e.g., insurance and maintenance must be accounted for on a straight line basis over the lease term unless some other more systematic basis better reflects the pattern of earnings associated with the lease. The costs inclusive of depreciation incurred must be charged to income. Depreciation on leased assets must be consistent with the depreciation policy of the lessor for similar assets. Finally, initial direct costs can be written off in the period of incurrence or alternatively as

deferred revenue expenditure written off over the lease term proportionate to the rental income recognized.

10.6 LEASING AND TAX BENEFITS

Lease money paid is taken as a business expense in the books of lessee and reduces the tax liability : Lessee is not eligible to get depreciation under Income tax Act, 1961 as the asset is not owned by the lessee. The primary condition in allowing depreciation under Income Tax is that the assessee must be the owner of this asset

If the asset is purchased the interest on borrowing is taken as business expense and depreciation is allowed as operating expense. In such a case the tax benefit can be calculated with the help of the following formula.

$$\frac{\text{Interest} \times (1 - \text{tax rate})}{\text{Depreciation} \times (1 - \text{tax rate})}$$

Asset Salvage Value : Cash salvage value is an inflow in case of purchase and it will be discounted at the cost of capital in order to arrive at the present value. But lessee does not have any right on salvage value of asset as the title of the asset remains with the lessor.

If the maintenance cost is to be borne by the lessee it can also be shown as a business expense in Profit and Loss Account of the lessee and with this the tax liability of the firm goes down.

Activity - 2

i) List out the advantages of leasing.

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ii) How do you show the leased assets in the final accounts of the lessor?

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10.8 LEASE OR BUY ARRANGEMENTS

The problem of whether to lease or purchase capital assets, is most common and fundamental with the banking and insurance companies hiring office buildings, large retail stores, oil companies having service stations and utilities. The analysis of the profitability of objects involved in such commitments is often complicated and requires a very serious consideration of good number of financial factors.

If purchasing of property as an alternative to leasing is chosen, immediate payment of purchase price (Capital cost) has to be made. If the money required for purchasing the asset is raised through equity shares then a certain dividend (equal to the current market rate) has to be

paid to the shareholders. But in turn there will be no financial botheration or embarrassment caused by a fixed annual payment in the form of rent, as is done in lease contracts. Moreover, if a property is purchased outright, the potential debt raising capacity is enhanced as the property so acquired can be pledged as a security.

If leasing rather than purchasing alternative is preferred, there will be saving of cost of purchase as it is not paid outright. But annual rent as agreed between the lessor and lessee will be payable over the period of lease. This rent will constitute a fixed charge like the interest payable on a debt. However, the credit status is likely to be impaired on account of extensive lease commitments. The security which can be offered for raising debt is also substantially reduced.

In exercising the choice between leasing a property or buying outright, the deciding criteria will be the relative economy of both the courses of action. From the firm's point of view it has to be seen 'which is more economical? Leasing or Buying?' In this way the profitability of projects involved in these arrangements will be ascertained.

When lease or buy alternatives are to be evaluated, the initial step required is to reduce them to common time period. When an asset is purchased outright, usually it has a useful life 30-40 years but if obtained on lease it may be acquired only for 20 years. To reduce both the alternatives to a common time period for analyzing the profitability of projects it is necessary that the value of ownership in the case of outright purchase should be taken for the same period as that of lease. In the above illustration, if the asset is purchased outright then its likely scrap value at the end of 20 years (which is also the period of lease) will be taken for assessing the profitability. If the replacement cost is lower than the scrap value at the end of 20 years, then, this alone will be taken into consideration.

When lease or buy alternatives have been reduced to a common time period, it is necessary to analyse the following financial factors in detail to decide the crucial choice :

- a) The initial payment required in the case of outright purchase.
- b) If the sum required for initial payment is obtained through sale of shares, then the dividend rate payable on them.
- c) The period for which dividend on equity shares will be payable. Equity cost for the period of lease will be calculated. As already noted lease or buy alternatives have been reduced to a common time period.
- d) The scrap value of the owned assets at the expiry of the period of lease.
- e) The periodical lease rental obligation and the total amount payable over the period of lease on this account.
- f) The rate of tax and cost of equity after tax.
- g) The period upto which yearly tax can be paid or deferred
- h) The risk involved in the alternatives.
- i) The capital allowances on the property purchased
- j) The impact on the credit status of the firm.

Each of the above financial factors exercises its impact upon the profitability of the project. Its impact is to be checked in detail so as to arrive at a crucial decision.

10.8 LEASE FINANCING VS. LOAN FINANCING

Lease financing is one of the methods of long-term financing. Assets may be acquired by purchase through borrowing or on lease basis. It is to be seen whether it is economical to buy an asset through borrowing or to be obtain it on lease basis. A decision has to be taken on the basis of present value analysis of alternatives available.

Financial Evaluation of Leasing

The most important part of a leasing transaction is the financial evaluation of the proposal both to the lessor and lessee. Financial evaluation of a lease can be calculated separately (i) from the point of view of the lessee; and (ii) from the point of view of the lessor.

Lessee's Point of view

Once a lessee has evaluated the economic viability of an asset as an investment and accepted the proposal, it has to consider alternate methods of financing the investment. Given that an investment decision has already been made, the firm need not own the asset. It is basically interested in acquiring the use of the asset. Thus, the firm may consider leasing of the asset rather than buying it. Since lease rental payments are similar to payments of interest on debt, leasing in essence is an alternative to borrowing. The lease evaluation from the lessee's point of view, thus essentially involves a choice between debt financing versus lease financing. The financial evaluation of lease financing decisions from the point of view of the lessee involves the following steps.

- i. Calculate the present value of net-cash flow of the buying option, called NPV (B)
- ii. Calculate the present value of net cash flow of the leasing option, called NPV (L)
- iii. Decide whether to buy or lease the asset or reject the proposal altogether by applying the following method :
 - a) If NPV (B) is positive and greater than the NPV (L), purchase the asset.
 - b) If NPV (L) is positive and greater than the NPV (B), lease the asset
 - c) If NPV (B) as well as NPV (L) are both negative, reject the proposal altogether.

Most of the financial analysts argue that the lease financing decisions arise only after the firm has made an accept-reject decision about the investment; it is only the comparison of cost of leasing and borrowing options. The following steps are involved in such an analysis:

- i. Determination of the present value of after tax cash outflows under the leasing option.
- ii. Determination of the present value of after-tax cash outflows under the buying or borrowing option.
- iii. Comparison of the present value of cash outflow from leasing option with that of buying/borrowing option.
- iv. Selection of the option with lower present value after tax cash outflows.

Illustration - 1

Tata & Company is interested in acquiring the use of an asset costing Rs.5,00,000. It has two options (i) to borrow the amount at 20% p.a. repayable in 5 equal installments, or (ii) to take on lease the asset for a period of 5 years at the year end rentals of Rs. 1,20,000. The corporate tax is 50% and the depreciation is allowed on WDV at 20%. The asset will have a salvage value of Rs.1,80,000 at the end of the 5th year.

You are required to advise the company about lease or by decision. Will the decision change if the firm is allowed to claim investment allowance at 25%?

Note

1. The present value of Re.1 at 20% discount factor

1 st year	0.833
2 nd Year	0.694
3 rd Year	0.579
4 th Year	0.482
5 th Year	0.402

2. The present value of an annuity of Re.1 at 20% p.a. for 5 years is 2.991.

Solution

I. Calculation of loan installment

$$\text{Loan Installment} = \frac{\text{Amount of Loan}}{\text{P.V. factor of Annuity}}$$
$$= 5,00,000 \div 2.991 = \text{Rs.}1,67,168 \text{ approx.}$$

II. Schedule of Loan Payment

Year	Loan balance at beginning of the year (Rs.)	Loan Installment (Rs.)	Interest payment (Rs.)	Principal Payment (Rs.)	Loan Balance at the end of the year (Rs.)
1.	5,00,000	1,67,168	1,00,000	67,168	4,32,832
2.	4,32,832	1,67,168	86,566	80,602	3,52,230
3.	3,52,230	1,67,168	70,446	96,722	2,55,508
4.	2,55,508	1,67,168	51,102	1,16,066	1,39,442
5.	1,39,442	1,67,330	27,888*	1,39,442	Nil

* The amount of loan installment in the last year is different from the equal payments because of compensation for rounding error.

III. Calculation of Present Value of After Tax Cash outflows under Borrowing/Buying Option.

Year end	Loan Installment	Interest	Depreciation (after tax)	Total	Net cash out flow	P.V. Factor at 20%	PV of after tax Net cash out flow
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	2			3	4 = 2-3	5	6
1	1,67,168	50,000	50,000	1,00,000	67,168	0.833	55,951
2	1,67,168	43,283	40,000	83,283	83,885	0.694	58,216
3	1,67,168	35,223	32,000	67,223	99,945	0.579	57,868
4	1,67,168	25,551	25,600	51,151	1,16,017	0.482	55,920
5	1,67,330	13,944	20,480	34,424	1,32,906	0.402	53,428
			Total				2,81,383

Total Present Value after tax

Net cash flow Rs. 2,81,383

Less : PV of salvage value at the end of 5th year

Rs. 1,80,000 X 0.402

Rs. 72,360

2,09,023

IV. Calculation of Present Value After-Tax Cash Outflows under lease Option

Year end	Lease Rental	Tax Savings on lease rent	After tax cash outflow	P.V. Annuity Factor at 20%	Total P.V. of cash outflows
1	2	3	4	5	6
	Rs.	Rs.	Rs.		Rs.
1-5	1,20,000	60,000	60,000	2.991	1,79,460

V. **Evaluation :** As the present value of after tax cash outflows under the leasing option are lesser than the present value of after-tax cash outflows of the buying option, it is advisable to take the asset on lease.

VI. **Decision if Investment Allowance is Allowed :** If the investment allowance is allowed on purchase of asset the total of present value of net cash outflows will decrease by the present value of tax savings on investment allowance as calculated below :

Investment allowance	Rs.
Allowed at the end of 1 st year 5,00,000 X 25/100	1,25,000
Tax Savings (50%)	62,500
P.V. Factor at the end of year 1	0.833

PV of Tax Savings on investment allowance (62,500 x 0.833)	52,063
Hence PV of cash outflows in Buying option shall be 2,09,023	52,063
	<u>1,56,960</u>

If the investment allowance is allowed, the PV of cash outflows under buying option will be lesser than the PV of cash outflows under leasing option and hence, the company should buy the asset.

Illustration - 2

From the information given below relate to an investment proposal of the Ram & Co.

Investment outlay Rs.200 lakh

Useful life 4 years

Net salvage value after 4 years Rs.20 lakh

Annual tax relevant rate on depreciation 40%

Net salvage after 3 years Rs.30 lakhs

M/s. Ram & Co. has two alternatives to choose from to finance the investment.

Alternative I : Borrow and buy the equipment. The cost of capital of M/s. Ram & Co. 12%, marginal rate of tax 35%, cost of debt 18% per annum.

Alternative II : Lease the equipment from the Ram & Co. on a three-year full payout basis @ Rs.444/Rs.1,000 payable annually in arrears. The lease can be renewed for a further period of 3 years at a rental of Rs.18/1,000 payable annually in arrear. Which alternative should M/s. Ram & Co. choose? Why?

Solution

Decision Analysis (Rs. Lakhs)	Rs. in Lakhs
1. Investment outlay	200.00
2. Add ; Present value of Tax Shield on lease rentals (Working Note 1)	(+) 74.65
	<u>274.65</u>
3. Less : Present value of lease rental (Working Note 1)	193.05
4. Less : Present value of Tax Shield on Depreciation (Working Note 3)	45.57
5. Less : Present value of interest shield on displaced debt (Working Note 4)	21.21

6. Less : Present value of net salvage value (Working Note 5)	21.36	(-) 281.19
NAL/NPV (L)		<u>(-) 6.54</u>

NAL = Net Advantage on Lease, NPV (L) = Net present value of Leasing

Since the NAL is negative, the lease is not economically viable. M/s. Ram & Co. should opt for the alternative to borrow and buy.

Working Notes

1. Present value of Tax Shield on lease rentals

$$= \text{Rs.}200 \text{ lakh} \times 0.444 \times 0.35 \times \text{PVIFA}(12,3)$$

$$= 31.08 \times 2.402 = \text{Rs.}74.65 \text{ lakh}$$

2. Present Value of Lease Rentals :

$$= 200 \text{ lakh} \times 0.444 \times \text{PVIFA}(18,3)$$

$$= 88.8 \text{ lakh} \times 2.1174 = \text{Rs.}193.05 \text{ lakh}$$

3. Present Value of Tax Shield on depreciation =

$$= 80 \times \text{PVIF}(12,1) + 48 \times \text{PVIF}(12,2) \times 28.8 \times \text{PVZIF}(12,3) \times .35$$

$$= (80 \times .893 + 48 \times .797 + 28.8 \times .712) 0.35$$

$$= (71.44 + 38.26 + 20.51) 0.35$$

$$= 130.21 \times 0.35 = \text{Rs.}45.57 \text{ lakh}$$

4. Present value of interest tax shield on displaced debt

$$= 34.75 \times \text{PVIF}(12,1) + 25.02 \times \text{PVIF}(12,2) + 13.54 \times \text{PVIF}(12,3) .35$$

$$= (34.75 \times .893 + 25.02 \times .797 + 13.54 \times .712) 0.35$$

$$= (31.03 + 19.94 + 9.64) 0.35$$

$$= 60.61 \times .35 = \text{Rs.}21.21 \text{ lakh}$$

Debt (Present value of Lease rentals) Amortisation Schedule

(Rs. in lakhs)					
Year	Loan balance at the beginning of the year (Rs.)	Loan Installment (Rs.)	Interest payment (Rs.)	Principal Amount (Rs.)	Loan balance at the end of the year (Rs.)
1	193.05	88.80	34.75	54.05	139.00
2	139.00	88.80	25.02	63.78	75.22
3	75.22	88.76	13.53	75.22	

5. Present Value of Net salvage value

$$= 30 \times \text{PVIF}(12,3)$$

$$= 30 \times .712 = 21.36$$

B. Financial Evaluation from Lessor's Point of View

The financial evaluation of lease from the point of view of the lessor aims at ascertaining whether to accept a lease proposal or to choose from alternative proposals. It can be evaluated with the help of the following two time adjusted methods of capital budgeting.

- a) Present Value method
- b) Internal Rate of Return method

The above technique is explained with the help of the following example.

Illustration - 3

From the information given below, you are required to advise about leasing out of the asset.

Cost of Equipment	Rs. 4,00,000
Average cost of capital to the lessor	12%
Depreciation (Allowable)	20% on original cost
Expected life of asset	5 years
Salvage Value	Nil
Lease rent payable at the end of each of 5 years	1,50,000
Corporate tax (applicable to lessor)	50%
PV of an annuity of Re.1 for 5 years @ 12% is	Rs.3.605

Solution

a) Present Value method

i) Calculation of cash out flow

Cost of Equipment	4,00,000
Less: Tax advantage, if any	Nil
Cash outflow	<u>4,00,000</u>

ii) Calculation of after tax cash inflows

Lease rental	1,50,000
Less : Depreciation	<u>80,000</u>
Earnings before tax (EBT)	<u>70,000</u>
Less : Tax at 50%	35,000
Earnings After Tax (EAT)	35,000
Add : Depreciation	<u>80,000</u>
	<u>1,15,000</u>

iii) Calculation of Present Value (PV) of Cash outflows

Year	Cash outflow	PV Discount Factor at 12%	PV of cash outflows
0	4,00,000	1.00	4,00,000

iv) Calculation of PV of Cash inflows

Year	Cash flow after tax CFAT	Discount factory at 12%	
1-5	1,15,000	3.605	4,14,575

Calculation of Net Present Value

Present value of cash inflows	Rs. 4,14,575
Less : PV of Cash outflows	Rs. 4,00,000
	<u>Rs. 14,575</u>

Since the present value of cash inflows is more than the present value of cash outflows or say NPV is positive, it is desirable to lease out the asset.

b) Internal Rate of Return Method

The internal rate of return can be determined with the help of present value tables. The following steps are required to practice the internal rate of return method.

1. Determine the future net cash flows for the period of the lease.. The net cash inflows are estimated future net cash flows for the period of the lease. The net cash inflows are estimated future earnings from leasing out the asset, before depreciation but after taxes.
2. Determine the rate of discount at which the present value of cash inflows is equal to the present value of cash outflows. This may be determined as follows:

Annual Cash inflows are equal over the life of the asset:

First, find out present value factor by dividing initial outlay by annual cash flow, i.e.,

$$\text{Present Value Factor} = \frac{\text{Initial outlay}}{\text{Annual cash flow}}$$

Then, consult present value of annuity tables with the number of years equal to the life of the asset and find out the rate at which the calculated present value factor is equal to the present value given in the table.

Illustration - 4

Initial outlay	Rs. 50,000
Life of the asset	5 years
Estimated annual cash flow	Rs. 12,500
Calculate the Internal Rate of Return	

Solution

$$\text{Present value factor} = \frac{\text{Initial outlay}}{\text{Annual cash flow}} = \frac{50,000}{12,500} = 4$$

Consulting present value of Annuity tables for 5 years period at present value factor of 4.

Internal Rate of Return = 8% approx.

(Annuity table shows that at 8% for 5 years the PV factor is 3.9927 which is nearly equal to 4)

Annual Cash flows are unequal over the life of the asset

In case annual cash flows are unequal over the life of the asset, the internal rate of return is calculated by hit and trial and that is why this method is also known as hit and trial yield method. Several discount rates may have to be tried until the appropriate rate is found:

Illustration - 5

Initial Investment Rs. 60,000

Life of the asset 4 years

Estimated net annual cash flows:

1 st Year	15,000
2 nd Year	20,000
3 rd Year	30,000
4 th Year	20,000

Compute the internal rate of return and also advise the lessor about the leasing out decisions if his expected minimum rate of return is 15%.

Solution

Present value of cash flows table at various assumed discount rates of 10%, 12%, 14% & 15%.

Year	Annual Cash flow Rs.	Discount rate 10%		12%		14%		15%	
		PVF	PV Rs.	PVF	PV Rs.	PVF	PV Rs.	PVF	PV Rs.
1	50,000	.909	13,635	.892	13,380	.877	13,155	.869	13,035
2	20,000	.826	16,520	.892	13,380	.769	15,380	.756	15,120
3	30,000	.751	22,530	.797	15,940	.674	20,220	.657	19,710
4	20,000	.683	13,660	.711	21,330	.592	11,840	.571	11,420
			66,345		63,350		60,595		59,285

1. Present value of net flows at 15% rate of discount is 59,285. So the initial cost of investment which is Rs.60,000 falls in between 14% and 15%.

Exact IRR =	PV requires = 60,000	595
	PV 14% = 60,595	
	PV 15% = 59,285	1310
	= 14 + 1% (595/1310) = 14 + .45 = 14.45%	

2. As the IRR is less than the minimum required rate of return, the lessor should not lease out the asset.

Methods of Computing Lease Rentals

The steps involved in computing lease rentals are:

1. Determine the cost of the asset which includes the actual purchase price and expenses like freight, insurance, taxes and installation etc.
2. Determine the cash flows to the lessor on account of ownership of the asset. These include tax advantage provided by depreciation and investment allowance.
3. Calculate the present value of cash flows as determined in step (ii).
4. Subtract the present value of cash flows of ownership advantage from the cost of the asset determined in step (i) so as to determine the minimum required net recovery through lease rentals.
5. Calculate the post tax lease rentals by dividing the minimum required net recovery through lease rentals by present value factor of annuity.
6. Compute the pre-tax lease rentals by adjusting the post-tax lease rentals for the tax factor.

Illustration - 6

Number one leasing is considering to lease out an equipment costing Rs.10,00,000 for five years, which is the expected life of the equipment, and has an estimated salvage value of Rs.1,00,000. **Everyday** leasing can claim a depreciation of 20% on WDV of the asset but is not eligible for investment allowance. The firm falls under a tax rate of 50% and the minimum post-tax required rate of return is 12%. You are required to calculate the lease rental which the firm should charge.

Note: PVF at 12% discount rate is

1. $Y_1 = .893, Y_2 = .797, Y_3 = .712, Y_4 = .636, Y_5 = .567$
2. Annuity discount factor at 12% for 5 years = 3.605

Solution

Calculation of cash flows to the lessor on account of ownership of the asset

Cost of the equipment = Rs.10,00,000

Year	Amount of Depreciation Rs.	Tax advantage on Depreciation Rs.	Tax advantage on Investment Allowance	Salvage Value Rs.	Total Cash flow Rs.
1	2,00,000	1,00,000	Nil	-	1,00,000
2	1,60,000	80,000		-	80,000
3	1,28,000	64,000		-	64,000
4	1,02,400	51,200		-	51,200
5.	81,920	40,960		1,00,000	1,40,960

1. Calculation of Present Value of Cash flow

Year	Cash flows Rs.	PV factor at 12%	PV of Cash flow Rs.
1	10,000	.893	89,300
2	80,000	.797	63,760
3	64,000	.712	45,568
4	51,200	.636	32,563
5	1,40,960	.567	79,924
	Total		3,11,115

2. Minimum required net recovery through lease rentals:

$$\text{MRLR} = 10,00,000 - 3,11,115 = 6,88,885$$

$$3. \text{ Post-tax lease rental (PTLR)} = 6,88,885 / 3.605 = 1,91,092$$

$$4. \text{ Pre-tax lease rental (LR)} = 1,91,092 \times 100 / 50 = \text{Rs. } 3,82,184$$

Lease Rent expressed in terms of lease financing:

$$= 3,82,184 \times 1,000 / 10,000,000 \times 1/2$$

$$= 31.85 \text{ per thousand per month}$$

$$= 382.18 \text{ per thousand per annum}$$

10.9 SUMMARY

Lease arrangements are used by the business firms to obtain the services of various types of property over a period of time without buying them outright. In leasing there will be two parties viz., lessor and the lessee. Leasing is advantageous to both the lessor and the lessee.

Broadly, leases can be divided into two types and they are financial lease and operating lease. The financial manager of a company has to evaluate the decisions relating to leasing mainly on two grounds. These include : Lease vs. Buying, and Lease financing vs. Loan financing.

10.10 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. Define leasing. State the parties involved in leasing.
2. What are the essential elements in leasing?
3. What are various types of leasing?
4. What is a financial lease?
5. Explain the various types of financial lease.

II. Long Answer Questions

1. Explain operating lease with examples.
2. Discuss the advantages and limitations of leasing?
3. How do you evaluate lease or buy decisions?
4. Do you favour lease financing or loan financing? Give reasons.

EXERCISES

1. Purchase of an asset at a price of Rs.1,10,000 with Rs.10,000 down payment and balance in 10 equal installments of Rs.10,000 each.

Rate of interest : 15% p.m.

Depreciation 10% p.a. on straight line method

Tax rate : 50%

Scrap value of the asset at the end of 10 years will be Rs.20,000 i.e., cash inflow after tax will be Rs.10,000.

Lease : Rs.15,000 per annum as lease rent

Tax rate: 50%

2. Sri Krishna corporation may purchase or lease equipment costing Rs.1,00,000 and having a salvage value of Rs.10,000. If purchased, the equipment would be depreciated using straight line method of depreciation over its 5-year life. If leased, the lease payment would be made at year's end and the cost would be Rs.28,773.40. In either case operating revenues would be increased by Rs.50,000 per year and if the equipment is purchased operating costs would be increased by Rs.5,000. The corporation's tax rate is 50%, its cost of capital 16%, risk adjusted discount rate for salvage 20%, and its after-tax cost of debt 5%. Assume that investment tax credits are the same if purchased or leased. Determine the NPV of the purchase.
3. Nagarjuna Industries is considering the leasing of special handling equipment for a period of 20 years. The lease will cost Rs.20,000 per year, with payments in advance. As a result of using the machine, costs will be reduced by Rs.23,000 per year. If Nagarjuna has a marginal tax rate of 48% determine the internal rate of return of the machine.
4. Sirpur Paper company has decided to acquire a Rs.5,00,000 pulp control device that has a useful life a ten years. The investment tax credit is applicable at the time the device is acquired and placed into service. The device would be depreciable on straight-line basis

and no salvage is expected. The company is in the 50% tax bracket. If the acquisition is financed with a lease, lease payments of Rs.55,000 would be required at the beginning of each year. The company can also borrow at 10% and debt payments would be due at the very beginning of each of the ten years. What is the present value of cash outflow for each of these financing alternatives, using the after tax cost of debt? Which alternative is preferable?

5. A machine costing Rs.1,00,000 will result in increased operating income of Rs.30,000 per year. It will be depreciated straight line over five years with no salvage value. The tax rate is 50%. The machine could also be leased for five years at Rs.26,000 per year. The lease payment would be paid at the beginning of each year. Determine whether it is more profitable to lease or purchase.
6. An industrial unit desires to acquire a diesel generating set costing Rs.20 lacs which has an economic life of ten years at the end of which the asset is not expected to have any residual value. The unit is considering the alternative choices of:
 - a. Taking the machinery on lease; or
 - b. Purchasing the asset outright by raising a loan.

Lease payments are to be made in advance and the lessor requires the asset to be completely mortgaged over its useful period and that the asset will yield him a return of 10%.

The cost of debt is worked at 16% per annum. Average rate of income-tax is 50%. It is expected that the operative costs would remain the same under either method.

The following factors may also be taken into account:

- i) The present value discount factors for even stream of cash flows over the number of years are:

Year	8%	10%	16%
1	.93	.91	.86
2	1.78	1.74	1.60
3	2.58	2.49	2.25
4	3.31	3.17	2.80
5	3.99	3.79	3.27
6	4.62	4.35	3.68
7	5.20	4.87	4.04
8	5.75	5.33	4.34
9	6.25	5.76	4.61
10	6.71	6.14	4.83

- ii) Straight line method of depreciation may be adopted.
- iii) Investment allowance will be eligible on investment.

As a financial consultant, indicate what your advice will be? Workings are to form part of your answer.

7. Kaitan Company is considering either leasing or purchasing a new machine costing Rs.2,73,550. If the machine is purchased, it will be depreciated straight-line. The lease would entail a 3 year lease requiring annual beginning-of-year payments of Rs.1,00,000. Alternatively, a Rs.2,73,550, 10% loan will be used to finance the purchase. The loan would be repaid by three equal payments of Rs.1,10,000, the first payment being due one period from now.
 - a) With a zero tax rate, should the firm buy or lease
 - b) With a 40% tax rate should the firm buy or lease? Assume that the firm uses the after-tax borrowing rate in computing present values.
8. Suguna Motors is considering the lease of a new machine. The lease will run for 10 years and will cost Rs.40,000 per year. It will result in added revenue of Rs.85,000 and increase operating costs of Rs.30,000. The company is in the 48% tax bracket. The company requires 15% return on investment. Determine whether or not the leased machine will provide this return.
9. A company decides to acquire an item of equipment which costs Rs.14,000 and has a useful life of 4 years. Assume that the market value of the equipment at the end of 4 years is expected to be Rs.4,431. The company required rate of return is 10% and is expected to remain at approximately this rate in the future. The company has the opportunity of either purchasing the equipment outright or obtaining through a financial lease agreement. The lease agreement allows for four lease payments of Rs.4,000 per year to be paid at the beginning of each year. The company is also able to borrow up to Rs.20,000 from a financial institution at 6%. Which of the alternatives would you recommend to the company?

10.11 FURTHER READINGS

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5. Pandey, I.M. : **Financial Management**, Vikas Publications, Delhi.
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7. Rustagi, R.P. : **Financial Management**, Galgotia Publishing Company, Delhi.

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10.12 KEY WORDS

- Leasing** : A special type of contract. It is an important source of equipment financing.
- Financial Lease** : A long term lease that is not cancellable. All the risks and rewards incident to ownership of an asset are substantially transferred to the lessee.
- Operating Lease** : It is a short-term lease that is often cancelable. The risks and rewards incident to the ownership of an asset remain with the lessor.
- Leveraged Leasing** : A lease agreement in which the lessor provides an equity portion of the leased asset cost and third party lenders provide the balance of the financing.
- Sale and Leaseback** : The sale of an asset with an agreement to immediately lease it back for an extended period of time.

BRAOU

BLOCK – IV: DIVIDEND DECISION

This block has two units.

Unit 11 explains the issues in dividend policy, dividend relevance, the relationship between dividend and uncertainty and dividend irrelevance.

Unit 12 discusses the dividend policy, its determinants, constraints on payment of dividends and forms of dividends.

BRAOU

BRAOU

UNIT - 11 : DIVIDEND THEORIES

Objectives

The objectives of this unit are :

- to explain the meaning and issues in dividend policy;
- to discuss dividend relevance; and
- to explain the dividend theories.

Contents

- 11.0 Introduction
- 11.1 Issues in Dividend Policy
- 11.2 Dividend Relevance
 - 11.2.1 Walter's Model
 - 11.2.2 Gordon's Model
- 11.3 Dividend and Uncertainty
- 11.4 Dividend Irrelevance
- 11.5 M.M. Hypothesis
- 11.6 Illustrations
- 11.7 Summary
- 11.8 Self Assessment Questions
- 11.9 Further Readings
- 11.10 Key Words

11.0 INTRODUCTION

The functions of finance involve three major decisions. They are investment decision, financing decision and dividend decision. An optimal combination of these three decisions will create value. Dividend refers to that portion of a firm's net earnings, which are paid to the shareholders. The firm has to choose between distributing the profits to the shareholders and ploughing them back into the business. There are conflicting views regarding the impact of dividends on the valuation of a firm. According to one school of thought, dividends are irrelevant and the other school of thought considers dividends as relevant to the value of the firm.

11.1 ISSUES IN DIVIDEND POLICY

Dividend policy implies some kind of constant approach to the distribution v/s retention decision rather than making the decision on a purely adhoc basis from period to period. The dividend policy includes when and how much dividend is to be paid. Further, the dividend

policy must have an element of continuity from year to year. Therefore, the dividend policies are of greater importance to stockholders because such policies will affect their wealth.

The dividend - payment of a firm depends upon the way earnings are measured. Pay-out ratio is calculated by taking dividends as a percentage of earnings. It is an important concept in the context of dividend policy. When we treat dividend policy as strictly a financing decision, the payment of cash dividend is a passive residual. It assumes that the dividends are irrelevant. 100 per cent minus payout percentage is called retention ratio. Let us take two companies, one company with high payout and the other company with low payout. These two companies have a return on equity of 20 per cent. Assume that both the companies' have equity shares have a face value Rs. 10 each and high payout company distributes 80 per cent, while low payout company distributes 20 per cent of its earnings as dividends.

A low payout policy produces a higher share price. A high payout policy produces more current dividends, less retained earnings and low market price per share. The firm will have a given amount of cash available for paying dividends given its investment and financing decisions. Thus, a dividend decision involves a trade-off between the retained earnings and issue of new shares. The objective of a dividend policy should be to maximize the shareholders return so that the value of the investment is maximized. The dividend policy has a direct influence on the two components of return. The optimal dividend policy is that which strike the exact balance between current dividends and the future growth that maximizes the price of the firm's stock. As per the relationship between dividend policy and the value of the firms, different theories are classified into two groups: (i) theories which consider dividend decision as an active variable influencing the value of the firm; and (ii) theories which consider dividend decision as irrelevant.

Activity - I

List out the objectives of Dividend Policy.

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11.2 DIVIDEND RELEVANCE

Dividend decision is concerned with distribution of equity earnings between dividends and retained earnings. Dividend decision affects growth rate of the firm, market price of the share and ultimately the overall value of the firm. Hence it is imperative for the management of any corporate entity to design an optimum dividend policy ensuring rational distribution of profits into retained earnings and dividends to maximize the market value of the firm.

However, there are conflicting views regarding the impact of dividend policy on the value of the firm. One school of thought on dividend decision holds that the dividend decisions affect the value of the firm. This school of thought includes Myron Gordon, James E. Walter, John Lintener and Richardson. According to their view, dividends communicate information to the investors about the firm's profitability and hence dividend decision becomes relevant. The firms that pay higher dividends will have greater value and those firms that pay lower dividends will have lower value. Now, let us discuss the following two theories of dividend :

- i) Walter's Model; and
- ii) Gordon's Model.

11.2.1 WALTER'S MODEL

Prof. James E. Walter's Model supports that dividend decisions are relevant and affect the value of the firm. The key argument of Walter's Model is the relationship between the return on a firm's investment or its internal rate of return (r) and its cost of capital or the required rate of return (k). In determining the dividend policy that will maximise the wealth of the shareholders, the relationship between ' r ' and ' k ' assumes importance.

The relationship of r and k is presented in the following table :

S. No.	Relationship between r and k	Result of the relationship	Status of the firm	Payout ratio
1.	$R > k$	The firm earns a higher rate of return on its investment than the required rate of return	Growth	Zero
2.	$R < k$	The firm does not have profitable investments. The shareholders would stand to gain if the firm distributes its earnings.	Declining	100%
3.	$R = k$	The dividend policy will not affect the market value, shareholders will get the same return from the firm as expected by them.	Normal	Not changed

Assumptions

Following are the assumptions of Walter's dividend theory:

- i) The investments of the firm are financed through retained earnings only and the firm does not use external sources of funds like debt or new equity capital.
- ii) All earnings are either distributed as dividends or reinvested internally immediately.
- iii) With additional investments undertaken the firm's business risk does not change (i.e. r and k are constant).
- iv) Earnings (E) and Dividends (D) do not change while determining the value.
- v) The firm has an infinite life.

Walter's Formula

Based on the above assumptions, he puts forward the following valuation formula:

$$P_0 = \frac{D/Ke + r(E-D)/Ke}{Ke}$$

Where -

P = Market price per share

D = Dividend per share

r = Internal rate of return

E = Earnings per share

K_e = Cost of equity capital

As per the above formula, the market price of a share is the sum of two components i.e.

- i) The present value of an infinite stream of dividends; and
- ii) The present value of an infinite stream of returns from retained earnings.

Thus, the Walter's model concludes that there is no unique optimum payout ratio for a normal firm. One dividend policy is as good as the other. The market value of share is not affected by payout ratio when $r = k$.

Example - 1

The following information is relates to a firm.

Capitalisation rate = 10%

Earnings per share = Rs. 50/-

Assumed rate of return on investments:

- i) 12%
- ii) 8%
- iii) 10%

Show the effect of dividend policy on market price of shares by applying Walter's formula when dividend payout ratio is.

- a) 0%
- b) 20%
- c) 40%
- d) 80% and
- c) 100%

Solution :

CONDITIONS WHEN	EFFECT OF DIVIDEND POLICY ON MARKET PRICE OF SHARES		
	r = 12% (r > k)	r = 8% (r < k)	r = 10% (r = k)
a) WHEN DIVIDEND PAY OUT RATIO IS 0%	$P = \frac{0}{0.10} + \frac{0.12(50-0)/0.10}{0.10}$ $= 0 + 60$ $= 0 \times 600$ $= \text{Rs. } 600$	$P = \frac{0}{0.10} + \frac{0.18(50-0)/0.10}{0.10}$ $= 0 + 40$ $= 0 + 400 = \text{Rs. } 400$	$P = \frac{0}{0.10} + \frac{0.18(50-0)/0.10}{0.10}$ $= 0 + 50$ $= 0 + 500 = \text{Rs. } 500$
b) WHEN DIVIDEND PAY OUT RATIO IS 20%	$P = \frac{10}{0.10} + \frac{0.12(50-10)/0.10}{0.10}$ $= 100 + \frac{48}{0.10}$ $= 100 + 480$ $= \text{Rs. } 580$	$P = \frac{10}{0.10} + \frac{0.08(50-10)/0.10}{0.10}$ $= 100 + \frac{32}{0.10}$ $= 100 + 320$ $= \text{Rs. } 420$	$P = \frac{10}{0.10} + \frac{0.10(50-10)/0.10}{0.10}$ $= 100 + \frac{40}{0.10}$ $= 100 + 400$ $= \text{Rs. } 500$
c) WHEN DIVIDEND PAY OUT RATIO IS 40%	$P = \frac{20}{0.10} + \frac{0.12(50-20)/0.10}{0.10}$ $= 200 + \frac{36}{0.10}$ $= 200 + 360$ $= \text{Rs. } 560$	$P = \frac{20}{0.10} + \frac{0.08(50-20)/0.10}{0.10}$ $= 200 + \frac{24}{0.10}$ $= 200 + 240$ $= \text{Rs. } 440$	$P = \frac{20}{0.10} + \frac{0.10(50-20)/0.10}{0.10}$ $= 200 + \frac{30}{0.10}$ $= 200 + 300$ $= \text{Rs. } 500$
d) WHEN DIVIDEND PAY OUT RATIO IS 80%	$P = \frac{40}{0.10} + \frac{0.12(50-40)/0.10}{0.10}$ $= 400 + \frac{12}{0.10}$ $= 400 + 120$ $= \text{Rs. } 520$	$P = \frac{40}{0.10} + \frac{0.08(50-40)/0.10}{0.10}$ $= 400 + \frac{8}{0.10}$ $= 400 + 80$ $= \text{Rs. } 480$	$P = \frac{40}{0.10} + \frac{0.10(50-40)/0.10}{0.10}$ $= 400 + \frac{10}{0.10}$ $= 400 + 100$ $= \text{Rs. } 500$
e) WHEN DIVIDEND PAY OUT RATIO IS 100%	$P = \frac{50}{0.10} + \frac{0.12(50-50)/0.10}{0.10}$ $= 500 + \frac{0}{0.10}$ $= 500 + 0$ $= \text{Rs. } 500$	$P = \frac{50}{0.10} + \frac{0.08(50-50)/0.10}{0.10}$ $= 500 + \frac{0}{0.10}$ $= 500 + 0$ $= \text{Rs. } 500$	$P = \frac{50}{0.10} + \frac{0.10(50-50)/0.10}{0.10}$ $= 500 + \frac{0}{0.10}$ $= 500 + 0$ $= \text{Rs. } 500$

Conclusion : From the above analysis we can draw the following conclusions :

- i) $r > k$, the company should retain the profits, i.e. where ' r ' = 12%, $K = 10\%$.
- ii) $R < k$, the payment should be high i.e., when ' r ' is 8% and ' k ' is 10%
- iii) $R = k$, the dividend pay out does not affect the price of the share i.e., ' r ' is 10% and ' k ' is 10%.

Limitations of Walter's Model

The Walter's model explains the relationship between dividend policy and value of the firm based on certain assumptions, which are not valid in reality.

Following are the limitations of Walter's model.

- i) The model assumes that the firm's investments are financed exclusively by retained earnings. In practice, firms do raise funds by external financing.
- ii) The model is applicable to only all equity firms.
- iii) The model assumes that r is constant. It is not a realistic assumption because when increased investments are made by the firm, r is also changing.
- iv) The model also assumes that k will remain constant. It ignores the effect of risk on the value of firm.

11.2.2 GORDON'S MODEL

Myron Gordon has also developed a model that is similar to the Walter's model. This model explains that dividend policy of the firm is relevant and that investors put a positive premium on current dividends. His theory of dividend explicitly relates the market value of the firm to dividend policy. According to Gordon's dividend/ capitalization model the market value of a firm's share is equal to the present value of an infinite stream of dividends to be received by the shareholder.

His model is based on the following assumptions.

- i) The firm is an all equity firm
- ii) r and k are constant.
- iii) The firm and its stream of earnings are perpetual
- iv) No external finances are used or available. The firm will depend only on retained earnings.
- v) The retention ratio ' br ' is constant, thus the growth rate $g = br$ is constant.
- vi) $K_e > br = g$
- vii) No corporate tax

Gordon's Formula

According to Gordon, the market value of a share is equal to the present value of an infinite future streams of dividends to be receivable by the share. A simplified version of Gordon's model can be expressed as follows:

$$P_0 = \frac{E(1-b)}{K_e - br}$$

$$P_0 = \frac{D_1}{K - g}$$

Where -

- P_0 = Market price of a share
- E = Earnings per share
- b = Retention ratio or percentage of earning retained.
- $1-b$ = D/P ratio, i.e., percentage of earnings distributed as dividends.
- K_e = Capitalization rate (cost of capital)
- $br = g$ = Growth rate of profits retained, rate of return on investment of an all equity firm.

Here, the market value of the shares will be maximized, if the same dividend payout rules applicable in Walter's model are followed. The firms are divided into three groups i.e., growth firms when $r > k_e$, normal firms when $r = k$ and declining firm where $r < k_e$, same as in case of Walter's model.

Activity - II

Explain the Gordon's model of dividend policy.

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Example - 2

The following information is relating to the rate of return on investment 'r', the cost of capital 'k' and earnings per share 'E' of XYZ Ltd. Rate of return on investments (r) = i) 15%, ii) 10%, iii) 12%.

Cost of capital (k) = 12%

Earnings per share = E = Rs. 10/-

Determine the value of its share using Gordon's model assuming the following :

	D/P ratio (1-b)	Retention ratio (b)
(a)	100	0
(b)	80	20
(c)	40	60

Solution

$$P_0 = \frac{E(1-b)}{K_e - br}$$

DIVIDEND POLICY AND THE VALUE OF SHARES

Conditions	(i) $r = 15\%$ ($r > k$)	(II) $k = 10\%$ ($r > k$)	(III) $r = 12\%$ ($r > k$)
a) When D/P Ratio is 100% or $b = 0$	$P = \frac{10(1-0)}{0.12 - (0)(0.15)}$ $= \frac{10}{0.12}$ $= \text{Rs. } 83.33$	$P = \frac{10(1-0)}{0.12 - (0)(0.10)}$ $= \frac{10}{0.12}$ $= \text{Rs. } 83.33$	$P = \frac{10(1-0)}{0.12 - (0)(0.12)}$ $= \frac{10}{0.12}$ $= \text{Rs. } 83.33$
b) When D/P Ratio is 80% or $b = 20$	$P = \frac{10(1-0.20)}{0.12 - (0.20)(0.15)}$ $= \frac{8}{0.09}$ $= \text{Rs. } 88.89$	$P = \frac{10(1-0.20)}{0.12 - (0)(0.10)}$ $= \frac{8}{0.10}$ $= \text{Rs. } 88.89$	$P = \frac{10(1-0.20)}{0.12 - (0.20)(0.12)}$ $= \frac{8}{0.096}$ $= \text{Rs. } 88.89$
c) When D/P Ratio is 40% or $b = 60$	$P = \frac{10(1-0.60)}{0.12 - (0.60)(0.15)}$ $= \frac{4}{0.03}$ $= \text{Rs. } 133.33$	$P = \frac{10(1-0.60)}{0.12 - (0)(0.10)}$ $= \frac{4}{0.06}$ $= \text{Rs. } 66.67$	$P = \frac{10(1-0.60)}{0.12 - (0.60)(0.12)}$ $= \frac{4}{0.048}$ $= \text{Rs. } 83.33$

Example - 3

The following information is available in respect of return on investment (r), the cost of capital (K_e) and earning per share (E) of ABC Ltd.

$i = 10\%$

$E = \text{Rs. } 50/-$

	D/P ratio (1-b)	Retention ratio (b)	Cost of equity (K_e)
(a)	20	80	20
(b)	40	60	18
(c)	20	80	20
(d)	40	60	18

Solution

$$P_0 = \frac{E(1-b)}{K_e - br}$$

Where -

P = Price of shares

E = Earnings per share

b = Retention ratio

Ke = Cost of equity capital

br = g = Growth rate in r, i.e., rate of return on investment of all equity firm.

DIVIDEND POLICY AND VALUE OF SHARES OF ABC LIMITED

A	B	C	D
D/P ratio = 20 Retention ratio=80 br=0.80x0.10=0.08	D/P ratio = 40 Retention ratio=60 br=0.60x0.10=0.06	D/P ratio = 60 Retention ratio=40 br=0.40x0.10=0.04	D/P ratio = 80 Retention ratio=20 br=0.20x0.10=0.02
$P = \frac{50(1 - 0.80)}{0.20 - 0.08}$	$P = \frac{50(1 - 0.60)}{0.18 - 0.06}$	$P = \frac{50(1 - 0.40)}{0.16 - 0.04}$	$P = \frac{50(1 - 0.20)}{0.14 - 0.02}$
$= \frac{50(0.20)}{0.12}$	$= \frac{50(0.40)}{0.12}$	$= \frac{50(0.6)}{0.12}$	$= \frac{50(0.80)}{0.12}$
$= \frac{10}{0.12}$	$= \frac{20}{0.12}$	$= \frac{30}{0.12}$	$= \frac{40}{0.12}$
= Rs. 83.33	= Rs. 166.67	= Rs. 250	= Rs. 333.33

Limitations of Gordon's Model

Gordon's Model's conclusions about dividend policy are similar to that of Walter's Model. This similarity is on account of similar assumptions proposed in both the theories. Thus the Gordon model suffers from the same limitations as the Walter model.

11.4 DIVIDEND AND UNCERTAINTY

Dividends should be declared in a manner that the investor is confident about the further of his earnings. If he receives dividends annually and the amount is such that it satisfies him, then the company is able to gain his confidence because it reduces his uncertainty about future capital gains or appreciation of the company's equity stock. In the view of Gordon, dividend policy is irrelevant where $r = k$, when all other assumption are held valid. This view is based on the assumption that under conditions of uncertainty, investors tend to discount distant dividends at a higher rate than they discount near dividends.

In the words of Graham and Dodd, the typical investor would most certainly prefer to have his dividend today and let tomorrow take care of itself. No instances are on record in which the withholding of dividends for the sake of future profits has been hailed with such enthusiasm as to advance the price of the stock. The direct opposite has invariably been true.

Given two companies in the same general position and with the same earning power, the one paying the larger dividend will always sell at a higher price.

Finally, distant dividends would be discounted at a higher rate than near dividends. As the discount rate increases with the length of time, a low dividend payment in the beginning will tend to lower the value of share in future.

11.5 DIVIDEND IRRELEVANCE

The argument is that dividend decision is passive decision and is out of the residual value. If the company has investment opportunities, i.e., so long as 'r' is greater than 'k' the firm would keep on investing its funds and the investors would not mind whether dividend is distributed or not. The proposition is that the firm should be able to earn more than its equity capitalization rate. Dividends are irrelevant because investors are indifferent between dividends and capital gains. But when return on investment is less than the cost of capital investor's would prefer a dividend.

The conclusion that dividends are not relevant is based on two pre-conditions. They are:

- i) The investment and financing decisions have already been made and that these decisions will not be altered by the amount of dividend payment; and
- ii) The perfect capital market is there in which an investor can buy and sell the shares without any transaction costs and that the companies can issue shares without any flotation costs.

A residual theory of dividend policy does not necessarily mean that dividends need to fluctuate from period to period in keeping with investment opportunities. A firm may smooth out actual payments by saving some funds in surplus years in anticipation of deficit ones. If forecasting is relatively accurate, the firm can establish its dividend payment at a level, which the cumulative distribution over time corresponds to cumulative residual funds over the same period. The fact is that dividends do not correspond to residual funds period by period does not negate the residual theory of dividends. The critical question is whether dividends are more than just a means of distributing unused funds? Should dividend policy be active decision variable as opposed to a passive one? To answer these questions, the arguments that dividends are irrelevant so that changes in the pay out ratio (holding investment opportunities constant) do not affect share holder's wealth are examined with the help of various theories.

11.6 MODIGLIANI AND MILLER'S HYPOTHESIS

M.M. hypothesis explains that dividend policy has no effect on share prices and is, therefore, of no consequence. What matters is the investment policy through which the firm can increase its earnings and thereby its value. Dividing earnings into retention and dividends is a matter of details and not of any consequences.

Assumptions

The M.M. Theory is based on the following assumptions.

- i) Existence of perfect capital markets

- ii) Investors are rational
- iii) There are no transaction costs
- iv) No investor is large enough to influence market price of securities.
- v) There are no floatation costs.
- vi) There are no taxes. Alternatively, there are no differences in income tax rates between capital gains and dividends.
- vii) A firm has a fixed investment policy which will not change over a period of time
- viii) Financing of new investments will not change in the required rate of return.

According to the M.M. Hypothesis neither the firm paying dividends nor the shareholders receiving the dividends will be adversely affected by the firms paying either too little or too much dividends. The crux of the matter is the 'arbitrage process' or the switching and balancing operation. It also refers to the simultaneous movement of two transactions, which exactly offset each other. The two transactions involved are paying dividends and raising capital through external funds either through the sale of new shares or raising additional funds through loans to finance investment programmes. The benefit of increase in market value as a result of dividend payment will be offset completely by the decrease in terminal value of the share. The shareholders therefore, would be indifferent between the dividend payments or retaining the profits.

Proposal - I

If dividends are distributed, an amount will have to be raised through the sale of new shares. The increased value per share through dividends will be exactly offset by the external raising of shares. The terminal value of shares will decline. Shareholders are indifferent between retention of profit or payment of dividend but they are interested in the firms future earnings.

Proposal - II

If instead of raising equity shares the firm raises amount in the form of loan, there will be no difference between debt and equity because of leverage and the real cost of debt is the same as the real cost of equity.

Therefore, according to the M.M. Hypothesis, the dividend policy is irrelevant. The arbitrage process also implies that the dividend pay out ratio between two identical firms should be the same and so also the total value of the firm. The individual shareholder can invest his own earnings as well as the firm would, with dividend being irrelevant, a firm's cost of capital would be independent of the dividend.

Finally, in the arbitrage process the dividend policy would be irrelevant even under uncertainty. Market price of the firm should also be the same for two identical firms. Differences in current and future dividend policies can not affect the market value of the two firms as the present value of prospective dividends plus terminal value is the same. MM provide the proof in support of their argument in the following manner;

Step 1

The market price of a share in the beginning of the period is equal to the present value of the dividends paid at the end of the period plus the market price of share at the end of the period. Thus;

$$P_0 = \frac{1}{(1+K_e)} (D_1 + P_1)$$

Where: P_0 = Current market price per share
 K_e = Cost of equity capital
 D_1 = Dividend to be received at the end of period 1.
 P_1 = market price of the share at the end of period 1.

Step 2

Assuming no external financing, the total capitalized value of the firm would be the number of shares (n) times the price of each share (P_0) thus;

$$\eta P_0 = \frac{1}{(1+K_e)} (nD_1 + nP_1)$$

Step 3

If the firm's internal source of financing its investment opportunities falls short, funds required and X_n is the number of new shares issued at the end of year 1 at price P_1 .

Thus

$$\eta P_0 = \frac{1}{(1+K_e)} (nD_2 + X_n) P_1 - X_n P_1$$

Where;

X_n = The change in the number of shares out standing during the period.

N = Number of shares out standing at the beginning of the period.

The step 3 implies that the total value of the firm is the capitalized value of the dividends to be received during the period plus the value of the number of shares outstanding at the end of the period considering new shares, less the value of the new shares. Thus step 3 is the same as step 2.

Step 4

If the firm is to finance all investment proposals, the total amount of new shares issued would be

$$X_n P_1 = C - (E - n D_1)$$

$$X_n P_1 = C - (E + n D_1)$$

$X_n P_1$ = The amount obtained from the sale of new shares to finance capital budget requirements.

C = The total amount required for capital budgeting.

E = Earnings of the firm during the period.

ND_1 = Total dividends paid

$(E - D_1)$ = Retained earnings.

The step 4 states that, whatever investment needs (C) are not financed by retained earnings must be financed through the sale of additional equity shares.

Step 5

If step 4 is substituted into step 3, we derive step 5:

$$nP_0 = \frac{1}{1 + k_e} (nD_1 + (n + X_n) P_1 - (C - E + nD_1))$$

Solving the above equation we get the following:

$$nP_0 = \frac{nD_1 + (n + X_n) P_1 - (C + E - nD_1)}{(1 + K_e)}$$

There is a positive nD_1 and a negative nD_2 . Therefore nD_1 cancels, then we have

$$nP_0 = \frac{(n + X_n) P_1 - (C + E)}{(1 + K_e)}$$

Step 6

Since dividend (D) are not found in step 5, MM hypothesis concludes that dividends do not count and that the dividend has no effect on the share price.

Example - 4

A company has an equity capitalisation rate of 10%. Its currently out standing shares are 20,000 selling at Rs. 100/- each. The firm is planning to declare dividend of Rs. 5/- per share at the end of the current financial year. The company expects to have a net income of Rs. 2,00,000/- and proposes to make new investment of Rs. 4,00,000/-. What will be the value of the firm's share at the end of the year if;

- i) a dividend is not declared, and
- ii) assuming that the firm pays dividend how many shares must be issued?

Use M.M. model to answer these question.

Solution

I. Value of the firm when dividends are not paid. Price per share at the end of the year 1

$$P_0 = \frac{1}{(1 + K_e)} (D_1 + P_1)$$

Where, $D_1 = 0$, $K_e = 10\%$

$$100 = \frac{1}{(1 + 0.10)} (0 + P_1)$$

$$100 = \frac{1}{1.10} (P_1)$$

$$100 = \frac{P_1}{1.10}$$

$$\begin{aligned} P_1 &= 100 \times 1.10 \\ &= \text{Rs. } 110/- \end{aligned}$$

Amount required to be raised from the issue of new shares:

$$\begin{aligned} XnP_1 &= C - E + nD_1 \\ XnP_1 &= 4,00,000 - 2,00,000 + 0 \\ &= 2,00,000 \end{aligned}$$

$$\text{No. of new shares to be issued} = \frac{2,00,000}{110} = \frac{20,000}{11} \text{ shares}$$

$$\text{Value of the firm} = \frac{\left(\frac{20,000 + 20,000}{1} \right) (110) - 4,00,000 + 2,00,000}{1 + 0.10}$$

$$= \frac{22,00,000}{1.10} = \text{Rs. } 20,00,000$$

II. Value of the firm when dividends are paid price per share at the end of year 1.

$$P_0 = \frac{1}{(1+K_e)} (D_1 + P_1)$$

$$100 = \frac{1}{(1+0.10)} (5 + P_1)$$

$$110 = 5 + P_1$$

$$P_1 = \text{Rs. } 105/-$$

Amount required to be raised from the issue of new shares:

$$\begin{aligned} XnR_2 &= C - (E - nD_2) \\ &= 4,00,000 (2,00,000 - 1,00,000) \\ &= 4,00,000 - 1,00,000 \\ &= 3,00,000 \end{aligned}$$

No. of additional shares to be issued;

$$Xn = \frac{3,00,000}{105} \text{ shares} = 2857.143 \text{ or } 2857 \text{ shares}$$

Value of the firm

$$\begin{aligned} N/o &= \frac{(n + Xn) P_1 - C + E}{(1 + K_e)} \\ &= \frac{(20,000 + 3,00,000 + (105) - 4,00,000 + 2,00,000)}{1.10} \\ &= \frac{24,00,000 - 2,00,000}{1.10} \\ &= \text{Rs. } 20,00,000 \end{aligned}$$

Thus, whether dividends are paid or not paid the value of the firm is the same. The above example clearly demonstrates that the shareholders are indifferent between the retention of profits and payment of dividends.

Example - 5

ABC Ltd. Belongs to a risk class for which the appropriate capitalization rate is 10%. It has currently outstanding 5,000 shares, selling at Rs.100/- each. The firm is contemplating the declaration of dividend of Rs. 6/- per share at the end of the current financial year. The company expects to have at net income of Rs. 50,000/- and has a proposal for making new investments of Rs. 1,00,000/-. Show that under the MM hypothesis, the payment of dividend does not effect the value of the firm.

Solution

Value of the firm when dividends are paid.

- i) Price of the share at the end of the current financial year.

$$P_0 = \frac{1}{(1+K_e)} (D_1 + P_1)$$

$$100 = \frac{1}{(1+0.10)} (6 + P_1)$$

$$100 = \frac{1}{(1+10)} (6 + P_1)$$

$$100 (1.10) = 6 + P_1$$

$$110 - 6 = P_1$$

$$P_1 = \text{Rs. } 104/-$$

- ii) No. of shares to be issued;

$$\begin{aligned} Xn P_1 &= C - (E - nD_1) \\ &= 1,00,000 - (50,000 - 5000 \times 6) \end{aligned}$$

$$\begin{aligned} Xn P_1 &= 1,00,000 - 20,000 \\ &= 80,000 \end{aligned}$$

$$Xn = \frac{80,000}{104} \text{ shares}$$

- iii) Value of the firm;

$$nP_0 = \frac{(n + Xn) P_1 - C + E}{(1 + K_e)}$$

$$\begin{aligned}
&= \frac{\left(\frac{5,000}{1} + \frac{80,000}{104} \right) (104 - 1,00,000 + 50,000)}{(1 + 0.10)} \\
&= \frac{6,00,000 - 1,00,000 + 50,000}{1.10} \\
&= \frac{5,50,000}{1.10} \\
&= \text{Rs. } 5,00,000
\end{aligned}$$

Value of the firm when dividends are not paid :

i) Price per the share at the end of the current financial year.

$$P_0 = \frac{1}{(1+K_e)} (D_1 + P_1)$$

$$100 = \frac{1}{(1+0.10)} (0 + P_1)$$

$$100 (1.10) = P_1$$

$$P_1 = \text{Rs. } 110/-$$

No. of shares to be issued;

$$\begin{aligned}
X_n P_1 &= C - E - nD_1 \\
&= 1,00,000 - 50,000 + 0 \\
&= 50,000
\end{aligned}$$

$$X_n = \frac{50,000}{110} \text{ shares}$$

ii) Value of the firm;

$$n P_0 = \frac{(n + X_n) P_1 - C + E}{(1 + K_e)}$$

$$\begin{aligned}
 & \frac{5,000 + 50,000}{110} + 110 - 1,00,000 + 50,000 \\
 = & \frac{\quad}{(1 + 0.10)} \\
 = & \frac{6,00,000 - 1,00,000 + 50,000}{1.10} \\
 = & \frac{5,50,000}{1.10} = \text{Rs. } 5,00,000
 \end{aligned}$$

Hence, whether dividends are paid or not, the value of the firm remains the same Rs. 5,00,000.

Example - 6

Excel Ltd., had 50,000 equity shares of Rs. 10/- each outstanding on January 1. The shares are currently quoted at par in the market. In the wake of the removal of dividend restraint, the company now intends to pay a dividend of Rs. 2/- per share for the current calendar year. It belongs to a risk-class whose appropriate capitalization rate is 15%. Using MM model and assuming no taxes, ascertain the price of the company's share as it is likely to prevail at the end of the year.

- i) When dividend is declared, and
- ii) When no dividend is declared. Also find out the number of new equity shares that the company must issued to meet its investment need of Rs. 2 lakhs, assuming a net income of Rs. 1.1 lakh and also assuming the dividend is paid.

Solution

- i) Price per the share when dividends are paid :

$$P_0 = \frac{1}{(1 + K_e)} (D_1 + P_1)$$

$$P_0 = \frac{1}{(1 + 0.15)} (2 + P_1)$$

$$10(1.15) = 2 + P_1$$

$$P_1 = 11.5 - 2$$

$$P_1 = \text{Rs. } 9.50$$

ii) Price per share when dividends are not paid:

$$P_0 = \frac{1}{(1+K_e)} (D_1 + P_1)$$

$$10 = \frac{1}{(1+0.15)} (0 + P_1)$$

$$10(1.15) = P_1$$

$$P_1 = \text{Rs. } 11.50$$

iii) No. of new equity shares to be issued if dividend is paid.

$$\begin{aligned} XnP_1 &= C - E + nD_1 \\ &= 2,00,000 - 1,10,000 + (50,000 \times 2) \\ &= 2,00,000 - 1,10,000 + 1,00,000 \\ &= 1,90,000 \\ &= \frac{1,90,000}{9.50} \text{ shares} \\ &= 20,000 \text{ shares} \end{aligned}$$

Critical Appraisal: Under the assumptions set by MM, this model testifies that dividend is irrelevant and the investors are indifferent between the current dividends and the future capital gains. Given these assumptions, the effect of a dividend decision may be stated as: That there is no relationship between dividend policy and value of the share. One dividend policy is as good as another. Investors are concerned only with total returns and are indifferent whether these returns are coming as dividend income or from capital gains. That is, to finance the growth, the firm (a) may choose to issue shares and thereby allow profits to be used to pay dividends; or (b) may use internally generated funds for financing the growth and thereby pay less in dividends and not issuing any shares.

In the first case, the shareholders receive dividend income, while in the second case, the market value of their investment should increase, providing capital gains. The nature of the return is the only difference, however, the total returns should be same. The model has shown that the value of the firm depends upon the number of shares, market price at the end of the year 1, investment opportunities at the end of the year 1 and the total earnings for the year 1. On theoretical grounds, the model seems to be true, but in practical situations it may be difficult to be applied.

A dividend payout or higher dividend payout definitely conveys that the future of the firm is bright and promising. On the other hand, a lower or no payout may be taken by the investors to suggest the uncertain future of the firm. The dividend payment by the firm reduces the uncertainty and therefore, investors do prefer current dividends to future capital

gain. Thus, the share of dividend paying companies will command a better price than that of the shares of no dividend paying companies. MM model fails to consider that dividends conveys informations to investors, which may make them more confident of the firm's prospects. If dividends are in fact irrelevant, then why the firm are spending a great deal of time pondering over an issue about which its shareholders are indifferent.

The critics of MM model argue that assumptions underlying the model are unrealistic and vulnerable and have disputed the validity of dividend irrelevance. The assumptions needed to arrive at the dividend irrelevance may seem so onerous that these may be rejected outrightly. The MM model may not hold good if the assumptions underlying it are not met. In particular, the MM model may be criticized as follows:

- i) The assumption of perfect capital market is theoretical in nature as the perfect market is never found in practice.
- ii) No flotation cost and no time lag assumptions are also unrealistic. In reality, the fact is otherwise and companies have to incur expenses in raising fresh equity capital from the market and that too it requires a time gap to fulfill a lot of legal formalities for raising capital etc.
- iii) Similarly, the assumption of no transaction costs is imaginary. Some brokerage or commission etc., is payable by the investors whenever they decide in future to encash future capital gain arising out of bonus shares. Hence, the investors may prefer current dividend.
- iv) Assumption of no tax is also questionable. There is generally a difference in tax rate applicable to dividend incomes and capital gains in the hands of the shareholders. For example, in India, the dividend income is non-taxable in the hands of the shareholders while they are required to pay taxes at a flat rate of 20% on capital gains arising out of sale of shares. Moreover, the cost of bonus shares is taken as nil with the result that whole of the selling price of bonus shares is treated as capital gains resulting in substantial tax liability of the shareholders. Therefore, the investors may have a preference for current dividends as against the expected capital gains.

In other countries, however, the dividend income is subject to personal income tax in the year of receipt. The investors have to pay tax on their dividend income. However, if the company does not distribute dividends and allow profits to accumulate in the value of shares, the company helps the shareholder to postpone their tax liability. In such a case, the tax liability will arise only when the bonus shares are sold by a shareholders. So, the shareholders will have a preference for future capital gains as against the current dividends.

- v) MM have assumed that the investment policy of the firm is independent of the financing policy. But, some of the firms may undertake only limited investment projects which can be financed by retained earnings only. Some companies, even if they are willing, may not find conducive conditions to raise capital from the market. There may be legal constraints in raising capital or the investors may be less willing to subscribe to the fresh capital. In such situations, the firm will have a tendency to retain as much profits as possible by lowering the payout ratio.
- vi) The MM model may not hold good if the firm is not able to issue additional equity share capital at the then prevailing current market price when dividends are paid and are to be replaced by fresh funds. These new shares would possibly be offered

in the capital market and can be sold at a price lower than the then prevailing current market price. Consequently, the firm would be required to sell more shares. Thus, the firm may find the retention of profits as a better option than paying dividends to shareholders and simultaneously raising fresh capital.

To sum up, (i) Investor's preference for dividend (so as to avoid uncertain future capital gain; (ii) Transactions costs involved in conversion of capital receipt into incomes (by the sale of bonus shares); (iii) Possibility to unprofitable investment being undertaken by the firm, and the fear of tax burden at the time of sale of bonus shares suggest that a company should adopt a liberal dividend policy and opt for a higher dividend payout ratio.

On the other hand, flotation costs (at the time of issuing fresh capital), chances of lower issue price than the market price, legal and procedural constraints, market conditions and sentiments suggest that a company should follow a policy of maximum retention and a lower payout ratio.

Thus, the MM model is not a practical proposition. The dividend irrelevance argument does not seem to be feasible when the assumptions underlying the MM model are relaxed.

Conclusion: The discussion of different models is indicative of the fact that investors do prefer current dividend to retained earnings. The reason for this is obvious that the present dividends are certain. Investors assign higher value to certain stream of dividends. A finance manager should also recognize the existence of different types of investors. A low payout and consequently higher also recognize the existence of different types of investors. A low payout and consequently higher retention with higher expected growth will attract and satisfy the risk oriented investors while the high payout and consequently low retention and low growth rate will attract and satisfy the risk averse and conservative investors.

Therefore, neither 100% payout nor 0% payout will bring the maximum market price. The optimum point lies somewhere in between. Too much payment in spite of reinvestment opportunities causes the investor to penalize the share price while too little payout also causes the investors to penalize the share price. Still the dividend payout ratio should be lower among the firms having good growth opportunities than the dividend payout ratio among those firms which have less opportunities of growth.

Activity – III

"Dividend policy is irrelevant as far as maximization of shareholders' wealth is concerned". Do you agree? Give reasons.

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11.6 ILLUSTRATIONS

1. A company earns Rs. 5/- per share, its earnings are capitalised at a rate of 10% and has a rate of return on investment at 18 percent. According to Walter's model, what should be the price per share at 25 percent dividend payout ratio? Is this the optimum pay out ratio according to the Walter?

Solution

$$P = \frac{D}{K_e} + \frac{r(E - D) / K_e}{K_e}$$

Where, P = Market price per share

D = Dividend per share

R = Internal rate of return

E = Earnings per share

K_e = Cost of equity capital

$$= \frac{1.25}{0.10} + \frac{0.18(5 - 1.25) / 0.10}{0.10}$$

$$= 12.5 + \frac{0.18(3.75) / 0.10}{0.10}$$

$$= 12.5 + \frac{6.57}{0.10}$$

$$= 12.5 + 67.5$$

$$= \text{Rs. } 80/-$$

This is not the optimum dividend pay out ratio because Walter suggests a zero per cent dividend pay out ratio in situations where $r > K_e$ to maximise the value of the firm. At this ratio, the value of the share would be maximum, that is, Rs. 90.

2. From the following information supplied to you, determine the theoretical market value of equity shares of a company as per Walter's models:

Earnings of the company	Rs. 5,00,000
Dividends paid	Rs. 3,00,000
No. of shares outstanding	1,00,000
Price earning ratio	8
Rate of return on investment	0.15

Are you satisfied with the current dividend policy of the firm? If not, what should be the optimal dividend pay out ratio in this case?

Solution

$$\begin{aligned} P &= \frac{D}{K_e} + \frac{r(E-D)/K_e}{K_e} \\ &= \frac{3}{0.125} + \frac{0.15(5-3)/0.125}{0.125} \\ &= 24 + 19.20 \\ &= 43.20 \end{aligned}$$

No, we are not satisfied with the current dividend policy. The optimal dividend pay out ratio, given the facts of the case, should be zero.

Workings

- i) K_e is the reciprocal of price earning ratio = $1/8 = 12.5\%$ or 0.125
- ii) $E = \text{Total Earnings} \div \text{No. of shares outstanding}$ i.e. $5,00,000/1,00,000 = 5$
- iii) $D = \text{Total Dividends} \div \text{No. of shares outstanding}$ i.e. $3,00,000/1,00,000 = 3$

11.7 SUMMARY

The functions of finance involve three major decisions. They are investment decision, financing decision and dividend decision. The firm has to choose between distributing the profits to the shareholders and ploughing them back into the business. There are conflicting opinions regarding the impact of dividends on the valuation of a firm. According to one school of thought dividends are irrelevant and the other school of thought consider dividends are relevant to the value of the firm.

The school of thought advocating dividend relevance includes Prof. James Walter and Myron Gordon. The key argument of Walter's model is the relationship between the return on a firm's investment or its normal rate of return and its cost of capital or the required rate of return (k). The firm would have an optimum dividend policy, which will be determined by the relationship of r and k . Myron Gordon also developed a model that is similar to that of Walter's model. This model explains that dividend policy of the firm is relevant and that investors put a positive premium on current income / dividend.

Another school of thought felt that dividends are irrelevant because investors are indifferent between dividends and capital gains. M.M. Hypothesis explains that dividend policy has no effect on share prices and is, therefore, of no consequence. The crux of the M.M. Hypothesis is the arbitrage process or the switching and balancing operation. It also refers to the simultaneous movement of two transactions which exactly offset each other. The two transactions involved are paying dividends and raising capital through external funds either through the sale of new shares or raising additional funds through loans to finance investment programmes.

11.8 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. Identify the issues in dividend policy.
2. Explain the concept of dividend irrelevance.
3. What are the limitations of Walter's model.

II. Long Answer Questions.

1. Explain —
 - a) Walter's approach to dividend policy.
 - b) Gordon's approach to relevance of dividend decision.
2. "Walter's and Gordon's models are based on the same assumptions. Thus there is no basic difference between the two models". Do you agree? Give reasons.
3. "The assumptions underlying the dividend irrelevance hypothesis of Modigliani and Miller are unrealistic". Discuss.

Exercises

1. a) Company Z earns Rs. 5 per share, is capitalized at a rate of 10%, and has an 18% rate or return on investment.

According to Walter's formulae, what should be the price per share at 25% dividend payout ratio? Is this the optimum payout ratio according to Walter?

- b) Omega company has a cost of equity capital of 10%, the current market value of the firm (V) is Rs. 20,00,000 @ Rs. 20 per share. Assume the values for I (new investment), Y (earnings) and D (dividends) at the end of the year as I = Rs. 6,80,000, Y = Rs. 1,50,000, and D = Re 1 per share. Show that under the Modigliani-Miller assumptions, the payment of D does not affect the value of the firm.

2. XYZ Company's shareholders' funds for the year ending 31st December are as follows:

	Rs.
12% Preference share capital	1,00,000
Equity share capital	4,00,000
Share premium	40,000
Retained earnings	3,00,000
	<hr/>
	8,40,000

The earnings available for equity shareholders from this period's operations are Rs. 1,50,000, which have been included as part of the Rs. 3,00,000 retained earnings.

- i) What is the maximum Dividend Per Share (DPS) the firm can pay?
- ii) If the firm has Rs. 60,000 in cash, what is the largest DPS it can pay without borrowing?

- iii) Indicate what accounts, if any, will be affected if the firm pays the dividends indicated in (ii) above.

3. Following is the Earnings Per Share (EPS) record of ABC Company Ltd. Over the past 10 years.

Year	EPS (Rs.)	Year	EPS (Rs.)
10	20.00	5	12.00
9	19.00	4	6.00
8	16.00	3	9.00
7	15.00	2	2.00
6	16.00	1	1.00

- i) Determine the annual dividend paid each year in the following cases:
- If the firm's dividend policy is based on a constant dividend payout ratio of 50% for all the years.
 - If the firm pays dividend at Rs. 8 per share, and increases it to Rs. 10 per share when earnings exceed Rs. 14 per share for two consecutive years.
 - If the firm pays dividend at Rs. 7 per share each year except when EPS exceeds Rs. 14 per share, when an **extra** dividend equal to 80% of earnings beyond Rs. 14.00 would be paid.

- ii) Which type of dividend policy will you recommend to the company and why?

4. X and Y are two fast growing companies in the engineering industry. They are close competitors, and their asset composition, capital structure, and profitability records have been very similar for several years. The primary difference between the companies, from a financial management perspective, is their dividend policy. Company X tries to maintain a non-decreasing dividend per share, while company Y maintains a constant dividend payment ratio. Their recent earnings per share (EPS), dividend per share (DPS), and share price (P) history are as follows:

Year	Company X (In Rs.)			Company Y (In Rs.)		
	EPS	DPS	P (range)	EPS	DPS	P (range)
1.	9.30	2.00	75-90	9.50	1.90	60-80
2.	7.40	2.00	55-80	7.00	1.40	25-65
3.	10.50	2.00	70-110	10.50	2.10	35-80
4.	12.75	2.25	85-135	12.25	2.45	80-120
5.	20.00	2.50	135-200	20.25	4.05	110-225
6.	16.00	2.50	150-190	17.00	3.40	140-180
7.	19.00	2.50	155-210	20.00	4.00	130-190

In all calculations below that require a share price, use the average of the two prices given in the share price range.

- i) Determine the dividend payment ratio (D/P), and price to earnings ratio (P/E) for both companies for all the years.
 - ii) Determine the average D/P and P/E for both the companies over the period 1 through 7.
 - iii) The management of company Y is puzzled as to why their share prices are lower than those of company X, in spite of the fact that profitability record of the company Y is slightly better (particularly of past three years). As a financial consultant, how would you explain the situation?
5. Two companies – X Ltd. And Y Ltd. – are in the same industry with identical earnings per share for the last five years. X Ltd has a policy of paying 40 per cent of earnings as dividend, while Y Ltd. Pays a constant amount of dividend per share. There is disparity between the market prices of the shares of the two companies. The price of X's share is generally lower than that of Y, even though in some years, X pays more dividends than Y. The data on earnings and dividends per share and market price for the two companies is as follows:

Year	X Ltd EPS Rs.	Y Ltd EPS Rs.	X Ltd DPS Rs.	Y Ltd DPS Rs.	X Ltd Market price Rs.	Y Ltd Market price Rs.
1.	4.00	4.00	1.60	1.80	12.00	13.50
2.	1.50	1.50	0.60	1.80	8.50	12.50
3.	5.00	5.00	2.00	1.80	13.50	12.50
4.	4.00	4.00	1.60	1.80	11.50	12.50
5.	8.00	8.00	3.20	1.80	14.50	15.00

- a) What are the reasons for the differences in the market prices of the two companies' shares?
- b) What can be done by X Ltd to increase the market price of its shares?

11.9 FURTHER READINGS

1. I.M. Pandey : **Financial Management**, Vikas Publishing House Pvt. Ltd., New Delhi.
2. R.K. Sharma and Shashi K. Gupta : **Management Accounting**, Kalyani Publishers, New Delhi.
3. M.Y. Khan and P.K. Jain : **Financial Management - Text and Problems**, Tata McGraw Hill Publishing Company Limited, New Delhi.
4. Prasanna Chandra : **Financial Management**, Tata McGraw Hill Publishing Company Limited, New Delhi.

5. James C. Van Horne : **Financial Management and Policy**, Prentice-Hall of India Private Limited, New Delhi.
6. Linter, J, : **Dividends, Earnings, Leverage, Stock Prices and the Supply of Capital to Corporations**, Review of Economics and Statistics, August, 1992.

11.10 KEY WORDS

- Dividend – Payout Ratio** : Annual cash dividends divided by annual earnings or dividends per share divided by earnings per share.
- Regular Dividend** : The dividend that is normally expected to be paid by the firm.
- Stock Repurchase** : Repurchase (buyback) of stock by the issuing firm.
- Stock Dividend** : A payment of additional shares of stock to shareholders.

BRAOU

ISSUES OF DIFFERENT PAYOUT POLICIES

YEAR	EQUITY (Rs.)		EARNINGS AT 20% (Rs.)		DIVIDENDS (Rs.)		RETAINED EARNINGS (Rs.)	
	HIGH PAYOUT COMPANY	LOW PAYOUT COMPANY	HIGH PAYOUT COMPANY	LOW PAYOUT COMPANY	HIGH PAYOUT COMPANY	LOW PAYOUT COMPANY	HIGH PAYOUT COMPANY	LOW PAYOUT COMPANY
1	10.00	10.00	2.00	2.00	1.60	0.04	0.04	1.60
2	10.40	11.60	2.08	2.32	1.66	0.46	0.42	1.86
3	10.82	13.46	2.16	2.69	1.73	0.53	0.43	2.16
4	11.25	15.62	2.25	3.12	1.80	0.62	0.45	2.50
5	11.70	18.12	2.34	3.62	1.87	0.72	0.47	2.90
6	12.17	21.02	2.43	4.20	1.94	0.84	0.49	3.36
7	12.66	24.38	2.53	4.87	2.02	0.97	0.51	3.90
8	13.17	28.28	2.63	5.65	2.10	1.13	0.53	4.52
9	13.70	32.80	2.74	6.56	2.19	1.31	0.55	5.25
10	14.25	38.05	2.85	7.61	2.28	1.52	0.57	6.09
11	14.82	44.14	2.96	8.82	2.37	1.76	0.59	7.06
12	15.41	51.20	3.08	10.24	2.46	2.05	0.61	8.19
13	16.02	59.39	3.20	11.87	2.56	2.37	0.64	9.50
14	16.66	68.89	3.33	13.78	2.66	2.75	0.67	11.03
15	17.33	79.92	3.47	15.98	2.77	3.19	0.70	12.79
16	18.03	92.71	3.61	18.54	2.88	3.70	0.73	14.84
17	18.76	107.55	3.75	21.51 nm	3.00	4.30	0.75	17.21
18	19.51	124.76	3.90	24.95	3.12	4.99	0.78	19.96
19	20.29	144.72	4.05	28.94	3.24	5.78	0.81	23.16
20	21.10	167.88	4.22	33.57	3.37	6.71	0.85	26.86

UNIT – 12 : DIVIDEND POLICY

Objectives

After studying this Unit, you should be able to:

- to explain the Meaning of Dividend policy;
- to discuss the Dividend vs. Retention policy;
- to present the constraints, stability and forms of Dividends; and
- to study the meaning and conditions for the issue of Bonus Shares.

Contents

- 12.0 Introduction
- 12.1 Dividend vs. Retention Policy
- 12.2 Determinants of Dividend Policy
- 12.3 Constraints on Payment of Dividends.
- 12.4 Stability of Dividends
- 12.5 Forms of Dividends
- 12.6 Bonus Shares
- 12.7 Conditions for the Issue of Bonus Shares
- 12.8 Stock Split
- 12.9 Summary
- 12.10 Self Assessment Questions
- 12.11 Further Readings
- 12.12 Key Words

12.0 INTRODUCTION

The previous Unit provided an overview of the relationship between the dividend decision of a firm and its total value. As per the theoretical views, one school of thought believes that dividends increase the value of the share. On the other hand, the other school of thought believes that payment of dividends result into the payment of higher taxes and thus they reduce the shareholders' wealth. In the light of the conflicting and contradictory view points as also the available empirical evidence, there appears to be a case for the proposition that investors prefer dividends over retained earnings and they have a bearing on the firm's objective of maximizing the shareholders' wealth. The present unit is devoted to discuss the determinants of the dividend policy of a firm.

12.1 DIVIDEND Vs RETENTION POLICY

Dividends refer to that portion of a firm's net earnings which are paid out to the shareholders. 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. The retained earnings are the most significant internal sources of financing the growth of the firm. Similarly, dividends are desirable from shareholders' point of view as it tends to

increase their current wealth. Thus, there is a reciprocal relationship between retained earnings and cash dividends; larger dividends – smaller retention, lesser dividend – larger retention. Therefore, the firm's dividend policy has the effect of dividing its net earnings into two viz., retained earnings and dividends. A major decision of financial management is the dividend decision in the sense that the firm has to choose between distributing the profits to the shareholders and ploughing them back into the business.

Dividend policy involves the decision to pay out earnings or to retain them for reinvestment in the firm. The retained earnings constitute a source of financing, whereas the payment of dividends results in the reduction of cash. Hence, the choice would obviously hinge on the effect of the decision on the maximization of shareholders' wealth. The firm would be well advised to use the net profits for paying dividends to the shareholders if the payment will lead to the maximization of wealth of the owners. If not, the firm should rather retain them to finance investment programmes. So, that the relationship between dividends and value of the firm should be the decision criterion. There is a conflicting opinion regarding the impact of dividends on the valuation of a firm. According to one school of thought, dividends are irrelevant so that the amount of dividends paid has no effect on the valuation of a firm. On the other hand, certain theories consider the dividend decision as relevant to the value of the firm measured in terms of the market price of the shares.

12.2 DETERMINANTS OF DIVIDEND POLICY

Stability and regularity in the payment of dividends are the two main considerations of the firm's dividend policy. For the purpose of exposition, the factors determining the firm's dividend policy can be classified into:

- i) Dividend payout ratio
- ii) Stability of dividends
- iii) Residual dividend policy
- iv) Corporate dividend behaviour
- v) Legal and procedural aspects of dividends
- vi) Stock dividend and stock split
- vii) Inflation

Activity – 1

List out the determinants of dividends.

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12.3 CONSTRAINTS ON PAYMENT OF DIVIDENDS

The payment of dividend includes some legal and financial constraints. It is difficult to design a general dividend policy which can be followed by different firms at different times because the dividend decision has to be taken considering the special circumstances of an individual case. The following are the important constraints which determine the dividend policy of a firm;

i. Age of the company

The age of the company influences the dividend decision of a company. A newly established company has to limit payment of dividend and retain substantial part of earnings for financing its future growth and development, while older companies which have established sufficient reserves can afford to pay liberal dividends.

ii. Control objectives

If a company pays substantial dividends, it may need to raise capital at a later time through the sale of stock. Under such circumstances, the controlling interest of the company may be diluted if controlling stockholders cannot subscribe for additional shares. These stockholders may prefer a low dividend payout and the financing of investment needs with retained earnings. Control can work two ways, however, when a company is being bought by another company or by individuals, a low dividend payout may work to the advantage of the "outsiders" seeking control. The outsiders may be able to convince stock holders that the company is not maximizing shareholders wealth and that they can do a better job. Consequently, companies in danger of being acquired may establish a high dividend payout in order to please stockholders.

iii. Nature of stockholders

When a company is closely held, management usually knows the dividend desires of its stockholders and may act accordingly. If most stockholders are in high tax brackets and prefer capital gains to current income, the firm can establish a low dividend payout. The low payment, of course, would be predicted upon having profitable investment opportunities for the retained earnings. The corporation with a large number of stockholders can judge their desires for dividends only in a market context.

iv. Nature of industry

Certain industries have a comparatively steady and stable demand irrespective of the prevailing economic conditions. Such firms expect regular earnings and hence can follow a consistent dividend policy. On the other hand, if the earnings are uncertain, as in the case of luxury goods, conservative policy should be followed. Such firms should retain a substantial part of their current earnings during boom period in order to provide funds to pay adequate dividends in the recession periods. Thus, industries with steady demand for their products can follow a higher dividend payout ratio while cyclical industries should follow a lower payout ratio.

v. Legal restrictions

Legal stipulations may specify the conditions under which dividends must be paid. Such conditions pertain to (a) Capital impairment; (b) Net profits; and (c) insolvency.

a) Capital impairment rules

Legal enactments limit the amount of cash dividends that a firm may pay. A firm cannot pay dividends out of its paid-up capital, otherwise there would be a reduction in the capital adversely affecting the security of its lenders. The rationale of this rule lies in protecting the claims of preference shareholders and creditors on the firms' assets by providing a sufficient equity base since the creditors have originally relied upon such an equity base while extending credit. The dividends that impair capital are illegal and the directors are personally held liable for the amount of illegal dividend payments.

b) Net profits

The net profit requirement is essentially a corollary of the capital impairment requirement, in that it restricts the dividend to be paid out of the firm's current profits plus past accumulated retained earnings. Alternatively, a firm cannot pay cash dividends greater than the amount of current profits plus the accumulated balance of retained earnings. For instance, section 205 of the Indian Companies Act 1956 provides that dividends shall be paid only out of the current profits or past profits after providing for depreciation. The point to be noted is that the company can use the profits of previous years, if the current year's profits fall short of the required funds for maintaining a desired stable dividend policy.

c) Insolvency

A firm is said to be insolvent in two situations: first, when its liabilities exceed the assets; and second, when it is unable to pay its bills. If the firm is currently insolvent in either sense, it is prohibited from paying dividends. Similarly, a firm would not pay dividends if such a payment leads to insolvency of either type. The rationale of the rule is to protect the creditors by prohibiting the liquidation of near bankrupt firms through cash dividend payments to the equity owners.

vi. Future financial requirements

The management of a concern has to reconcile the conflicting interests of shareholders and those of the company's financial needs. If a company has highly profitable investment opportunities it can convince the shareholders of the need for limitation of dividend to increase the future earnings and stabilize financial position. But when profitable investment opportunities do not exist then the company may not be justified in retaining substantial part of its current earnings. Thus, a concern having few internal investment opportunities should follow high payout ratio as compared to one having more profitable investment opportunities.

vii. Government's economic policy

The dividend policy of a firm has also to be adjusted to the economic policy of the Government as was the case when the temporary restriction on Payment of Dividend Ordinance was in force. In 1974 and 1975, companies were allowed to pay dividends at not more than 33 per cent of their profits or 12 per cent on the paid-up value of the shares, whichever is lower.

viii. Taxes

The dividend policy of a firm may be dictated by the income tax status of its shareholders. If a firm has a large percentage of owners who are in high tax brackets, its dividend policy should seek to have higher retentions. Such a policy will provide its owners with income in the form of capital gains as against dividends. Since capital gains are taxed at a lower rate than dividends, they are worth more, after taxes, to the individuals in a high tax bracket. On the other hand, if a firm has a majority of low income shareholders who are in a lower tax bracket, they would probably favour a higher payout of earnings because of the need for current income and the greater certainty associated with receiving the dividend now, instead of the less certain prospects of capital gains later. With effect from June 1997, dividend from domestic companies is totally exempt from tax in India. The company itself has to pay a 10 per cent tax on dividends declared / announced / paid, in addition to the normal tax on income.

ix. Liquidity

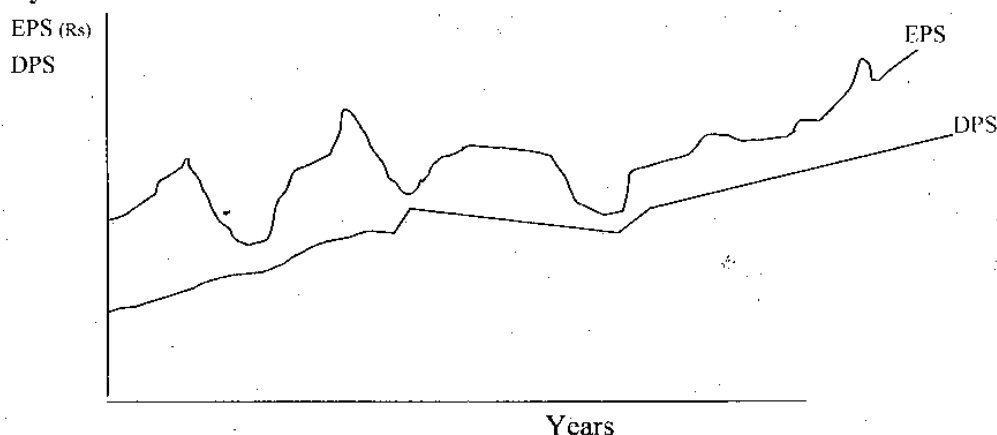
The liquidity position of a company is a basic condition for dividends decision. As dividends represent a cash outflow, the better the cash position and over all liquidity of a company, the greater its ability to pay a dividend. A company that is growing and profitable may not be liquid, for its funds may go into fixed assets and permanent current assets. Because the management of such a company usually desires to maintain some liquidity cushion, it may be reluctant to jeopardize this position in order to pay a large dividend.

12.4 STABILITY OF DIVIDENDS

The term **dividend stability** refers to "the consistency or regularity in the stream of payment of dividends." In more precise terms, it means that a certain minimum amount of dividend is paid out regularly. The stability of dividends can take any of the following three forms : (a) Constant dividend per share; (b) Constant dividend payout (D/P) ratio; and (c) Constant dividend per share plus extra dividend.

a) Constant dividend per share

As per this form of stable dividend policy, a company follows a policy of paying a certain fixed amount per share as dividend. For instance, on a share of face value of Rs. 100, a firm may pay a fixed amount of, say Rs. 25 as dividend. This amount would be paid year after year, irrespective of the level of earnings. In other words, fluctuations in earnings would not affect the dividend payments. In fact, when a company follows such a dividend policy, it will pay dividends to the shareholder even when it suffers losses. A stable dividend policy in terms of a fixed amount of dividend per share does not, however, mean that the amount of dividend is fixed for all times to come. The dividends per share are increased over the years when the earnings of the firm increase and it is expected that the new level of earnings can be maintained. Of course, if the increase is expected to be temporary, the annual dividend remains at the existing level. The relationship between the Earnings Per Share (EPS) and Dividends Per Share (DPS) with a constant dividend policy per year is shown below:



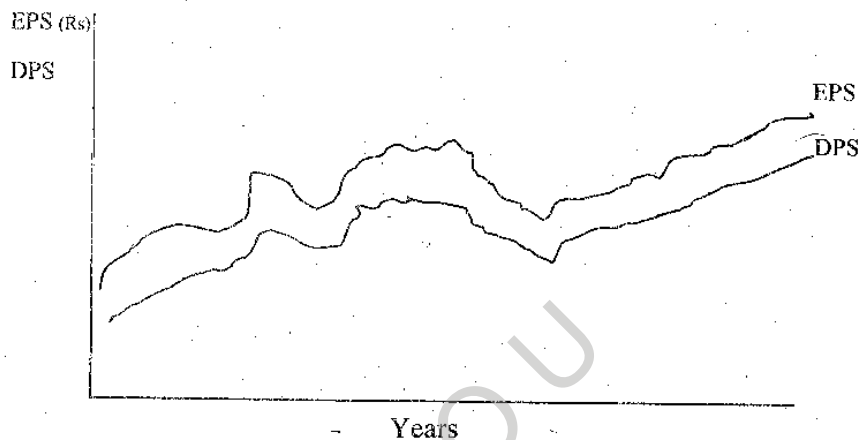
Stable dividend policy of constant rupee dividends

From the above graph we have seen that while the earnings may fluctuate from year to year, the dividend per share is constant. To pursue such a policy, a firm whose earnings are not stable would have to make provisions in years when earnings are higher for

payment of dividends in lean years. Such firms usually create a reserve for dividend equalization.

b) Constant payout ratio

The ratio of dividend to earnings is known as payout ratio. Some companies may follow a policy of constant payout ratio, i.e., paying a fixed percentage of net earnings every year with this policy the amount of dividend will fluctuate in direct proportion to earnings. If a company adopts a 40 per cent payout ratio, then 40 per cent of every rupee of net earnings will be paid out. For example, if the company earns Rs. 20 per share, the dividend per share will be Rs. 8 and if it earns Rs. 15 per share the dividend per share will be Rs. 6. The relation between the earnings per share and the dividend per share is shown below:



Dividend policy of constant payout ratio

The policy is related to a company's ability to pay dividends. If the company incurs losses, no dividend shall be paid regardless of the expectations of the shareholders. Internal financing with retained earnings is automatic when this policy is followed. At any given payout ratio, the amount of dividends and the additions to retained earnings increase with increasing earnings and decrease with decreased earnings. This policy does not put any pressure on a company's liquidity since dividends are distributed only when the company earns profits.

c) Constant dividend per share plus extra dividend

According to this policy, a firm usually pays a fixed dividend to the shareholders and in the years of marked prosperity, additional or extra dividend is paid over and above the regular dividend. As soon as normal conditions return, the firm cuts the extra dividend and pays the normal dividend per share.

Advantages of stability of dividends

The following are the advantages of stability of dividends:

i. Desire for current income

Many individual investors depend on dividend income to meet a part of their living expenses. Since these expenses remain stable or increase gradually over time they prefer a similar behavioral pattern in dividends. Sharp changes in dividend income may entail selling of some shares, if dividends fall steeply, or reinvestment of a portion of dividend

income if dividends rise substantially. In both the cases investors have to incur transaction costs and put up with some inconvenience. These are avoided if the dividend stream is stable and predictable.

ii. Institutional investors' requirements

Shares of the companies are not only purchased by individuals but also by financial, educational and social institutions and trusts and mutual funds. In India, financial institutions such as IFCI, IDBI, LIC and UTI are some of the largest investors in corporate securities. Every company is interested to have these financial institutions in the list of their investors. These institutions generally invest in the shares of those companies, which have a record of paying regular dividends. A company which has a history of adopting an erratic dividend policy may not be preferred by these institutional investors. Thus, to cater the requirement of institutional investors, a company prefers to follow a stable dividend policy.

iii. Resolution of investor's uncertainty

When a company follows a policy of stable dividends, it will not change the amount of dividends if there are temporary changes in its earnings. Thus, when the earnings of a company fall and it continues to pay the same amount of dividend as in the past, it conveys to investors that the future of the company is brighter than suggested by the drop in earnings. Similarly, the amount of dividends is increased with increased earnings level only when it is possible to maintain it in future. On the other hand, if a company follows a policy of changing dividends with cyclical changes in the earnings, shareholders would not be certain about the amount of dividends.

iv. Raising additional finances

A stable dividend policy is also advantageous to the company in its efforts to raise external finances. Stable and regular dividend policy tends to make the share of a company as quality investment rather than a speculation. Investors purchasing these shares intend to hold them for long period of time. The loyalty and goodwill of shareholders towards a company increase with stable dividend policy. The fact that the company has been paying dividend regularly in the past is a sufficient assurance to the purchasers of these securities that no default will be made by the company in paying their interest or preference dividend and returning the principal sum. The financial institutions are the largest purchasers of these securities. They purchase debentures and preference shares of those companies which have a history of paying stable dividends.

Limitations of stability of dividends

The following are the limitations of stable dividend policy :

i. Serious effect on investor's attitude

Once a stable dividend policy is established, it cannot be changed without seriously affecting investors attitude. If a company, with a pattern of stable dividends, misses dividend payment in a year, this break will have an effect on investors more severe than the failure to pay dividend by a company with unstable dividend policy.

ii. Maintenance of fixed rate of dividend

The dividend rate should be fixed at a conservative figure so that it may be possible to maintain it even in lean periods of several years. To give the benefit of the company's

prosperity, extra or interim dividend, can be declared. When a company fails to pay extra dividend, it does not have a depressing effect on investors as the failure to pay a regular dividend does.

12.6 FORMS OF DIVIDENDS

Dividends may be classified on the basis of medium in which they are paid:

a) Cash dividend

A cash dividend is a usual method of paying dividend. Payment of dividend in cash results in out flow of funds and reduces the company's net worth, though the shareholders get an opportunity to invest the cash in any manner they desire. This is why the ordinary shareholders prefer to receive dividends in cash. But the firm must have adequate liquid resources at its disposal or provide for such resources so that its liquidity position is not adversely affected on account of cash dividends.

b) Scrip or bond dividend

A scrip dividend promises to pay the shareholders at a specific future date. In case a company does not have sufficient funds to pay dividends in cash, it may issue notes or bonds for amounts due to the shareholders. The objective of scrip dividend is to postpone the immediate payment of cash. A scrip dividend bears interest and is accepted as a collateral security.

c) Property dividend

Property dividends are paid in the form of some assets other than cash. They are distributed under exceptional circumstances and are not popular in India.

d) Stock dividend

Stock dividend means the issue of bonus shares to the existing shareholders. If a company does not have liquid resources it is better to declare stock dividend. Stock dividend amounts to capitalization of earnings and distribution of profits among the existing shareholders without affecting the cash position of the firm.

Activity – 2

Explain the various forms of dividend.

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12.7 BONUS SHARES

A company can pay bonus to its shareholders either in cash or in the form of shares. Many a times, a company is not in a position to pay bonus in cash, inspite of sufficient profits, because of unsatisfactory cash position or because of its adverse effects on the working capital of the company. In such cases, if the company so desires and the articles of association of the company so provide, it can issue bonus shares to its shareholders by making partly paid shares as fully paid or by the issue of fully paid bonus shares.

Bonus shares are issued to the existing shareholders as a result of capitalization of reserves. The nature of this capitalization before and after issue of bonus shares is exhibited as follows:

Effects of a Bonus issue on the equity portion of the balance sheet
Equity portion before Bonus Issue

Paid up share capital	...	Rs. 10,00,000
1,00,000 shares of Rs. 10 each fully paid		
Reserves and surplus	...	Rs. 30,00,000

Equity portion After Bonus Issue in the Ratio 1 : 1

Paid up share capital	...	Rs. 20,00,000
2,00,000 shares of Rs. 10 each fully paid		
Reserves and surplus	...	Rs. 20,00,000

Reasons for issuing Bonus Shares

From the foregoing analysis it appears that the issue of bonus shares is more or less a financial gimmick without any real impact on the welfare of equity shareholders. The important reasons for issuing bonus shares are the following:

- i) The bonus issue tends to bring the market price per share within a more popular range.
- ii) It increases the number of outstanding shares. This promotes more active trading in the stock exchanges.
- iii) The nominal rate of dividend tends to decline.
- iv) The share capital base increases and the company may achieve a more respectable size in the eyes of the investing community.
- v) Shareholders regard a bonus issue as a firm indication that the prospects of the company have brightened and they can reasonably look for an increase in total dividends.
- vi) It improves the prospects of raising additional funds. In recent years many firms have issued bonus shares prior to the issue of convertible debentures or other financing instruments.

Advantages of issue of Bonus Shares

I. Advantages from the view point of the company

- i) It makes available capital to carry on a larger and more profitable business.
- ii) It is felt that financing helps the company to get rid of market influences.
- iii) When a company pays bonus to its shareholders in the value of shares and not in cash, its liquid resources are maintained and the working capital of the company is not affected.
- iv) It enables a company to make use of its profits on a permanent basis and increase credit worthiness of the company.

- v) It is the cheapest method of raising additional capital for the expansion of the business.
- vi) Abnormally high rate of dividend can be reduced by issuing bonus shares which enables a company to restrict entry of new entrepreneurs into the business and thereby reduces competition.
- vii) The balance sheet of the company will reveal a more realistic picture of the capital structure and the capacity of the company.

II. Advantages from the view point of shareholders

- i) The bonus shares are a permanent source of income to the investors.
- ii) Even if the rate of dividend falls, the total amount of dividend may increase as the investor gets dividend on a larger number of shares.
- iii) The investors can easily sell these shares and get immediate cash, if they so desire.
- iv) The declaration of the bonus issue may have a favourable psychological effect on shareholders.
- v) When a shareholder receives cash dividend from company, the amount is included in his ordinary income and taxed at ordinary income tax rate. But the receipt of bonus shares by the shareholders is not taxable as income, but attracts the capital gains tax when these are sold.

Disadvantages of issue of Bonus shares

- i) The issue of bonus shares leads to a drastic fall in the future rate of dividend.
- ii) The fall in the future rate of dividend results in the fall of the market price of shares.
- iii) The reserves of the company decline and leave lesser security to investors.
- iv) The company has to now print certificates and post them to thousands / lakhs of shareholders. Thus it becomes costly to administer.
- v) The bonus issue can be disadvantageous if the company declares periodic small bonus shares. The investment analysts do not adjust the earnings per share for small issues of bonus shares.

Activity – 3

Describe the advantages and disadvantages of issue of Bonus Shares.

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12.8 CONDITIONS FOR THE ISSUE OF BONUS SHARES

In India, bonus shares are issued in addition to, and not in lieu of, cash dividends. A company is not allowed to declare bonus shares unless partly paid-up shares have been converted into fully paid-up shares. The bonus issue is made out of free reserves built out of genuine profits or share premium collected in cash only. In no time the amount of bonus should exceed the paid-up capital. A company can declare bonus shares once in a year. A company intending to issue bonus shares should not be in default of payments of

statutory dues to employees and term loans to financial institutions. The maximum bonus shares ratio is 1:1 i.e., one bonus share for one fully paid-up share held by the existing shareholders.

The maximum bonus ratio is determined by the Residual Reserve Criterion and profitability criterion. The residual reserves after the proposed capitalization should be at least 40 per cent of the increased paid-up capital. A 30 per cent of the average profits before tax of the company for the previous 3 years should yield a rate of dividend on the expanded capital base of the company at 10 per cent.

The maximum ratio of bonus that a company can declare is the value of 'b' which satisfies the following constraints:

$$\text{Residual Reserve Requirement} \quad : \quad (R-Sb) \geq 0.4 S (1 + b)$$

$$\text{Profitability Requirement} \quad : \quad 0.3 \overline{\text{PBT}} \geq 0.1 S (1 + b)$$

Where -

R = Reserves before bonus declaration

S = Paid-up capital before bonus declaration

b = bonus ratio

$\overline{\text{PBT}}$ = average profit before tax of company in the previous 3 years

Example

A company has the following data :

	(Rs. In Lakhs)
Paid-up share capital (S)	100
Reserves (R)	150
Average profit before tax in the Previous 3 years (PBT)	80

Substituting the above values in the formula for residual reserve requirement and profitability requirement:

$$150 - 100b \geq 0.4 \times 100 (1 + b)$$

$$0 \times 80b \geq 0.1 \times 100 (1 + b)$$

On simplification, we find the following:

$$11/4 \geq b \text{ and } 14/10 \geq b$$

Since $11/4 \geq b$ is more restrictive than $14/10$, we find that the maximum bonus ratio is $11/14$. This may be checked as follows: when the bonus ratio is $11/14$, the paid-up share capital and reserves after the bonus issue are Rs. 178.6 and Rs. 71.4 lakhs, respectively. Thus, the residual reserve to increased share capital ratio is just 40 per cent.

12.9 STOCK SPLIT

A stock split is a method employed to increase the number of outstanding shares through a proportional reduction in the par value of the shares with a stock split the balance of equity account does not change, however the par value per share undergoes a change. In this stock split the earnings per share will be diluted and the market price per share will fall proportionately. But the total value of the holdings of the shareholders remains unchanged. Consider the following example.

The following is the capital structure of a company (Rs. In Lakhs)

Paid-up share capital (10,000 shares @ Rs. 100 each)	10
Share premium	15
Reserves and surplus	8
Total net worth	<u>33</u>

A Company split their shares one into ten. Show the new capitalization.

The capitalization of the company after the split: (Rs. In Lakhs)

Paid-up share capital (1,00,000 shares @ Rs. 10 each)	10
Share premium	15
Reserves and surplus	8
Total net worth	<u>33</u>

Bonus Issue Vs Stock Split

Sl. No.	Bonus Issue	Stock Split
1.	The par value of the share is unchanged	The par value of the share is reduced
2.	A part of reserves is capitalized	There is no capitalization of reserves
3.	The shareholders' proportional ownership remains unchanged	The shareholders' proportional ownership remains unchanged
4.	The book value per share, the earnings per share and the market price per share decline.	The book value per share, the earnings per share and market price per share decline.
5.	The market price per share is brought within a popular trading range.	The market price per share is brought within a more popular trading range.

Reasons for stock split

- The main purpose of a stock split is to reduce the market price of the share in order to make it more attractive to investors.
- The stock splits are used by the company management to communicate to investors that the company is expected to earn higher profits in future.

- iii) When the share is split, seldom does a company reduce or increase the cash dividend per share proportionately.

12.9 SUMMARY

The payment of dividend is subjected to some legal and financial constraints. Dividend stability refers to the consistency or regularity in the stream of dividends. The stability of dividends can take constant dividend per share, constant D/P ratio and constant dividend per share plus extra dividend. Dividends may be classified on the basis of from in which they are paid viz., cash dividend, bond dividend, property dividend and stock dividend.

A Company can pay bonus to its shareholders either in cash or in the form of shares. If a company is not in a position to pay bonus in cash inspite of sufficient profits because of unsatisfactory cash position or because of its adverse effects on the working capital the company will issue the bonus shares. Bonus shares are issued to existing shareholders as a result of capitalization of reserves. A stock split is a method to increase the number of outstanding shares through a proportional reduction in the par value of the shares.

12.10 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. Explain the nature of dividend decision.
2. List out the factors affecting dividend decision of a firm.
3. What are the alternatives to cash dividend?
4. How do you relate dividend policy and retention of earnings to the financing of firm's business?
5. What are the key considerations in evolving a dividend policy?
6. Explain the different forms of stability of dividends.

II. Long Answer Questions

1. Explain, in detail, the determinants of dividend policy.
2. Explain the constraints on payment of dividends, in detail.
3. What do you mean by stability of dividends? Explain the advantages and limitations of stability of dividends.
4. Discuss the recent guidelines issued by the SEBI regarding the issue of bonus shares.

12.11 FURTHER READINGS

1. Gitman, L J : **Principles of Managerial Finance**, Harper and Row, New York, 1976.
2. Linter, K : **Distribution of income of Corporations Among Dividends, Retained Earnings and Taxes**, American Economic Review, May 261 1956,

12.12 KEY WORDS

- Dividend** : Profits distributable / distributed to the shareholders.
- Retained Earnings** : The portion of profits that remains undistributed and which is retained in the business.
- Bonus Shares** : The payment of dividend in the form of shares instead of cash.
- Stock Split** : Increasing the number of outstanding shares by reducing the face value of shares.

BRAOU

BLOCK – V : WORKING CAPITAL MANAGEMENT

This block helps the learners to develop an understanding about the working capital. The important components of working capital, the ways and means of their financing and their effective utilisation are presented in this block.

Unit 13 discusses the meaning and concept of working capital, the process of estimating working capital needs and the determinants of working capital.

Unit 14 deals with approaches to financing the working capital requirements and the principles of working capital financing.

Unit 15 describes motives of holding cash, different facets of cash management and the techniques applied in managing surplus cash.

Unit 16 explains the credit policy of a firm, its nature and goals and methods of monitoring receivables including factoring.

Unit 17 covers extensively the objectives of inventory management and inventory control techniques.

BRAOU

UNIT – 13 : WORKING CAPITAL MANAGEMENT

Objectives

After studying this Unit you should be able to:

- understand the concepts of working capital;
- know the need to invest funds in working capital;
- analyse the determinants of working capital; and
- estimate the working capital requirements of a firm.

Structure

- 13.0 Introduction
- 13.1 Concepts of Working Capital
- 13.2 Need for Working Capital
- 13.3 Determinants of Working Capital
- 13.4 Types of Working Capital
- 13.5 Estimating Working Capital Requirements
- 13.6 Summary
- 13.7 Self Assessment Questions
- 13.8 Further Readings
- 13.9 Key Words

13.0 INTRODUCTION

In the earlier Units, a detailed discussion on Investment and Financing Decisions with regard to fixed assets was presented. Now we will discuss, in detail, the Working Capital Decisions.

Working Capital is the lifeblood of a business. It signifies the funds required for day - to - day operations of the firm. The management of current assets and current liabilities and the inter-relationship that exists between them may be regarded as Working Capital Management. It is also known as Current Assets management. It is an attempt to manage and control the current assets and the current liabilities in order to maximize profitability and maintain proper liquidity in business.

Working Capital Management is concerned with all the aspects of managing current assets and current liabilities. Current assets are those assets, which in the ordinary course of business can be converted into cash within a period of one year without diminution in the value of assets and without disrupting the operations of the firm. Current Assets include Cash and Bank balances, Accounts Receivables (Debtors and Bills Receivable), Stock of Raw Material, Work-in-Progress and Finished Goods; Short-term Investments, Prepaid Expenses and Incomes Outstanding. Current liabilities are those liabilities, which in the ordinary course of

business are expected to be paid within a period of one year. They include Accounts Payables (Bills Payable and Creditors), Short-term loans taken, Outstanding Expenses and Incomes received in advance. In accounting terminology, Working Capital is the excess of current assets over the current liabilities. It is the difference between the inflow and outflow of funds. The goal of the Working Capital Management is to manage the firm's current assets and current liabilities in such a way that a satisfactory level of Working capital is maintained.

13.1 CONCEPTS OF WORKING CAPITAL

There are two concepts of Working Capital. They are (i) Gross working capital (Gross concept); and (ii) Net working capital (Net concept).

i) Gross Concept / Quantitative Concept

It refers to the firm's investment in total current assets or circulating assets. It focuses its attention on two aspects of current asset management. One is, optimum level of investment in current assets. According to this aspect, the level of investment in current assets should avoid excessive / inadequate investment in current assets. This is because, excessive investment in current assets impairs the firm's profitability as idle investment earns nothing and inadequate investment threatens firm's solvency, if it fails to meet its current liabilities.

The other aspect of current assets management is financing of current assets. According to it, the firm should make arrangements for raising funds when the need arises due to increasing level of business activity or for any other reason. If surplus funds are available, the firm should make an arrangement to invest them in short-term securities. The financial manager should know both, sources of working capital from where the funds can be raised and investment avenues where idle funds may be invested temporarily.

ii) Net Working Capital (Net concept)

It is the excess of current assets over current liabilities. It is that portion of a firm's current assets which is financed by long-term funds. Net Working Capital focuses its attention on two aspects of current assets management. One is, the liquidity position, which states that current assets should be more than the current liabilities in order to meet the current obligations. The excess of current assets over current liabilities constitute a margin / buffer for meeting the maturing obligations. A weak liquidity position is a threat to the solvency of the company.

The other aspect is the financing position. Net working capital shows the extent of working capital needs to be financed from the permanent sources. There should be a judicious mix of long-term and short-term funds for financing current assets.

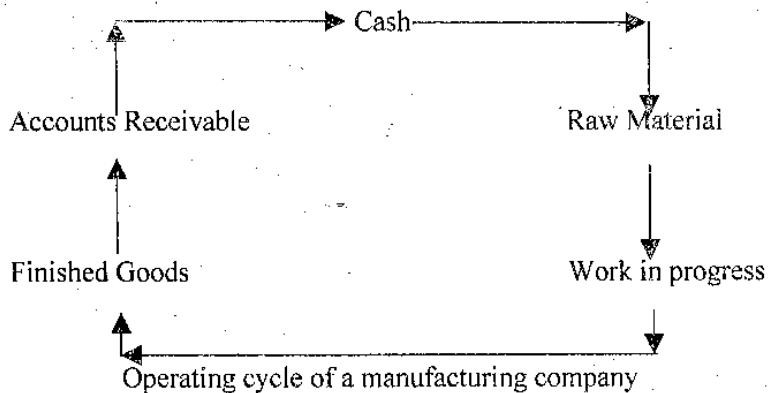
13.2 NEED FOR WORKING CAPITAL

A firm should earn sufficient returns from its operations in order to maximize the shareholder's wealth. The amount of returns, largely depends upon the magnitude of sales. The firm has to invest enough funds in current assets for a successful sales activity. Current assets are needed, as there is always a time gap between the sale of goods and receipt of cash. This time gap is technically termed as **operating cycle** of the business.

The duration of time required to complete the sequence of the events in case of a manufacturing firm is called as operating cycle. The events are:

- * Conversion of cash into raw material;
- * Conversion of raw material into work in progress;
- * Conversion of work in progress into finished goods;
- * Conversion of finished goods into accounts receivables; and
- * Conversion of receivables into cash.

Operating Cycle of Manufacturing Company



In the case of a trading concern, the operating cycle will be less than in manufacturing concerns as there is no production. Hence, the operating cycle, here, includes the length of time required to convert:

- * Cash into stock;
- * Stock into accounts receivable; and
- * Accounts receivable into cash.

In the case of financial services concerns, the operating cycle includes the length of time taken for conversion of cash into debtors and conversion of debtors into cash, as there is neither production of goods nor the trading in goods.

Thus, adequate amount of funds are to be invested in current assets for a smooth and uninterrupted production and sales process. Because of circulating nature of current assets, working capital is also called as "Circulating Capital".

Activity - I

Explain the need for working capital.

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13.3 DETERMINANTS OF WORKING CAPITAL

There is no set of rules to determine the level of the working capital of a concern. A wide variety of factors influence the total investment in the working capital of an enterprise. These factors are subject to shifts of emphasis so that their impact as working capital levels vary from time to time. These factors are discussed, in detail, below.

- **Nature and Size of Business:** In case of trading and financial firms, a large sum is to be invested in working capital. A large stock of variety of goods has to be maintained by the retail stores of a trading concern in order to cater to the various needs of customers. Public Utilities invest abundantly in fixed assets as their sales are on cash basis only and they supply services and not products. Their funds are therefore not tied up into debtors and stock. Hence, there is a limited need for working capital.

In case of manufacturing concerns, an adequate investment will be made in current assets depending upon total assets structure and other variables. Size of business can be measured in terms of scale of operations. A firm with a larger scale of operations requires more working capital than a small firm.

- **Manufacturing Cycle:** The time taken to convert raw material into finished stock is termed as manufacturing / production cycle. Longer the cycle, greater the working capital requirement as funds are tied up in inventories. Therefore, care is to be taken to shorten the period of cycle in order to minimize the working capital needs.
- **Business Cycle Fluctuations:** Here, we have two situations:
 - a) **Cyclical Fluctuations:** When there is an upward swing in the economy, sales will increase and consequently firm's investment in stock and book debts increases. Under boom, additional investment in fixed assets will be made to increase the productive capacity, which result in further additions to working capital.

When there is a decline in the economy, sales will decrease and consequently the levels of inventories and book debts will also go down, thereby reduce the working capital requirements.

- b) **Seasonal Fluctuations:** During a peak period of demand, increasing production may be expensive for the firm. Similarly, it will be even more during slack periods as the firm has to sustain its working force and physical facilities without adequate production and sales.

Thus, irrespective of seasonal variations, a steady production policy has to be followed to utilize its resources to the fullest extent. Such a policy results in accumulation of inventories during off-season and their quick disposal during peak period. During the slack seasons, funds get tied up in working capital.

- **Firm's Credit Policy:** It also affects working capital by influencing the level of book debts. Liberal credit policy without rating credit worthiness of customers will create problem of collecting funds from debtors later on. If collection period is high, funds will be tied up in accounts receivables. Slack collection procedures can increase the chances of bad debts. Higher the book debts, greater's the working capital requirement as funds get tied up in debtors.

It is necessary for the firms to follow a rationalized credit policy based on credit standards of customers in order to avoid unnecessary tie up of funds in book debts. Cases of delayed payments should be investigated thoroughly.

A higher receivable turnover indicates a prompt collection of receivables, resulting in a low working capital requirement.

- **Availability of Credit:** If liberal credit terms are available to the firm from the creditors, working capital funds will be less as there is no need for payment right now but goods are available for production and sales.
- **Growth and Expansion Activities:** A firm needs investment of funds in fixed assets in order to sustain its growing production and sales. To support enlarged scale of operation, investment in current assets also increases.
- **Market Conditions:** The degree of competition prevailing in the marketplace also affects working capital needs. When competition is keen, a larger inventory of finished goods is required to promptly serve customers who may not wait because other manufacturers are ready to meet their needs. Liberal credit terms may have to be offered to the customers to attract them. Thus, working capital needs tend to be high because of greater investment in finished goods inventory and accounts receivables.

In case of a weak competition, a firm can manage with smaller inventory of finished goods because, customers can be served with delay and the firm can insist on cash payment and avoid lock-up of funds in accounts receivables.

- **Conditions of Supply:** If the supply of raw materials, spares and stores is prompt and adequate, the firm can manage with small inventory.
- **Operating Efficiency:** It means optimum utilization of resources at minimum costs. With operating efficiency, the use of working capital will be improved and pace of cash cycle is accelerated. Better utilization of resources improves profitability and thus helps in releasing the pressure on working capital.
- **Cash Requirements:** Cash is one of the current assets, which is very essential. For the successful operations of the production cycle. There should be an adequate amount of cash and should be properly utilized, as idle cash earns nothing. As cash has a universal liquidity and acceptability, a minimum level of cash is always required to maintain good credit relations.
- **Inventory Turnover:** Working Capital requirement will be low, if the inventory turnover is high. A higher inventory turnover shows that stocks are moving fast and funds are not blocked in stock. With a proper inventory control, the firm will be able to reduce its working capital requirement.
- **Inflation:** During inflation, working capital requirement will be more in order to make the firm achieve a better cash inflow. The effect of inflation may be compensated to a certain extent by the rise in selling price.
- **Activities of the firm:** A firm which stocks heavy inventory or sells on easy credit terms, definitely calls for a higher level of working capital than when it depends on low level of inventory or sells on cash basis.
- **Attitude towards risk:** If the firm is risk averse, then, it would like to maintain higher level of working capital, as, higher the level of working capital, lower is the risk of illiquidity.
- **Profit Margin and Profit Appropriation:** To the extent net profit is earned in cash, it is a source of working capital. But, net cash inflows from operations cannot be considered as

W = Work in progress period

F = Finished goods storage period

D = Debtors collection period

C = Creditors payment period

The duration for the components of the operating cycle may be calculated as below.

$$R = \frac{\text{Average stock of raw materials and stores}}{\text{Average raw materials and stores consumption per day}}$$

$$W = \frac{\text{Average work - in - progress inventory}}{\text{Average cost of production per day}}$$

$$F = \frac{\text{Average finished goods inventory}}{\text{Average cost of goods sold per day}}$$

$$D = \frac{\text{Average book debts}}{\text{Average credit sales per day}}$$

$$C = \frac{\text{Average trade creditors}}{\text{Average credit purchases per day}}$$

Now, Working Capital Requirement (WCR) can be calculated as

$$WCR = \frac{\text{Total Operating Cost}}{\text{No. of Operating Cycles}}$$

Where

$$\text{No. of Operating Cycles} = \frac{\text{No. of days in a year}}{\text{Duration of Operating Cycle}}$$

For the purpose of calculating various items, it is necessary to know the proforma of cost sheet and calculate the required items accordingly. The proforma of cost sheet is given below.

Opening stock of Raw Materials	x x x
Add Purchase of Raw Materials	x x x
Less Closing Stock of Raw Materials	x x x
Raw Materials Consumed	x x x
Direct Wages	x x x

Direct Labour	x x x
Prime Cost	<u>x x x</u>
Add Factory Overheads	x x x
Add Opening Work – in – progress	x x x
Less Closing Work – in – progress	<u>x x x</u>
Factory Cost	x x x
Add Administration Overheads	x x x
Cost of Production	<u>x x x</u>
Add Opening Stock of Finished Goods	x x x
Less Closing Stock of Finished Goods	<u>x x x</u>
Cost of Goods Sold	x x x
Add Selling and Distribution Overheads	<u>x x x</u>
Total Cost	<u>x x x x</u>

Activity - II

i) Explain the procedure for estimating working capital requirements of a firm.

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Illustration 1

From the following information, extracted from the books of a manufacturing company, compute the operating cycle in days and the amount of working capital required.

Period covered	365 days
Average period of credit allowed by suppliers	16 days
	(Rs in '000)
Average total of Debtors outstanding	480
Raw material consumption	4,400
Total production cost	10,000
Total cost of sales	10,500
Sales for the year	16,000
Value of Average stock maintained:	
Raw Material	320
Work-in-process	350
Finished goods	260

Solution

COMPUTATION OF OPERATIONAL CYCLE

i) Raw materials held in stock	Avg stocks of raw materials held = 320x365 Avg consumption per day 4400	27 days
	Less: Average credit period granted by suppliers	16 days
		11 days
ii) Work-in-process	Average WIP maintained = 350 X 365 Avg cost of prod. Per day 10,000	13 days
iii) Finished goods held in stock:	Avg Finished goods maintained = 260X365 Avg cost of goods sold per day 10,500	9 days
iv) Credit period allowed to debtors	Avg total of outstanding debtors =365X480 Avg credit sales per day 16,000	11 days
Total operating cycle period	(i + ii + iii + iv)	44 days
Number of operating cycles in a year	365/44	8.30
Amount of working capital required	Total operating cost = 10,500 Number of operating cycles in a year 8.3	Rs1, 265

Working Capital is Rs. 1,265 thousands or Rs. 12,65,000

Illustration - 2

The following is the statement of costs of sales for a firm.

Statement of cost of sales

	Actual (1991)	Projected (1992)
		(Rs. in lakhs)
1. Purchase of Raw materials (credit)	4,653	6,091
2. Opening Raw material inventory	523	827
3. Closing Raw material inventory	827	986
4. Raw material consumed	4,349	5,932
5. Direct Labor	368	498
6. Depreciation	82	90
7. Other manufacturing expenses	553	704
8. Total cost (4+5+6+7)	5,352	7,224
9. Opening Work in process inventory	185	325
10. Closing work in process inventory	325	498
11. Cost of production (8+9-10)	5,212	7,051
12. Opening finished goods inventory	317	526
13. Closing finished goods inventory	526	995
14. Cost of goods sold (11+12-13)	5,003	6,582

15. Selling and administration expenses	304	457
16. Cost of sales (14+15)	5,307	7,039

The firm's data for sales and book debts and creditors are given below.

	(Rs. In lakhs)	
	1991	1992
Sales (credit)	6,087	8,006
Opening debtors	545	735
Closing debtors	735	1,040
Opening creditors	300	454
Closing creditors	454	642

Note: Assume 360 days a year.

Solution

Items	Rs. (lakhs)	
	ACTUAL 1991	PROJECTED 1992
1. Raw material conversion period		
a) Raw material consumption	4349	5932
b) Raw material consumption per day	12.1	16.5
c) Raw material inventory	827	986
d) Raw material inventory holding days	68	60
2. Work-in-process conversion period		
a) Cost of production *	5130	6961
b) Cost of production per day	14.3	19.3
c) Work-in-process inventory	325	498
d) Work-in-process inventory holding days	23 days	26 days
3. Finished goods conversion period		
a) Cost of goods sold *	4921	6492
b) Cost of goods sold per day	13.7	18.0
c) Finished goods inventory	526	995
d) Finished goods inventory holding days	38 days	55 days
4. Collection period		
a) Credit sales (at cost) **	5307	7039
b) Sales per day	14.7	19.6
c) Book debts	735	1040
d) Book debts outstanding days	50 days	53 days

5. Payment deferred period		
a) Credit purchases	4653	6091
b) Purchases per day	12.9	16.9
c) Creditors	454	642
d) Creditors outstanding days	35 days	38 days

* Depreciation is excluded on the assumption that the firm is interested in cash conversion period. Depreciation is a non-cash item.

** All sales are assumed to be on credit basis. Cost of sales figure should be used for calculation of collection period.

Summary of Operating Cycle Calculations

	Actual	Projected
Gross Operating Cycle		
1. Inventory conversion period		
i) Raw material	68	60
ii) Work in process	23	26
iii) Finished goods	38	55
	<u>129</u>	<u>141</u>
2. Debtors collection period	50	53
3. Gross Operating Cycle (1+2)	<u>179</u>	<u>194</u>
4. Payment deferred period	35	38
5. Net operating cycle	<u>144</u>	<u>156</u>

A finance manager can apply any of the following techniques for assessing the working capital requirements of a firm.

- **Per cent of Sales Method**

This method is a traditional and simple method of estimating working capital requirement. To increase the sales, it is necessary to make an additional investment in inventory and debtors. Therefore, based on the past experience, a ratio between sales and working capital requirement can be determined to estimate the future working capital requirement.

If the past experience shows that the working capital has been 15 per cent of sales, then, in the next year, if sales were Rs. 5 lakhs, the amount of working capital requirement would be estimated as Rs. 75,000 (5 lakhs x 15 %). Here, the basic assumption is the existence of a linear relationship between sales and working capital.

- **Per cent of Fixed Assets Method**

Here, the ratio between fixed assets and working capital requirement is calculated instead of working capital as a percent of sales. It is assumed that the installed capacity is fully utilized.

The assumptions on which the above two methods are based may not be true. As a result, the above two methods hold good only when the firm is operating under conditions of total certainty.

The most commonly used method is the operating cycle approach to estimate working capital.

- **Operating Cycle Approach**

As per this approach, the working capital requirement depends on the level of operations and the length of operating cycle. The working capital needs can be estimated based on the duration of various components of operating cycle.

Once the duration of an operating cycle for each component of working capital is computed, the total operating expenditure in the year is divided by 365 or 360 days and multiplied with the number of days in the cycle.

Working Capital Requirement for each component:

$$\frac{\text{Annual Expenditure for each component} \times \text{Operating cycle for each component}}{365 \text{ or } 360 \text{ days}}$$

Activity - III

What are the different techniques for assessing the working capital requirements of a firm?

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Illustration - 3

A Proforma cost sheet of a company provides the following data:

Costs (Per Unit):	Rs.
Raw Materials	52.0
Direct Labor	19.5
Overheads	39.0
Total Cost (per Unit)	<u>110.5</u>
Profit	<u>19.5</u>
Selling Price	<u>130.0</u>

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 Rs. 1,20,000.

You are required to prepare a statement showing the working capital needs 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

Calculation of Working Capital Needs

		Rs.
A. Investment in Inventory.		
1. Raw Material Inventory	$70,000 \times 52 \times 30/360$	3,03,333
2. Work in progress inventory	$70,000 \times 110.5 \times 15/360$	3,22,292
3. Finished goods inventory	$70,000 \times 110.5 \times 30/360$	6,44,583
		12,70,208
B. Investment in debtors	$52,500 \times 110.5 \times 60/360$	9,66,875
C. Cash Balance		1,20,000
D. Investment in Current Assets	(A+B+C)	23,57,083
E. Current Liabilities: Deferred payments		
1. Creditors	$70,000 \times 52 \times 30/360$	3,03,333
2. Deferred wages	$70,000 \times 19.5 \times 10/360$	37,917
3. Deferred overheads	$70,000 \times 39 \times 30/360$	2,27,500
F. Total deferred payment		5,68,750
G. Net working capital	(D - F)	17,88,333

Illustration - 4

Prepare an estimate of working capital requirement from the following information of a trading concern.

a) Project annual sales	1,00,000 units
b) Selling price	Rs. 8 per unit
c) Percentage of net profit on sales	25%
d) Average credit period allowed to customers	8 weeks
e) Average credit period allowed by suppliers	4 weeks
f) Average stock holding in terms of sales requirement	12 weeks
g) Allow 10% for contingencies	

Solution

STATEMENT OF WORKING CAPITAL REQUIREMENTS

		Rs.
Current Assets:		
Debtors at cost (8 weeks)	$6,00,000 \times 6 \times 8/52$	92,308
Stock	$1,00,000 \times 6 \times 12/52$	1,38,462
		2,30,770

Less: Current liabilities		
Creditors	$6 \times 1,00,000 \times 4/52$	46,154
Net working capital		1,84,616
Add: 10% for contingencies		18,462
Working capital required		2,03,078

Working Notes

- a) Selling price = Rs. 8
Profit @ 25 % on sales = Rs. 2
Cost of sales = Rs. 6
- b) As it is a trading concern, cost of sales is assumed to be the cost of purchases.
- c) Profits have been ignored as funds provided by profits may or may not be used as working capital.

Illustration 5

Mr. X wishes to commence a new trading business and gives the following information:

- The total estimated sales in a year would be Rs.12,00,000.
- His expenses are estimated as fixed expenses of Rs.2,000 per month plus variable expenses equal to five per cent of his turnover.
- He expects to fix a sales price for each product, which will be 25 % in excess of his cost of purchase.
- The sales and purchases will be evenly spread throughout the year. All sales will be for cash but he expects its one-month's credit for purchases.

Calculate average working capital requirements.

Solution

Statement Of Average Working Capital Requirements

		Rs.
Current Assets:		
Stock	$\text{Stock turnover } 4 = \frac{\text{COGS}}{\text{AVG Stock}}$ $0000 \times 100/125$ <hr/> $= x = 960,000/4$ x	2,40,000
Cash to meet fixed expenses		2,000
Cash to meet variable exp	Assumed for one month	5,000
Total current Assets		2,47,000
Less: Current liabilities		
Creditors	$960,000 \times 1/12$	80,000
Working capital required		1,67,000

13.6 SUMMARY

Working Capital is the lifeblood of business. While the investment in total Current Assets is considered as Gross Working Capital, the gap between the current assets and current liabilities is regarded as Net Working capital. The current ratio (current assets / current liabilities) of 2: 1 is regarded as an ideal ratio, which signifies the liquidity position of the concern. The same is reflected in the concept of Net Working Capital. The Net Working Capital is considered as the source of funds in Funds Flow Statement as this net working capital has to be financed from Non Current Sources (Liabilities). The success or otherwise of the firm depends on the working capital it has. The working capital can be regarded both as a part of Financing Decision (it explains from where the funds have come to finance net working capital) as well as Investment Decision (it explains as to where the excess of long term funds over the long term uses have been invested).

The operating cycle of a firm begins with acquisition of raw materials and ends with collection of debtors. Once the duration of operating cycle is completed, working capital requirement can be estimated.

13.7 SELF ASSESSMENT QUESTIONS

I. Short Answer Questions

1. What is working capital?
2. Bring out the concept of working capital.
3. Explain
 - a) Permanent working capital
 - b) Variable working capital
4. Write a note on
 - a) Adequacy of working capital
 - b) Operating cycle
5. What are the elements of working capital management?

II. Long Answer Questions

1. Discuss the factors determining the working capital requirements of working capital.
2. Explain the importance of working capital management. What techniques are used for planning and control of working capital?
3. Explain how working capital management policies affect the profitability and liquidity of firm?

Exercises

1. The data are available for Shanti Ltd.

	Rs.
Sales	14,00,000
Purchases	5,35,000

Annual consumption of raw materials	5,40,000
Cost of production	8,32,000
Cost of goods sold	10,82,000
Average stock of raw materials	1,72,500
Average stock of work in progress	46,500
Average stock of finished goods	1,75,000
Average debtors	2,37,500
Average creditors	1,75,000

Calculate the operating cycle and working capital required.

(Answer: Working capital required Rs. 4,11,406)

2. From the following particulars, calculate the duration of operating cycle and estimate the working capital requirement.

	(Rs. In lakhs)	
	01.04.2002	31.03.2003
Raw material	230	250
Work in progress	50	52
Finished goods	260	300
Bank debts	380	450
Trade creditors	250	300
Purchase of raw materials	810	
Consumption of raw materials stores	790	
Manufacturing expenses	380	
Depreciation	60	
Selling and administration expenses	400	

Assume a 360 days year.

(Answer: Working Capital Requirement Rs. 618.86 lakhs)

3. The board of directors of N E C co., Ltd requests you to prepare a statement showing the working capital requirements for a level of activity at 2,00,000 units of production.

Elements of cost	Per unit cost (Rs.)
Raw Materials	100
Direct Labor	50
Overheads	80
Total costs	<u>230</u>
Profit	80
Selling price	<u>310</u>

Other Information

- i) Raw materials are in stock, on an average for one month.
- ii) Materials are in process on an average for 2 weeks.
- iii) Finished goods are in stock on an average for one month
- iv) Credit allowed by suppliers one month.
- v) Time lag in payment from debtors –2 months.
- vi) Time lag in payment of wages-1.5 weeks.
- vii) Twenty percent of output is sold on credit.
- viii) Cash in hand and at bank is expected to be Rs.60, 000.
- ix) Assume that a month consists of 4 weeks and a year consists of 52 weeks

(Answer: Net Working Capital Rs. 52,63,846)

4. A proforma cost sheet of a company provides the following particulars:

ELEMENTS OF COST	
Material	40%
Direct Labor	20%
Overheads	20%

The following further particulars are available:

- a. It is proposed to maintain a level of activity of 1,00,000 units.
- b. Selling price is Rs.10/- per unit.
- c. Raw materials are expected to remain in stores for an average period of one month.
- d. Materials will be in process on average half a month.
- e. Finished goods are required to be in stock for an average period of one month.
- f. Credit allowed to debtors is two months.
- g. Credit allowed by suppliers is one month.

You may assume that sales and production follow a consistent pattern. You are required to prepare a statement of working capital requirements.

(Answer: Net Working Capital Rs. 2,33,333)

5. You are given the following estimates and are requested to add 15% to your computed figures to allow for contingencies:

	Rs.
1. Average Amount of Stocks	
Finished goods	30,000
Raw Materials	60,000

2. Average credit given:	
Inland Sales 4 weeks	2,60,000
Export Sales 2 weeks	6,50,000
3. Lag in payment of expenses:	
Wages 1 ½ weeks	2,60,000
Material and overheads 4 weeks	3,90,000

(Answer: Net Working Capital Rs. 1,12,125)

6. Calculate the working capital requirements from the information below.

Raw Materials	400
Direct Labor	150
Overheads (Including depreciation Rs.50/-)	350
Total cost	900

Additional Information

Selling Price	Rs. 1,000 per unit
Out put	52,000 units per annum
Raw material in stock	Average 4 weeks
Work-in-process (assume 50% completion stage with full material consumption)	Average 2 weeks
Finished goods in stock	Average 4 weeks
Credit allowed to debtors	Average 8 weeks
Cash at Bank is expected to be	Rs.50,000.

Assume that production is sustained at an even pace during the 52 weeks of the year. All sales are on credit basis. State any other assumptions that you might have made while computing.

(Answer: Net Working Capital Rs. 1,15,00,000)

13.8 FURTHER READINGS

1. Rustagi, R.P. : **Financial Management : Theory, Concepts and Problems**, Galgotia Publishing Company, New Delhi, 2000.
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3. Bhalla, V.K. : **Working Capital Management : Text and Cases**, Anmol Publishing Pvt. Ltd., New Delhi, 2001.
4. Gitman, L. J. : **Principles of Management Finance**, Harper and Row, New York, 1976.

5. Hampton J.J. and Wagner, C.L. : **Working Capital Management**, John Wiley and Sons, 1989.

13.9 KEY WORDS

- Working Capital** : Is the excess of current assets over the current liabilities
- Gross Working Capital** : Refers to the firm's investment in total current assets or circulating assets
- Net Working Capital** : The excess of current assets over current liabilities
- Operating Cycle** : Time gap between the sale of goods and receipt of cash
- Manufacturing Cycle** : The time taken to convert raw material into finished stock
- Permanent / Fixed / Regular/
Hard Core working capital** : Minimum level of current assets continuously required by the firm to carry on the business operations
- Fluctuating/Temporary/
Variable/ Seasonal Working
Capital** : Any amount over and above the permanent level of working capital is temporary

UNIT - 14 : WORKING CAPITAL FINANCING

Objectives

The objectives of this unit are to:

- understand the level of investment in different current assets;
- explain the working capital financing mix; and
- learn the Walker's principles of Working Capital.

Structure

- 14.0 Introduction
- 14.1 Levels of Working Capital
- 14.2 Optimum Level of Working Capital
- 14.3 Liquidity Vs. Profitability: Risk - Return Tangle
- 14.4 Costs Trade Off
- 14.5 Financing of Current Assets
 - 14.5.1 Hedging / Matching Approach
 - 14.5.2 Conservative Approach
 - 14.5.3 Aggressive Approach
 - 14.5.4 Short term Vs. Long term Financing
- 14.6 Walker's Principles of Working Capital
- 14.7 Summary
- 14.8 Self Assessment Questions
- 14.9 Further Readings
- 14.10 Key Words

14.0 INTRODUCTION

In this Unit, you will learn about the levels of working capital and a proper financing mix along with the Walker's principles of working capital. It is necessary that the firms have an adequate level of working capital so that funds are not blocked unnecessarily in current assets and thus losing profitability. At the same time ensure that enough current assets are maintained so that production is not interrupted and the customers demands are met.

14.1 LEVELS OF WORKING CAPITAL

The firm should have an adequate level of working capital for its smooth functioning. It should have neither excess nor inadequate working capital. The evils of excess and inadequate working capital are discussed below.

a) Evils of Excess Working Capital

Excess Working Capital means idle funds, earning no profit. If the actual investment in working capital is more than the actual required amount, it is termed as **excess** working capital or mismanagement of working capital funds. The dangers of excess working capital are:

- Unnecessary accumulation of inventories leading to mishandling, wastage, theft and losses.
- Higher incidence of bad debts affects profits due to defective credit policy and slack collection period.
- Low profitability, as idle funds earn nothing as they are blocked up in current assets.
- Tendencies of accumulating inventories to make speculative profits grow.

b) Dangers of Inadequate Working Capital

In case, a concern fails to plan the requirements of the working capital properly, it may have on one occasion excess working capital and on another occasion, an inadequate working capital. The effects of inadequate working capital are:

- It will be difficult to undertake profitable projects for non-availability of working capital funds.
- Difficult to implement plans and achieve firms profit targets.
- Fixed assets are not utilized efficiently for lack of funds. As a result, rate of return on investment slumps.
- Loses reputation when the firm is not able to honor its short-term obligations.

Thus, both excess and inadequate working capitals are dangerous. Excessive working capital means idle funds earning nothing. Inadequate working capital impairs firm's profitability and results in production interruptions and inefficiencies.

Every concern should, therefore, plan its working capital requirements properly and try to maintain an adequate amount. There should be an optimum level of current assets for the success of the organization.

14.2 OPTIMUM LEVEL OF WORKING CAPITAL

To maximize the shareholders wealth, the firm should have neither excess current assets nor inadequate current assets but should maintain an optimum level of current assets.

Current assets and fixed assets both are needed to support a particular level of output. As the firm's output and sales increase, need for current assets increases at a less than proportionate rate with the output. It takes a greater proportional investment in current assets when only a few units of output are produced than it does later on when the firm can use its current assets more efficiently.

There are three current assets policies. They are:

a) Aggressive Policy

It is one where a current assets to fixed assets ratio is low. The firm's profitability is high along with a high risk factor.

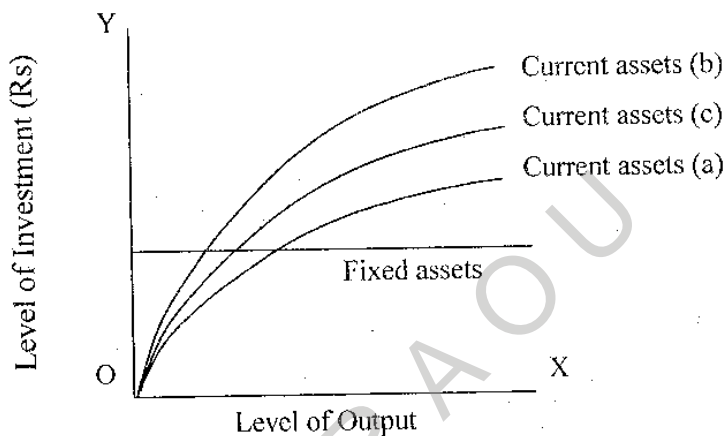
b) Conservative Policy

It is a situation where current assets to fixed assets ratio is high. This implies greater liquidity and lower risk.

c) Average Policy

The current assets policy of the most firm's fall between the above two extreme policies. The current assets policies are given in figure 1.

Figure 1



a : Aggressive policy

b : Conservative policy

c: Average policy

An increase in the ratio of current assets to total assets will result in a decline in profitability as current assets are assumed to be less profitable than fixed assets. On the other hand, liquidity position will increase with the increase in current assets, assuming no change in current liabilities. Whereas, a decline in the ratio of current assets to total assets will result in an increase in profitability as well as risk of illiquidity. The increase in profitability is due to the corresponding increase in fixed assets, which are likely to generate higher return. Thus, there should be a trade off between profitability and risk.

Activity - 1

Explain the current assets politics.

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14.3 LIQUIDITY Vs. PROFITABILITY: RISK RETURN TANGLE

The firm would make just enough investment in current assets, if it were possible to estimate working capital needs accurately. But, it is difficult to estimate. Hence, the firm is faced with the problem of excess or inadequate current assets.

A larger investment in current assets results in lower rate of return on investment. A smaller investment in current assets results in interruption in production and sales because of frequent stock outs and inability to pay creditors in time.

A conservative policy means lower returns and lower risk. While an aggressive policy leads to higher return and higher risk.

The aims in working capital management are to increase profitability, (lower level of current assets) and at the same time have liquidity (higher level of current assets).

Higher profitability is achieved only when solvency is sacrificed. This involves greater risk of cash shortages and stock outs.

In case of liquid firm, it hardly experiences a cash shortage or stock outs. But a considerable amount of funds will be tied up in current assets and to the extent the investment is idle, the firm's profitability will suffer.

14.4 COSTS TRADE OFF

Another dimension is in terms of cost of maintaining a particular level of current assets. There are two costs associated with the level of current assets. They are:

a) **Costs of Liquidity:** If current assets level is increased, the firm's liquidity position will improve. But, return on assets decline as idle cash and stocks earn nothing and high level of debtors reduces profitability. Thus, cost of liquidity through lower rate of return increases with the level of current assets.

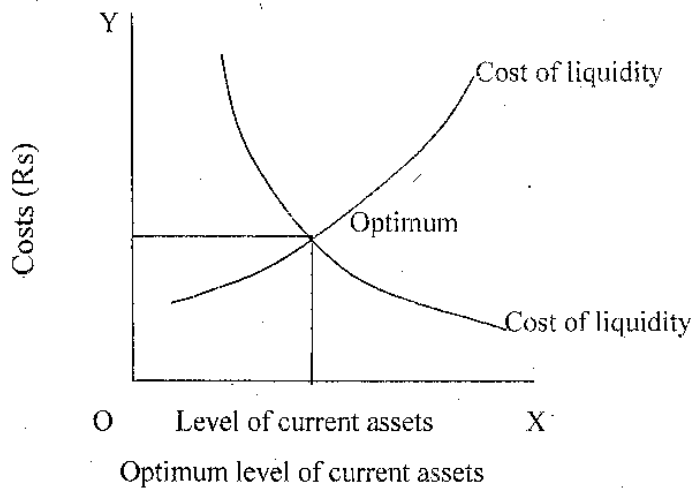
b) **Costs of Illiquidity:** Cost of illiquidity is the cost of holding insufficient current assets. The firm cannot honor its obligations if too little cash is maintained. Hence, it has to borrow at high rate of interest in order to honor its current obligations. Low stock result in loss of sales and customers shift to competitors. Low amount of debtors impairs sales. Thus, low level of current assets involves cost, which increases as the current assets level falls.

Firm should balance the profitability - solvency tangle by minimizing the total cost i.e. cost of liquidity and cost of illiquidity.

The optimum level of current assets is determined at the point of intersection of liquidity cost curve and illiquidity cost curve, which is shown in figure 2.

Optimum Level of Current Assets

Figure No.2



With the level of current assets, cost of liquidity increases while cost of illiquidity decreases and vice versa. Minimum cost point indicates the optimum level of current assets.

14.5 FINANCING OF CURRENT ASSETS

The financing mix refers to the proportion of current assets to be financed by current and long-term sources. There are three sources of financing current assets. They are:

- **Long Term Sources**

These are for a period of more than one year and include shares, debentures, retained earnings, loans from financial institutions etc.

- **Short Term Sources**

These are for a period of one year and include bank loan and overdraft.

- **Spontaneous Sources**

It is an automatic source of short-term funds and includes creditors, bills payable, and outstanding expenses. These are cost free sources. Therefore, they are used to finance current assets as much as possible. Thus, the real choice of financing current assets (not financed with spontaneous sources) is between the first two.

There are three basic approaches for determining the working capital financing mix. They are:

Activity – II

What are the sources of financing current assets?

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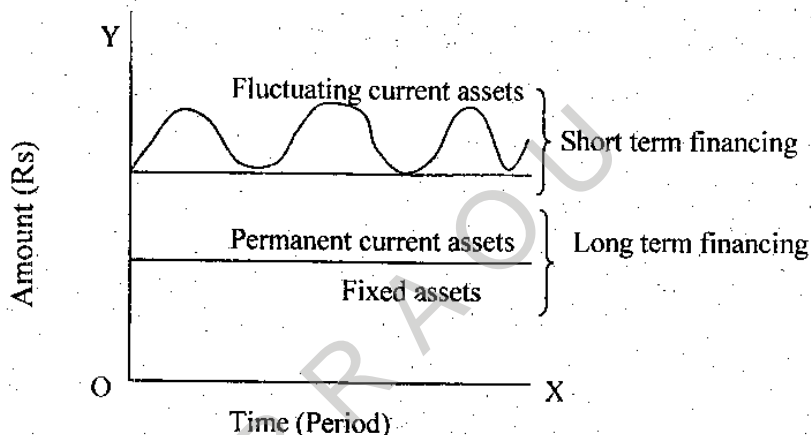
14.5.1 THE HEDGING / MATCHING APPROACH

Here, the expected life of assets is matched with the expected life of the source of funds raised to finance assets. The justification for the exact matching is that, since the purpose of financing is to pay for assets, the financing should be relinquished when the asset is expected to be relinquished.

Long term financing for short-term assets is expensive, as the funds will not be utilized for the full period. Like wise short term financing for long-term assets is costly as well as inconvenient as arrangements for new short term financing will have to be made on a continuing basis.

Long term financing will be used to finance fixed assets and permanent current assets and short term financing temporary / variable current assets as shown in figure-3. But, exact matching is not possible because of uncertainty about expected lives.

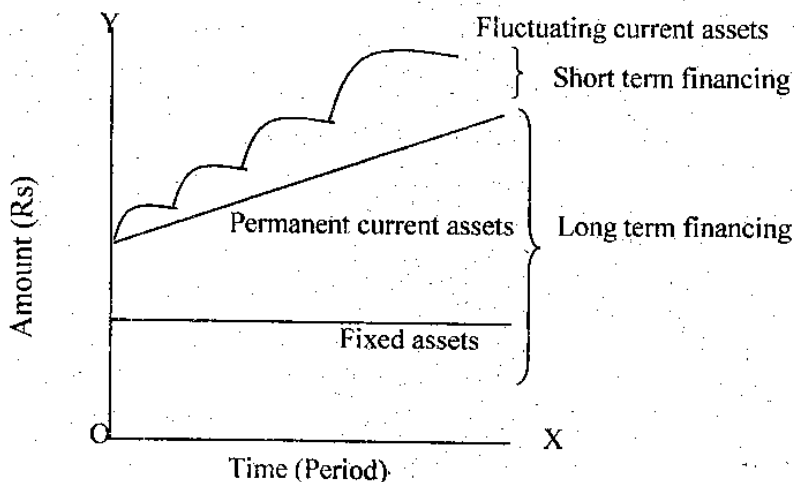
Figure 3



14.5.2 CONSERVATIVE APPROACH

Here, the firm depends more on long-term funds for financing needs. The firm finances fixed assets, permanent current assets and a part of temporary current assets with long-term sources. This approach is less risky. When the firm has no temporary current assets, the long-term funds released can be invested in securities to build up liquidity position of the firm.

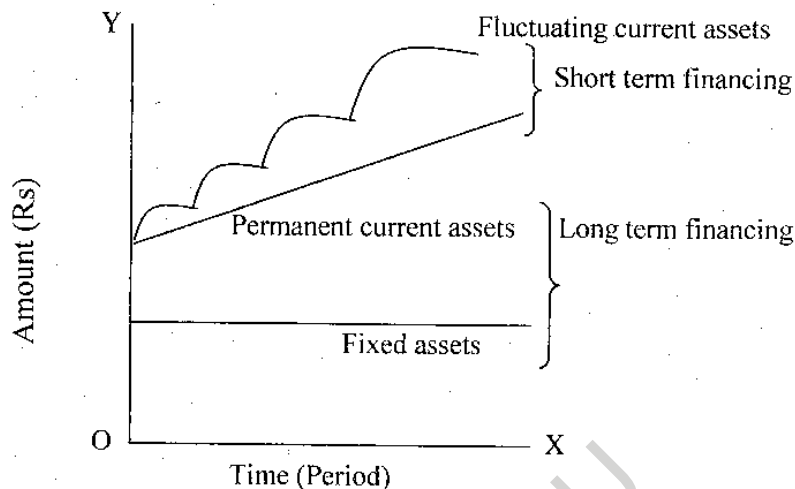
Figure 4



14.5.3 AGGRESSIVE APPROACH

The firm uses more short term financing than warranted by the matching plan. Short-term funds are used to finance temporary current assets and also a part of permanent current assets. This results in higher risk.

Figure 5



14.5.4 SHORT TERM Vs. LONG TERM FINANCING

Short term financing is preferred to long term financing because of cost advantage and flexibility. But, short term financing is more risky. The aspects to be taken into consideration before deciding the method of financing are given below.

1. **Cost of financing:** Short term financing should be generally less costly than the long term financing because of the time factor. The rate of interest is generally less costly as it is related to the maturity of debt. This relationship is found in term structure of interest rates. Longer the maturity period, higher the interest rate. The justification for higher interest rate is found in the liquidity preference theory.
2. **Flexibility:** It is easy to refund short-term funds when the need for funds diminishes. But long term funds like debentures, preference shares etc. cannot be refunded before the maturity period.
3. **Risk of financing:** Short term financing though less costly, they are more risky. There is a risk of renewing the borrowings again and again particularly in case of permanent current assets. It may be difficult for the firm to borrow during stringent credit periods.

Short-term funds are less expensive than long-term funds though they are risky. The choice between short term and long-term funds involves risk return trade off.

14.6 WALKER'S PRINCIPLES OF WORKING CAPITAL

According to Walker, the level of working capital depends on management's attitude towards risk and the factors that influence the amount of cash, receivables, inventory and other

current assets required to support a given volume of output. Risk here refers to an inadequate level of current assets and thus facing the evils associated with insufficient current assets.

First Principle – Principle of Risk Variation

It states, “if working capital is varied relative to sales, the amount of risk that a firm assumes is also varied and the opportunity for gain or loss is increased”. It means that there is a direct relationship between the risk and the return; the more risk that a firm assumes, the greater is the opportunity for gain or loss. In other words, an increase in the working capital reduces the risk as well as the opportunity for gain or loss.

A Conservative management prefers to minimize risk by holding a higher level of working capital for a given volume of sales, while liberal managements assume greater and greater risk by reducing the level of working capital. The goal of a management should be to maintain that level of working capital which would optimize a firm’s rate of return and this level is the point at which the incremental loss associated with a decreased in working capital investment becomes greater than the incremental gain associated with the investment.

Second Principle – Principle of Equity Position

It refers to the determination of ‘ideal level’ of working capital. It states “capital should be invested in each component of working capital as long as the equity position of the firm increases”. According to this principle, the amount of working capital invested in each component should be justified by a firm’s equity position. It means that each rupee invested in working capital should contribute to the net worth of the firm.

Third Principle – Principle of Cost of Capital

It is stated as “the type of capital used to finance working capital directly affects the amount of risk that a firm assumes as well as the opportunity for gain or loss and cost of capital”. It is concerned with the risk resulting from the type of capital used to finance the current assets.

If the current assets are financed by debt capital, the risk to the firm would be high but at the same time it provides an opportunity to increase the rate of return on equity. Therefore, if the firm desires to minimize risk, it will employ more of equity capital but by doing so, it foregoes the opportunity of higher returns.

Cost of capital moves inversely with risk, unlike the return on equity. As the firm employs more and more risk capital (debt), the cost of capital declines till the optimum capital structure is achieved by the firm.

Fourth Principle – Principle of Maturity of Payment

It states that “the greater the disparity between the maturities of a firm’s short term debt instruments and its flow of internally generated funds, the greater the risk and vice versa”. Here, management is not compensated for the risk assumed. The firm should relate maturities of payments to its flow of internally generated funds. A margin of safety should be provided for short-term debt payments. Adequate time should be allowed between the time the funds are generated and the date of maturity of a debt.

Activity - III

Explain the principle of maturity of payment.

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14.7 SUMMARY

For smooth functioning, the firm should have an adequate level of Working Capital i.e. neither excess nor inadequate working capital. An optimum level of working capital maximizes the shareholders' wealth. It is that level where the firm keeps the total cost i.e. cost of liquidity plus the cost of illiquidity at a minimum.

Several factors determine the level of working capital a firm should have. The success or otherwise of the business firm depends on the level of working capital. Therefore, care should be taken to have an adequate level of working capital and proper financing mix.

According to Walker, the precise level of investment in working capital is determined based on management's attitude towards risk and the factors that influence the amount of cash, receivables and inventories required to support a given volume of output. Thus, working capital management includes planning working capital requirements in advance and financing from appropriate sources to maintain a desired financing mix.

14.8 SELF ASSESSMENT QUESTIONS

A. Short Answer Questions

1. Explain the significance of an optimum level of working capital.
2. Briefly discuss the policies relating to the current assets.
3. Liquidity Vs. Profitability.
4. Short term Vs. Long term financing.

B. Long Answer Questions

1. How do you trade off the costs associated with liquidity and illiquidity?
2. Discuss the approaches for determining the working capital financing mix.
3. What are the likely consequences of conservative, moderate and aggressive current assets and current assets financing policies?
4. Explain the Walker's principles of working capital in detail.

14.9 FURTHER READINGS

- I. E.W. Walker : **Toward a theory of working capital**,
Engineering Economist, Vol. 1X, Nov.2 (Jan-Feb.
1964).

14.10 KEY WORDS

- Financing Mix** : The proportion of current assets to be financed by current and long term sources
- Cost of illiquidity** : Is the cost of holding insufficient current assets
- Spontaneous Source** : An automatic source of short term funds and includes creditors, bills payable and outstanding expenses
- Hedging / Matching Approach** : Here, the expected life of assets is matched with the expected life of the source of funds raised to finance assets
- Principle of Risk Variation** : "If working capital is varied relative to sales, the amount of risk that a firm assumes is also varied and the opportunity for gain or loss is increased"
- Principle of Equity Position** : "Capital should be invested in each component of working capital as long as the equity position of the firm increases"
- Principle of Cost of Capital** : "The type of capital used to finance working capital directly affects the amount of risk that a firm assumes as well as the opportunity for gain or loss and cost of capital"
- Principle of Maturity Payment** : "The greater the disparity between the maturities of a firm's short term debt instruments and its flow of internally generated funds, the greater is the risk and vice versa"

UNIT – 15 : CASH MANAGEMENT

Objectives

The objectives of this Unit are to:

- discuss the motives for holding cash;
- understand different facets of cash management;
- explain the strategies for the efficient management of cash; and
- discuss the techniques for speeding up collections and slowing down disbursements.

Structure

- 15.0 Introduction
- 15.1 Motives for Holding Cash
- 15.2 Facets of Cash Management
- 15.3 Cash Planning
- 15.4 Managing the Cash Flows
 - 15.4.1 Accelerating Cash Inflows
 - 15.4.2 Decelerating Cash Outflows
- 15.5 Determining Optimum Cash Balance
- 15.6 Investment in Marketable Securities
- 15.7 Cash Management Strategies
- 15.8 Summary
- 15.9 Self Assessment Questions
- 15.10 Further Readings
- 15.11 Key Words

15.0 INTRODUCTION

Current assets form an important aspect of working capital management. Cash is one of the important components of working capital. Cash, like the blood stream in human body, is vital for a business. It is the basic input needed to keep the business running on a continuous basis and at the same time, it is the ultimate output expected to be realized by selling the services / products manufactured by the firm.

Cash denotes the liquidity of a business enterprise. It is the least productive as idle cash earns nothing. Therefore, there should be a proper management of cash in order to maintain adequate cash to keep the firm sufficiently liquid and invest excess cash in some profitable way. The cash available with the organization should neither be short nor too excessive. There should be a trade off between liquidity and profitability so that solvency is not threatened and profitability is maintained.

15.1 MOTIVES FOR HOLDING CASH

Keynes identified three motives for holding cash, viz., the transaction motive, the precautionary motive and the speculative motive.

The Transaction Motive requires a firm to hold cash to conduct its everyday ordinary business such as making of purchases, payment of wages, operating expenses, taxes, dividend etc. Depending upon the frequency of cash transactions, the amount of cash needed varies from business to business and from firm to firm. Transaction cash balances can be minimized if cash inflows and cash outflows are closely matched.

The Precautionary Motive requires a firm to hold cash to meet any contingencies in future. It is concerned with the predictability of cash flows – both the inflows and outflows. Higher the predictability of cash, lower is the amount of cash needed and vice versa. It provides a cushion to withstand unexpected emergencies.

The Speculative Motive is concerned with taking advantage of profit making opportunities as and when they arise e.g. an abnormal increase in prices. However, this motive is the least common of the three motives.

Activity - I

Explain precautionary of holding cash.

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15.2 FACETS OF CASH MANAGEMENT

There are four facets of cash management. They are:

- Cash Planning
- Managing the Cash Flows
- Determining Optimum Cash Balance
- Investment in Marketable Securities

15.3 CASH PLANNING

Planning cash and controlling its use are very important tasks. If the future cash flows are not properly planned, a firm may face with a cash deficit resulting in firm's failure or cash surplus lowering firm's profitability. Therefore, the financial manager should plan the cash needs and uses. For this purpose, cash budget is prepared.

Cash Budget is the most significant device for planning and controlling cash flows. It incorporates estimates of future inflows and outflows of cash over a projected short period of time, which may be a year or a quarter or a half-year. The period and frequency of cash planning depends on the size of the firm. Large firms may forecast cash flows on a daily or

weekly basis, whereas, medium size firms for want of information and un-sophistication of operations may not forecast and if done, they do it monthly.

Cash forecasts are needed to prepare cash budgets. Short-term forecasts help to determine operating cash requirements, to anticipate short term financing, to manage money market investments, in guiding credit policies and scheduling payments in connection with capital expenditure programs.

Long-term forecasts of cash give an idea of the company's financial needs in the distant future. They indicate company's future financial needs; help to evaluate proposed capital projects and help to improve corporate planning.

There are two components of cash budget – cash inflows and cash outflows. Cash budget is a statement of the projected cash flows for a specific period. Cash budget helps the financial manager to know the timing and magnitude of expected cash inflows and outflows and cash balances over the projected period.

The main sources of cash inflows are cash sales, receivables collections, interest receipts, sale of marketable securities and assets, issue of new securities etc.

The main uses of cash are wage payments, capital expenditure, payments of bills and accounts payable, dividend payments, interest payments, redemption of securities, loan repayment, purchase of marketable securities, tax payments etc.

Cash budget summarizes the cash inflows (receipts) and cash outflows (payments) during a pre-determined period. Difference between the cash inflows and cash outflows is the net cash inflow or net cash outflow for each month indicating surplus/ deficit of cash. Whenever, there is a surplus of cash, the firm should make arrangement to invest surplus cash in short term marketable securities and make arrangement from banks when there is a deficit. This Receipts and Payments Method of preparing cash budget gives a complete picture of expected cash flows.

Activity – II

Explain the importance of cash planning.

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Illustration - 1

X Ltd. started business on 1-1-2000, with a capital of Rs.1,00,000. The estimated sales and purchases for the next six months are as follows:

PARTICULARS	JAN Rs.	FEB Rs.	MAR Rs.	APRIL Rs.	MAY Rs.	JUNE Rs.
Purchases	54,000	90,000	58,000	58,000	92,000	98,000
Sales	60,000	60,000	1,00,000	1,00,000	50,000	1,50,000

50% of purchases are credit purchases and are paid during the following months. Of the sales, 60% are on credit basis and are collected in the following month. Manufacturing expenses are @ 10,000 p.m. The machine was purchased for Rs.100,000 during the month of January, payable in two installments in the month of March and June. Prepare a cash budget for the six months-ended 30-6-2000.

Solution

Cash budget of 'x' Ltd for the month ended 30. 06. 2000

	Jan Rs.	Feb Rs.	March Rs.	April Rs.	May Rs.	June Rs.
Cash balance (opening)	1,00,000	87,000	65,000	7,000	39,000	34,000
A. Cash receipts						
Cash sales	24,000	24,000	40,000	40,000	20,000	60,000
Collections from Debtors	--	36,000	36,000	60,000	60,000	30,000
Total receipts (A)	<u>1,24,000</u>	<u>1,47,000</u>	<u>1,41,000</u>	<u>1,07,000</u>	<u>1,19,000</u>	<u>1,24,000</u>
B. Cash Payments						
Cash purchases	27,000	45,000	29,000	29,000	46,000	49,000
Payments to creditors	--	27,000	45,000	29,000	29,000	46,000
Manufacturing expenses	10,000	10,000	10,000	10,000	10,000	10,000
Purchase of machine	--	--	50,000	--	--	50,000
Total payments (B)	<u>37,000</u>	<u>82,000</u>	<u>1,34,000</u>	<u>68,000</u>	<u>85,000</u>	<u>1,55,000</u>
Cash balance:(A - B)	<u>87,000</u>	<u>65,000</u>	<u>7,000</u>	<u>39,000</u>	<u>34,000</u>	<u>(-)31,000</u>

Note : Closing balance of the previous month is the opening balance for the next month.
(-) sign represent deficit.

Illustration - 2

The following are the income and expenditure forecasts of a Limited Company.

Months	Cash Sales Rs.	Cash Purchases Rs.	Manu. Wages Rs.	Direct Expenses Rs.	Office O/H Rs.	Selling O/H Rs.
MAR	1,00,000	40,000	15,000	6,000	5,000	5,000
APRIL	70,000	30,000	8,000	5,000	3,000	4,500
MAY	1,10,000	45,000	19,000	5,500	4,950	6,000
JUNE	90,000	35,000	10,750	3,400	3,750	5,650

JULY	85,000	40,000	12,000	6,500	3,500	5,000
AUGUST	1,00,000	36,000	10,000	5,000	6,000	6,000

1. Cash balance on May 1st 2000 : Rs.20,000.
2. Equipment purchased Rs.50,000 in the month of March payable in the months of July and August in equal installments.
3. Credit sales and credit purchases were 50% of total sales and purchases respectively. 50% of credit sales is realized in month following the sale and remaining 50% in second month following. Creditors are paid in the following month of the purchase.
4. Sales commission is Rs.8000, Rs. 7000 and Rs, 6750 for the month of May, June, July respectively.
5. Lag in payment of manufacturing expenses and office and selling expenses is $\frac{1}{2}$ month.

Prepare a cash budget for the months of May, June and July.

Solution

Cash budget for the month of May, June and July

Particulars	May Rs.	June Rs.	July Rs.
Cash balance (opening)	20,000	1,03,775	1,68,325
A. Cash receipts			
Cash sales	1,10,000	90,000	85,000
Collections from debtor	85,000	90,000	1,00,000
Total receipts (A)	<u>2,15,000</u>	<u>2,83,775</u>	<u>3,53,325</u>
B. Cash Payments			
Cash purchases	45,000	35,000	40,000
Manufacturing expenses	13,500	14,875	11,375
Direct expenses	5,500	3,400	6,500
Office overheads	3,975	4,350	3,625
Selling & distribution overhead	5,250	5,825	5,325
Equipment purchased	--	--	25,000
Payment to creditor	30,000	45,000	35,000
Sales commission	8,000	7,000	6,750
Total payments (B)	<u>1,11,225</u>	<u>1,15,450</u>	<u>1,33,575</u>
Cash balance/(A - B)	<u>1,03,775</u>	<u>1,68,325</u>	<u>2,19,750</u>

Note: Manufacturing, selling and office overheads for a month are half of current month expenses plus half of last month expenses.

Illustration - 3

On the basis of the following information ascertain whether the firm has surplus or deficiency of cash.

	Normal periods	Peak periods
Desired days of cash	7	5
Average daily outflow	50,000	80,000
Actual cash balance	1,50,000	1,80,000

Solution

During normal period: The firm has a cash balance of Rs. 1,50,000. The average daily cash outflows are Rs. 50,000. It means the firm has cash available only for 3 days ($1,50,000/50,000$) as compared to amount of cash required for 7 days. Hence, the firm has deficiency of cash.

During peak period: The firm has a cash balance of Rs. 1,80,000. The average daily outflows are estimated at Rs. 80,000. It means the firm has cash only for 2.25 days ($1,80,000/80,000$) as compared to the amount that is required for 5 days. Hence, the firm has deficiency of cash.

Illustration - 4

The following is the information pertaining to Beta Co. Ltd.

	Quarter (Rs. '000s)			
	1	2	3	4
Sales	8000	10000	15000	20000
Cash payments :				
Manufacturing expenses	8000	10000	7000	8000
General, selling & distribution	2000	5000	8000	2000
Purchase of equipment and other fixed assets	50	250	250	2000

The opening balance of debtors is Rs. 50,00,000/-. The debtors at the end of a quarter are $\frac{1}{2}$ of sales for the quarter. The opening cash balance is Rs. 10,00,000 and the desired minimum balance is Rs. 6,00,000. Borrowings are made at the beginning of the quarter in which the need will occur in multiples of Rs.50,000 and are repaid at the end of the quarters.

Prepare a cash budget by quarters for the year and state the amount of loan outstanding at the end of the year.

Solution

	1	2	3	4	TOTAL
A) Cash receipts					
Collection from debtors					
From prior quarter	5000	4000	5000	7500	21500
From current quarter	4000	5000	7500	10000	26500
TOTAL (A)	<u>9000</u>	<u>9000</u>	<u>12500</u>	<u>17500</u>	<u>48000</u>
B) Cash payments					
Manufacturing expenses	8000	10000	7000	8000	33000
General, selling & dist.	2000	5000	8000	2000	17000
Purchase of equipment	50	250	250	2000	2550
TOTAL (B)	<u>10050</u>	<u>15250</u>	<u>15250</u>	<u>12000</u>	<u>52550</u>
(A-B)	(1050)	(6250)	(2750)	5500	(4550)
Beginning balance	1000	600	600	600	600
Surplus / Deficit	(50)	(5650)	(2150)	6100	(3950)
Borrowing	(650)	(6250)	(2750)	-	(4550)
(deficiency + minimum cash required)					
Repayment made				5500	
Closing Balance	600	600	600	600	600

Loan o/s = 650 + 6250 + 2750 - 5500 + 4550 = Rs.87,00,000.

(Figures within parenthesis indicate deficiency).

Illustration - 5

Prepare a cash budget of ABC Ltd. on the basis of following information for the month of April.

- Sales:** 20 % cash sales, 80 % credit sales, terms of credit ; 50%, 25%, 20% credit sales are collected in the month of sales, a month after and second month after, respectively. The remaining 5% become bad debts.
- Purchases:** The firm buys enough goods each month to maintain its inventory at 3 times the next month's sales. The firm is given 5% discount on all its purchases if bills are paid within 15 days and the firm avail all such discounts (creditors are then equal to 1/2 of that months net purchases).
- Cost of goods sold,** without considering 5% discount is 50% of selling prices. The firm records inventory net of discount.

D. Other data is as under:

	Amount (Rs.)
Sales	
January	2,00,000
February	2,50,000
March	3,00,000
April	3,20,000
May	2,40,000
Inventory on 31 st March	2,50,000
Cash balance on 31 st March	60,000
Gross purchase in March	1,50,000

General and administrative expenses budgeted for April are Rs. 60,000 including depreciation of Rs. 15,000. Selling and distribution expenses amounts to 5% of total sales and the payment will be made in the following month of sales. 80% of sales will be generated by salesman who will receive 5% commission and it is payable one month after it has been made.

Solution

Cash budget for the month of April

a) Cash Receipts :

Balance in the beginning 1 st April/ 31 st March	60,000	
Cash sales (320000 * 20%)	64,000	
Collections from debtors		
Feb. sales (250000*80%*20%)	40,000	
March sales (300000*80%*25%)	60,000	
April sales (320000*80%*50%)	1,28,000	2,28,000
Total of (a)	<u>3,52,000</u>	

b) Cash Payments

Payments for purchases		
March(Rs 1,50,000*95%*1/2)	71,250	
April(Rs 2,44,000*1/2)	1,22,000	1,93,250
Selling ,general and admin. Exp. (60,000-15,000)		45,000
Selling & dist. Exp. @ 5% (3,00,000*5%)		15,000
Salesmen commission (3,00,000*80%*5%)		12,000
		<u>2,65,250</u>
Cash balance		86,750

	Gross Rs.	Net Rs.
Desired ending inventory –gross(240000*50%*3)	3,60,000	3,42,000
Add:cost of sales in April –gross (320000*50%)	1,60,000	1,52,000
Total requirements	5,20,000	4,94,000
Less: beginning inventory –gross(250000*100/95)	2,63,158	(2,50,000)
Purchases	2,56,842	2,44,000

15.4 MANAGING THE CASH FLOWS

Cash, being a sensitive asset, should be regulated according to the needs. The flows of cash should be properly managed in such a way to gainfully invest the excess amount and rectify any deficits or inadequacies. The twin objectives of cash management are to accelerate cash inflows and decelerate cash outflows.

15.4.1 ACCELERATION OF CASH INFLOWS

Acceleration of cash inflows results in cash conservation and reduction of cash balances. Cash collections can be accelerated by reducing the time gap between the sale of goods and their cash collection. The reason for the time gap is because of mailing time (time taken by the cheque in transit) and processing time (time taken by the firm in processing cheque for internal accounting purpose).

The amount of cheque sent by the customers but not yet collected is the **deposit float**. Greater the deposit float, longer is the time taken to convert cheques into usable funds and greater will be the cash requirement. By speeding up the mailing, processing and collection time, the deposit float can be reduced and this can be done by (i) Decentralized Collection Procedure / Concentration Banking; and (ii) Lock Box System.

i) Concentration Banking

Here, a firm has a number of collection centers instead of a single collection center at the head office. The collection centers collect the cheques from the customers and deposit in their local bank accounts. The funds above a predetermined minimum are remitted to a Central / Concentration Bank Account which will be at the head office where usually disbursements are made.

This system results in saving of mailing and processing time, which should be compared with the cost of maintaining the system. This system should be adopted when savings exceed the cost.

ii) Lock Box System

Some firms with large collection transactions introduce lock box system. Here, the post boxes are hired at different collection centers where cash / cheques can be dropped in by the customers. The firm's local banker is given authority to collect the same daily from the locker and deposit the cheques in the firm's account. For internal purpose, the firm can maintain records of the cheques picked up.

For the service rendered, bank charges fees or puts a condition to maintain a minimum balance with it. This system can be adopted only when benefits exceed costs.

Illustration - 6

XYZ Ltd. sells the products through widely dispersed distributors in Northern India. It takes on an average 10 days for cash receipts checks to become available to the company from the day they are mailed. The company is contemplating the institution of concentration banking as an alternative for reducing the period. Such a system is expected to reduce the collection period by 5 days. Currently, Rs.15,00,000 is the average receipts.

The concentration banking would cost Rs.2,00,000 annually and the cost of funds is 20%.

- Determine the net benefit/cost associated with concentration banking system.
- It is estimated that a lock-box system, can reduce the collection time by 4 days and its annual cost would be Rs.5,00,000.

Between concentration banking and lock box system, which is better?

Solution

- a) Cash released by concentration banking system:

Rs. 15,00,000 x 5 days =	Rs. 75,00,000
Savings (Rs. 75,00,000 x 20%) =	Rs. 15,00,000
Less: Costs	2,00,000
Net savings	<u>13,00,000</u>

- b) Cash released by lock-box system Rs. 15,00,000 x 4 days =Rs. 60,00,000

Savings (Rs. 60,00,000 x 20 %)	Rs. 12,00,000
Less : Costs	Rs. 5,00,000
Net savings	<u>Rs. 7,00,000</u>

The concentration banking system is better.

15.4.2 DECELERATING CASH OUTFLOWS

Trade credit is a costless source of funds as it allows us to pay the creditors only after the credit period agreed upon expires. The dues can be withheld upto the last date. Unless cash discounts are offered, it is not advantageous to make early payments.

Centralized procedure is followed, for decelerating disbursement. Payments are made from a single central account, which is at the head office.

Some firms may like to take advantage of 'payment float' which is the time gap between the date of issue of a cheque and the actual date of presentation for payment by the customer directly or through the bank. During this gap period, the firms can invest the 'float' amount to earn a return. But, this is a risky game, which should be played very cautiously.

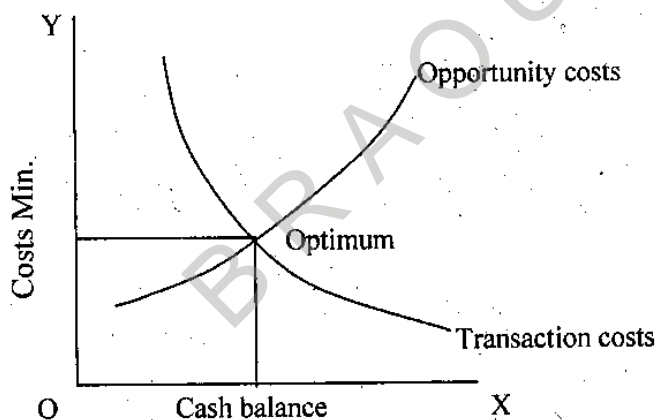
15.5 DETERMINING OPTIMUM CASH BALANCE

Determining appropriate cash balance and investing temporarily idle cash in interest earning safe assets or securities are the two other important aspects in cash management.

The financial manager has to maintain a sound liquidity position to meet the maturing obligations and at the same time ensure profitability. As idle cash earns nothing, holding of excessive cash is a non-profitable proposition. A small cash balance may result in a weak liquidity position, but will have high profitability by way of interest earned on investment of cash elsewhere. Therefore, every organization, irrespective of its size and nature, has to determine an optimum cash balance, neither too small nor too large, by a trade off between risk and return.

A high level of cash balance will result in lower transaction costs (sound liquidity position) but will have high opportunity cost (loss of return on investment). Now, the manager has to make a cost – benefit analysis for holding the required amount of cash. The costs of too little cash (transaction costs) and the costs of too high cash (opportunity costs) have to be balanced. The point, where the sum of two costs is minimum, determines the optimal cash balance.

Figure 1



Any balance either below or above the optimum level results in higher costs.

Activity – III

What is optimum cash balance?

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15.6 INVESTMENT IN MARKETABLE SECURITIES

It is a fact that receipts and disbursements are not completely predictable. There may be a surplus or deficit. Whenever there is a surplus cash, it should be invested for earning income without depriving of the benefit of liquidity of funds. The choice of investment of any idle cash balance for a short period depends upon three factors. They are:

- i) **Safety:** Investment should be made in very safe securities free from default risk (i.e. default in timely payment of interest and repayment of principal amount).
- ii) **Maturity:** The investment shall mature in a short span of time.
- iii) **Marketability:** There should not be any difficulty in converting the asset back into cash. The asset is considered as highly marketable and highly liquid, if it can be sold quickly.

Government Securities and Commercial Papers are the examples of the assets, which satisfy the above criteria.

15.7 CASH MANAGEMENT STRATEGIES

The financial manager can maintain a low level of cash by efficiently managing the cash cycle. **Cash cycle** refers to "the process by which cash is used to purchase material for the production to the point when cash is collected from the sale of the finished product and ultimately results in collection of receivables."

Cash Cycle = Average number of days for collecting accounts receivables (+) average age of inventories (-) average number of days for payment of accounts payables.

Lower the cash cycle, greater is the cash turnover and lower will be the minimum operating cash balance to be maintained.

Cash turnover refers to "the number of times the firm uses cash during each year". It is calculated by dividing the number of days in a year with the number of days in a cash cycle. When the number of days in a cash cycle are less, automatically the minimum cash balance required gets reduced as it is ascertained by dividing the firm's total annual outlays by the cash turnover rate.

Cash Turnover = No. of days in a year (\div) Cash Cycle days

Minimum Cash Balance = Annual Cash Outlay (\div) Cash Turnover

The aim of the firm should be to reduce the minimum cash balance required to be maintained. This can be done by following certain strategies.

As accounts receivable, inventory and accounts payable are the components of cash cycle, the period of cash cycle can be reduced by stretching accounts payable or reducing the lock-in-period of inventory or speeding up collection of accounts receivables or all of these strategies.

Accounts payable can be stretched by delaying the payment as much as possible without affecting the firm's credit standing and availing the cash discounts when offered.

Inventory period can be reduced by increasing the inventory turnover rate and avoiding stock-outs by an efficient inventory production management.

Solution

$$\text{Cash Break even point} = \frac{\text{Cash fixed costs}}{\text{Cash contribution per unit}} = \frac{40000}{10} = 400 \text{ units}$$

15.8 SUMMARY

Cash is the most liquid and the least productive asset. It is considered as the lifeblood of a business firm. Transactions motive, precautionary motive and speculative motive are the three motives for holding cash. There should be an adequate amount of cash balance neither more nor less. An excessive cash balance lowers the profitability though ensures liquidity. A lower balance increases profitability but endangers liquidity position. Therefore, there should be an optimum level of cash balance. Any amount in excess of minimum balance should be invested temporarily in safe, liquid and marketable securities.

The firm should plan its cash requirements on a short run basis. Cash budget is a useful tool for forecasting its cash inflows and cash outflows.

The aim of the firm should be to accelerate cash inflows and decelerate cash outflows by following appropriate strategies. Cash should be properly planned, controlled and managed.

15.9 SELF ASSESSMENT QUESTIONS

A. Short Answer Questions

1. Why does a firm need cash? Explain briefly the motives for holding cash.
2. Explain the different facets of cash management.
3. How optimum cash balance is determined?
4. Explain the strategies of cash management.

B. Long Answer Questions

1. What is Cash budget? Explain the importance of cash budget.
2. "In managing cash, the finance manager faces the problem of compromising the conflicting goals of profitability and liquidity". Comment.
3. What is cash cycle and how can it be reduced?

Exercises

1. Prepare a cash budget for 6 months-ended 31-12-2000 from the following information.

(Rs. '000)

PARTICULARS	JULY	AUG	SEP	OCT	NOV	DEC
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Sales	100	200	150	250	300	70
Purchases	6	10.5	10	20	36	23.5
Manu. Wages	12	15	21	15.5	15	14.75
Fac. Overheads	10	10	10	10	10	10

Office Expenses	8	8	8	8	8	8
S & D Expenses	5	4	6	8	5	7

- Dividends received in the month of July and December Rs.50,000 each.
- Sale of old machinery in the month of September Rs.100,000.
- Equipment purchased in the month of September payable in the month of November Rs.6,00,000.
- Loan taken in the month of October Rs.5,00,000.
- Dividends paid in the month of December Rs.500,000.
- Purchases and sales are on one-month credit basis.
- The time lag in payment of wages is 15 days.
- Cash balance on July 1st was Rs. 200,000.

Note : Manufacturing wages to be paid in a month = Half of current month wages and half of last month wages.

(Answer: Closing cash balance at the end of December Rs. 4,88,625)

- From the following data ascertain whether the firm has surplus or deficiency of cash :

The financial manager feels that the safety level should provide sufficient cash to cover cash payments for 7 days and the average daily cash outflows are 6000 and the actual cash balance is 50,000.

During the three busiest days in the month of December, the firm's cash outflows were Rs.10,000, 12,000, and 20,000. The average cash an outflow comes to Rs.20,000 .the finance manager desires sufficient cash to cover cash payments for 5 days during the peak period. The actual cash balance was Rs.150,000.

(Answer: Normal Period : Surplus and Peak Period : Surplus)

- A Company purchases materials on credit and makes payments within 40 days. Its debtors should pay the amounts within 45 days. On an average, it takes 50 days to pay its accounts payable and receive its accounts receivable in 60 days. The average age of inventory is 100 days. Determine the firm's cash cycle and cash turnover.

(Answer: Cash Cycle – 110 days and Cash Turnover = 3.27 times)

- ABC co. Ltd wants to introduce the lock-box system. It is estimated that the lock-box system shall reduce the average collection period by 5 days. The credit sales of the company are estimated to be Rs. 500 lakhs per annum. The cost of funds for the firm is 20%. The cost of lock-box system is Rs. 200000 p.a.

Advice the ABC co. Ltd.

(Answer: Net loss Rs. 61,100. Therefore, lock box system is not advisable).

5. Beta co. Ltd: On an average sells 100000units. @ Rs. 50 p.u. Assuming that the total fixed charges (other than depreciation) Rs. 1000000/-, depreciation Rs. 200000, variable cost Rs. 10 p.u. Calculate the cash break even point.

(Answer: 25,000 units)

6. From the following information draw a cash budget for a period of 6 months ending June.
(Rs. '000s)

i) Month	Sales Rs.	Production expenses Rs.	Other expenses Rs.
November	500	30	47
December	600	40	50
January	300	20	40
February	400	15	30
March	500	20	20
April	300	30	15
May	200	40	20
June	250	50	30

- ii) 50% of the sales are on cash and the balance on credit.
 iii) The company has a gross margin of 30% of sales.
 iv) 40% of the credit sales are collected in the month following the sales, 30% in the second month and 30% in the third month.
 v) Raw material for the sale of each month is purchased one month in advance on a credit for two month.
 vi) The time lag in the payment of production expenses is one-third of a month and of other expenses $\frac{1}{2}$ a month.
 vii) A minimum cash balance of Rs. 100000/- is to be maintained. Amount can be borrowed @ 15% p.a. and the interest being payable on monthly basis.

(Answer: Closing Balance at the end of June Rs. 3,21,537)

15.10 FURTHER READINGS

1. Khan and Jain : **Financial Management**, Tata Mc Graw Hill.
2. I.M. Pandey : **Financial Management**, Vikas Publishing House (P) Ltd.
3. P.V. Kulkarni : **Financial Management**.

UNIT – 16 : RECEIVABLES MANAGEMENT

Objectives

The objectives of this Unit are to:

- understand the importance of trade credit;
- examine the effects of change in credit policy; and
- discuss the aspects of credit policy.

Structure

- 16.0 Introduction
- 16.1 Meaning
- 16.2 Objectives of Receivables Management
- 16.3 Costs of Credit Extension
- 16.4 Benefits of Credit Extension
- 16.5 Credit Policy
- 16.6 Aspects of Credit Policy
 - 16.6.1 Credit Terms
 - 16.6.2 Credit Standards
 - 16.6.3 Credit Analysis
 - 16.6.4 Collection Policy
- 16.7 Effects of change in Credit Policy
- 16.8 Factoring
- 16.9 Types of Factoring
- 16.10 Illustrations
- 16.11 Summary
- 16.12 Self Assessment Questions
- 16.13 Further Readings
- 16.14 Key Words

16.0 INTRODUCTION

A firm can sell the product either on cash or on credit. Trade credit arises when a firm sells its products or services on credit i.e., allow the customers a reasonable period of time to pay for the goods or services purchased. A firm's investment of funds in account's receivable involves a trade off between profitability and risk. The optimum investment is determined by comparing benefits to be desired from a particular level of investment with the cost of maintaining that level.

16.1 MEANING OF RECEIVABLES

The term 'Receivables' refers to the debt due to the firm from the customers for the sale of goods or services rendered by the firm in the ordinary course of business. Accounts Receivables are created in the firm, when it sells goods or services on credit basis. Trade credit is a technique to increase the sales of the firm. Trade credit is extended to customers to attract the new customers and to protect the current sales against emerging competition.

The following are the features of accounts receivables.

- 1) The firm loses the time value of money by keeping its money tied up in accounts receivables thus resulting in opportunity cost. Had the money tied up in receivables been invested elsewhere, the firm would have earned a return, which is foregone now.
- 2) The firm runs the risk of the amounts due from the receivables not being paid.
- 3) The economic value of goods or services is passed on to the customer immediately while the seller expects an equivalent value to be received later on.

As substantial amounts are tied up in receivables, there should be a careful analysis and proper management of receivables.

16.2 OBJECTIVES OF RECEIVABLES MANAGEMENT

The purpose of trade credit is neither to maximize the sales (if so, all sales of the firm would have been on credit basis) nor to minimize the risk (if so, all sales would have been on cash basis only). The objective of the firm is to manage its trade credit in such a way to expand its sales with an acceptable level of risk. Trade credit is so managed to achieve an optimum level of sales to keep the costs of trade credit at a minimum and to maintain an optimum level of receivables by achieving a trade off between the costs of extending credit and benefits accruing from it.

16.3 COSTS OF CREDIT EXTENSION

The costs of credit extension are given below.

1. **Opportunity cost:** The use of credit results in blocking up of funds in receivables, thus, foregoing the return which could have been earned on the investment of funds blocked in receivables.
2. **Administrative costs:** The maintenance of receivables calls for investigations to be carried out to find out the credit worthiness or otherwise of its customers.
3. **Cost of collection:** For an effective collection of receivables, several persons or collection agencies are to be appointed to remind the customers to make payments which involves a cost.
4. **Bad debts:** Invariably, some amount of bad debts would be incurred because of default on the part of delinquent customers. In order to reduce the bad debts, cash discounts may have to be offered to encourage the customers to pay their bills before the due date, which is again a loss to the firm.

Activity – I

State the costs of credit extension.

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16.4 BENEFITS OF CREDIT EXTENSION

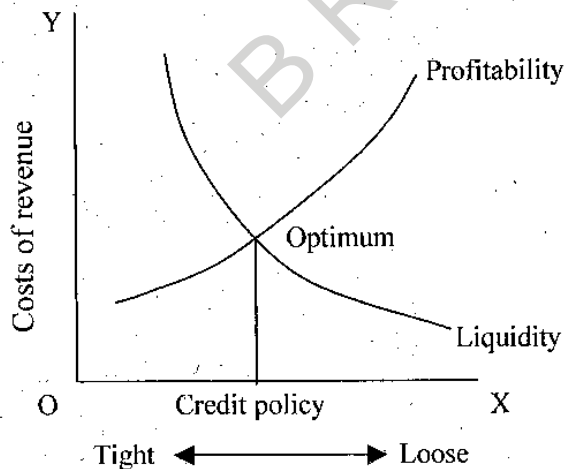
The benefits of credit extension are:

- **Expansion of sales:** Customers may have to be motivated to buy goods with the offer of credit terms. Receivables enable the firm to effectively push its sales in the market.
- **Increased profit:** With the increase in sales, profits also increase, with fixed cost however remaining constant.

Too much investment in receivables (liberal credit policy) blocks the funds and poses liquidity risk apart from resulting in opportunity loss. But, at the same time, sales increase and profits also increase, as fixed cost remains constant. Therefore, a trade off between liquidity and profitability is a must.

The point of intersection between liquidity and profitability curves determine the optimum credit policy, which is presented below.

Figure 1



16.5 CREDIT POLICY

The firms extending credit can follow either a lenient policy or a stringent policy.

Lenient / Loose / Expansive Credit Policy

When a firm extends credit to the customers whose creditworthiness is doubtful and for a very long period, then the firm is said to be on a liberal front in terms of credit. No doubt, sales

will increase resulting in increased profits but at the same time, the firm faces a problem of liquidity, increased bad debts, collection costs and loss on account of cash discount offers.

Stringent / Tight / Restrictive Credit Policy

Under this policy, the firm is cautious in extending trade credit. Only those customers who have proven their credit worthiness are offered credit. As a result, all costs connected with trade credit are minimized, but, at the same time, sales and profit margins are restricted.

Therefore, the firms normally follow a credit policy, which is neither too lenient nor too stringent credit policy. Here, the objective of credit management is to achieve a balance between a stringent and lenient policy that maximizes the overall return of the firm.

Activity – II

Distinguish between lenient and stringent credit policies.

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16.6 ASPECTS OF CREDIT POLICY

The important aspects of credit policy are credit terms, credit standards, credit analysis and collection policies.

16.6.1 CREDIT TERMS

The repayment terms required of all the firm's credit customers are specified by a firm's credit terms. The credit terms include (a) credit period (b) cash discount and (c) cash discount period. Credit terms may be stated as "2/10 net 30" which mean that the purchaser has to pay the bill amount within 30 days which represent the credit period. 2/10 indicates 2% cash discount, which can be availed if the purchaser pays the bill amount within 10 days after the beginning of the credit period. The period 10 days has reference to the cash discount offer period within which the cash discount offer can be availed of.

16.6.2 CREDIT STANDARDS

Before granting the credit to the customers, the firm should analyze their credit worthiness. This involves an analysis of five C's of credit viz., character, capacity, capital, collateral and conditions.

- **Character** refers to the willingness of the customer to pay the bill. The customers past payment history as well as any pending or resolved legal judgments against him would be checked.
- **Capacity** shows the ability of the customer to pay. Here, the emphasis is on liquidity.
- To assess the **Capital** base, the firm should examine the net worth of the customer. The financial strength of the applicant is reflected by the ownership position.

- The firm has to examine the kind of **collateral security** offered by the customer in securing the credit.
- General economic and business **conditions** also play a role in granting credit. For e.g., if the firm has excess inventory of the items the customer is willing to purchase, then the firm may be willing to sell such items on more favorable terms of credit or even to less credit worthy applicants.

16.6.3 CREDIT ANALYSIS

If the firm has previously extended credit to the applicant, it will have its own information on the payment history of the applicant. There will always be a problem in obtaining financial and qualitative information about the new customers. The company may analyze the financial statements of the customer, obtain credit information from the applicant's banks, ask the customer to provide a list of references or the names of companies with whom the customer has transacted in the past and may also obtain information by interviewing the customer or visiting his place of work.

Once the firm obtains the information and decides to extend credit to the applicant, the amount and duration of the credit has to be decided. In case of a frequent buyer, a line of credit is established avoiding the need to investigate each order from the customer. The line of credit shows the maximum amount and maximum period of the credit the firm would extend to the customer. In case the customer wants an extended period of credit, a cost benefit analysis of extended credit period would be made and then a decision would be taken.

Activity – III

Describe credit analysis.

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16.6.4 COLLECTION POLICY

It is the procedure adopted by the firm to collect the amount due on its receivables. The effectiveness of the policy can be evaluated by a reduction in the level of bad debt expenses. To encourage prompt payment of firm's dues, cash discounts are offered to the customers.

To speed up the collections, the company may design a policy of sending a letter or call in the customer on telephone few days before the payment becomes due. When the bills become overdue, a visit to the customer may prove to be effective. The firm should try to understand the problems of the customer for not paying and if they are found to be genuine, the firm should not take stringent action. Legal action should be the last resort. In some cases, it may prove to be worthless when the customer becomes bankrupt.

If the firm is strict with regard to the collection policy in case of permanent but temporarily slow payers, they may get offended and shift to the competitors and the firm loses its permanent customers. At the same time, if the firm is lenient in its collection policy, bad debts may increase and profitability would be affected. Therefore, the firm should follow an optimum collection policy by achieving a trade off between costs and benefits, which maximizes profitability and the value of the firm.

16.7 EFFECTS OF CHANGE IN CREDIT POLICY

A change in any of the variables of credit policy will have an impact on the revenues and costs, thus affecting the profitability of the firm.

- **Change in credit standards:** A relaxation in credit standards will result in additional profit contribution from sales which has to be compared with added costs of the marginal investment in accounts receivables and the cost of marginal bad debts. If the benefit exceeds the cost, credit standards should be relaxed, otherwise, present standards should be unchanged.
- **Change in credit terms:** Credit terms include cash discount and credit period. By initiating or increasing cash discount, sales volume would increase, chances of bad debts would reduce and average investment in accounts receivables would reduce leading to an increase in profit. At the same time, the amount of cash discount offered would be a loss. By extending the credit period, the costs that would be incurred would be in the form of additional bad debts and opportunity cost of additional investment in receivables. The positive effect on profit would be due to increased sales volume. A cost benefit analysis will enable the firm to take a right decision.
- **Change in collection effort:** With a tight collection policy, chances of bad debts and investment in accounts receivables would reduce due to reduced collection period having a positive effect on profits. But, at the same time, the negative effect would be because of a decline in sales volume and increase in collection expenses. Therefore, savings should be compared with costs and then a decision should be taken with regard to the collection efforts.

Important Formulae

Investment in Accounts Receivables = Total Cost / Debtors Turnover

Debtors Turnover = No. of days in a year / Collection Period

Opportunity Cost = Funds Blocked x Rate of Return on Investment

Return on Funds Released = Funds Released x Rate of Return on Investment

Funds Blocked = New Investment – Original Investment in Accounts Receivables

Funds Released = Original Investment – New Investment in Accounts Receivables

A comparison is always made between present position and new position to see if there is a benefit or additional cost incurred due to shifting from present policy to a new policy.

16.8 FACTORING

In large concerns, the management of receivables may be difficult and the firm may be exposed to more and more default from the customers. Therefore, large concerns may entrust the work of collection of receivables to specialized organizations (called Factors) which are engaged in receivables management.

Factoring is a method of financing whereby a firm sells its trade debts at a discount to a financial institution. In other words, factoring is a continuous arrangement between a financial

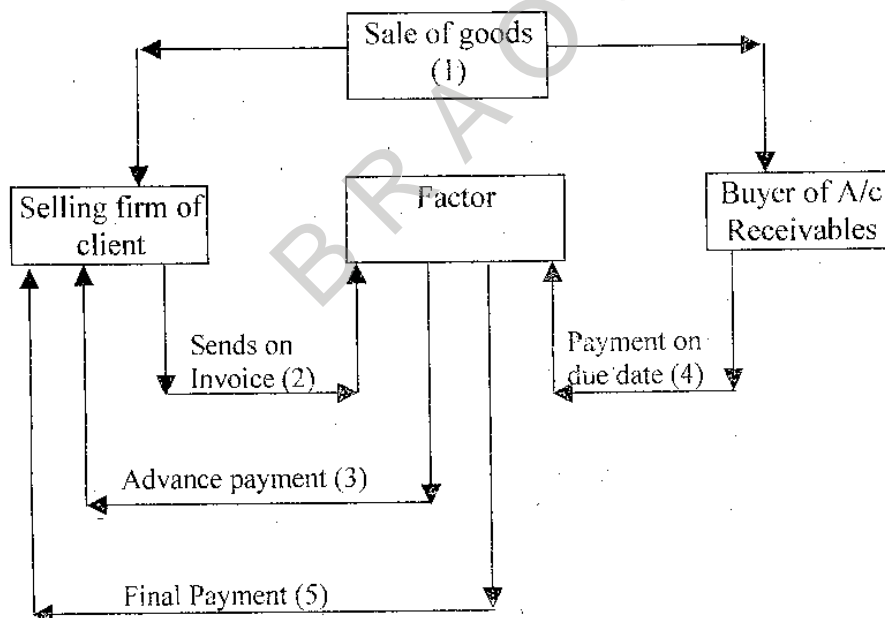
institution (namely the factor) and a firm (namely the client) which sells goods and services to trade customers on credit. As per this arrangement, the factor purchases the clients trade debts including accounts receivable either with or without recourse to the client and thus exercises control over the credit extended to the customers and administers the sales ledger of his client. To put it in a layman's language, a factor is an agent who collects the dues of his client for a certain fee.

The Kalyana Sundaram Committee has heralded the entry of factoring in India mainly to mitigate the difficulties faced by the small scale entrepreneurs, many of which were unable to collect their receivables from large corporate to whom they have invoice supplies.

Factoring Procedure

Under an agreement between the selling firms and the factor firm, the factor evaluates the credit worthiness of the potential customers. On the basis of the evaluation, the factor fixes limits for the customers of the client indicating the extent and period for which factor is prepared to accept the client debts on such customers. The client after selling the goods to the customer, sends the invoice to the factor. The factor pays an advance to the client and the balance is paid on maturity or on payment by the customer. At the end of the credit period, the customer makes the payment of the invoice to the factor.

Figure 2



Thus, the factor provides debt management services relieving the seller of the burden of administration of accounts receivable and save the administration cost. The seller's funds are released instead of getting blocked in receivables.

For the services rendered, the factor may charge substantial fees and commission for the collection of receivables. Though factoring is a costly service, some firms may find it more economical than to have their own collection department.

16.9 TYPES OF FACTORING

The factoring services can be classified as under:

1. Recourse Factoring

In case of a recourse factoring, the factor can have a recourse to the seller if the buyer is not paying the amount. Thus, the risk of bad debts is of the supplier. It is also known as 'Pure Factor'. Here, the factor does only the work of collection of the receivables. In case of default, the selling firm will have to refund the amount to the factor together with the charges as per the agreement.

2. Non-recourse Factoring

In case of Non Recourse, the factor assumes the risk and proceeds against the customer in case of bad debts. This type of factoring is also known as "Full Factoring" as the factor undertakes all the activities like evaluation of credit worthiness, collection of debts and assessing the risk of bad debts.

3. Disclosed Factoring

Here, the name of the factor is disclosed in the invoice by the seller asking the buyer to make payment directly to the factor named therein.

4. Factoring with Bank Participation

Here, the factor pays an advance to the buyer and the bank finances that portion of debt which the factor has held in reserve.

5. Export Factoring

The factor provides factoring services only in case of export debts.

Activity – IV

Distinguish between recourse factoring and non-recourse factoring.

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16.10 ILLUSTRATIONS

Illustration - 1

From the following calculate average age of receivables.

1. Sales (all credit sales) for the year	Rs.2,00,000
Opening accounts receivable	Rs.1,00,000
Closing accounts receivable	Rs. 50,000

Solution

$$\text{Average Accounts Receivables} = (\text{Opening Receivables} + \text{Closing Receivables}) / 2$$
$$(1,00,000 + 50,000) / 2 = \text{Rs. } 75,000$$

$$\text{Average Receivables Turnover} = \text{Credit Sales} / \text{Average Accounts Receivables}$$
$$2,00,000 / 75,000 = 2.66 \text{ times}$$

$$\text{Average age of Receivables} = \text{Months or days in a year} / \text{Average receivables turnover}$$
$$12\text{months} / 2.66 \text{ times} = 4.51 \text{ months}$$

Illustration - 2

A Company is selling 10,000 units @ 50 per unit. All sales are credit sales. The costs of producing and marketing the units – Direct wages Rs.5 per unit, Direct materials Rs.5 per unit, Variable overheads Rs.15 per unit, selling and distribution costs per unit Rs.10 and General and Administration costs are Rs.5,00,000. The average collection period may be assumed to be 30 days. Calculate average investment in receivables.

Solution

Variable Cost	10,000 units x 35	=	Rs. 3,50,000
Fixed Cost			Rs. 5,00,000
Total Cost			<u>Rs. 8,50,000</u>

$$\text{Average Receivables Turnover} = \text{No. of days in a year} / \text{collection period}$$
$$= 360 / 30 = 12 \text{ times}$$

$$\text{Average investment in receivables} = \text{Total Cost} / \text{Receivables turnover}$$
$$= 8,50,000 / 12 = \text{Rs. } 70,833$$

Illustration - 3

The following are the details regarding the operations of a company during a period of 12 months.

Sales	Rs.20,00,000
Selling price per unit	Rs.10
Variable cost per unit	Rs.5
Average cost per unit	Rs.8
Collection period	60 days

Calculate Average investment in Receivables and also Calculate fixed cost.

Solution

Average Cost (Total Cost) $2,00,000 \times 8 =$	Rs. 16,00,000
Less Variable Cost $2,00,000 \times 5 =$	Rs. 10,00,000
Fixed Cost	<u>Rs. 6,00,000</u>

No. of units = $20,00,000 / 10 =$ Rs. 2,00,000

Receivables turnover = $360 / 60 = 6$ times

Average investment in receivables = Total Cost / Receivables turnover
= $16,00,000 / 6 =$ Rs. 2,66,667

Illustration - 4

The following are the details regarding operations of a firm during a period of 12 months.

Sales	Rs.50,00,000
Selling price per unit	Rs.25
Variable cost per unit	Rs.12
Average cost per unit	Rs.15
Credit allowed to customers	40 days

The firm is considering the proposal for a more liberal extension of credit which will result in increase in the average collection period from 40 days to 60 days. This relaxation is expected to increase the sales by 40% from its existing level.

You are required to advise the firm regarding the adoption of new credit policy, presuming that if firms required rate of return on investments is 20%.

Solution

	Present Rs.	Future Rs.
Variable Cost (2,00,000 x 12)	24,00,000	33,60,000 (2,80,000 x 12)
Fixed Cost (balance)	<u>6,00,000</u>	<u>6,00,000</u>
Total Cost (2,00,000 x 15)	30,00,000	39,60,000
Sales (2,00,000 x 25)	<u>50,00,000</u>	<u>70,00,000 (2,80,000 x 25)</u>
Profit	<u>20,00,000</u>	<u>30,40,000</u>

Increase in Profit : $30,40,000 - 20,00,000 =$ Rs. 10,40,000 (benefit)

Average Investment in Accounts Receivables :	<u>30,00,000</u>	<u>39,60,000</u>
	360/40	360/60

Rs. 3,33,333 Rs. 6,60,000

Increase in the investment in Accounts Receivables : $6,60,000 - 3,33,333 = \text{Rs. } 3,26,667$
(funds blocked)

$$\begin{aligned} \text{Opportunity Cost} &= \text{Funds Blocked} \times \text{Rate of Return} \\ &= 3,26,667 \times 20\% = \text{Rs. } 65,333 \text{ (cost)} \end{aligned}$$

Net benefit from the new proposal = $10,40,000 - 65,333 = \text{Rs. } 9,74,667$

As the new proposal results in a net benefit, accept the new proposal.

Illustration - 5

A company in the process of pushing up its sales wants to relax its credit policy from the average collection period of 30 days to 60 days. Presently it is selling 50,000 units @ Rs.25 per unit. The variable cost per unit is Rs.10 and the average cost Rs.20 per unit. Due to relaxation of the credit policy, their sales are expected to increase by 20%. Bad debts will increase from 2% to 5% due to the relaxation.

You are required to advise whether the company should retain its credit policy if the firm's required rate of return is 25%.

Solution

	Present Rs.	Future Rs.
Variable Cost (50,000 x 10)	5,00,000	6,00,000 (60,000 x 10)
Fixed Cost (balance)	5,00,000	5,00,000
Total Cost (50,000 x 20)	10,00,000	11,00,000
Sales (50,000 x 25)	12,50,000	15,00,000 (60,000 x 25)
Profit	2,50,000	4,00,000

Increase in Profit : $4,00,000 - 2,50,000 = \text{Rs. } 1,50,000$ (benefit)

Average Investment in Accounts Receivables :	10,00,000	11,00,000
	360/30	360/60

Rs. 83,333 Rs. 1,83,333

Increase in the investment in Accounts Receivables : $1,83,333 - 83,333 = \text{Rs. } 1,00,000$
(funds blocked)

$$\begin{aligned} \text{Opportunity Cost} &= \text{Funds Blocked} \times \text{Rate of Return} \\ &= 1,00,000 \times 25\% = \text{Rs. } 25,000 \text{ (cost)} \end{aligned}$$

$$\begin{aligned} \text{Bad Debts} &= \text{Sales} \times \text{Bad debts \%} \\ &= 12,50,000 \times 2\% \quad 15,00,000 \times 5\% \\ &= \text{Rs. } 25,000 = \text{Rs. } 75,000 \end{aligned}$$

Increase in bad debts : $75,000 - 25,000 = \text{Rs. } 50,000$ (cost)

Total Cost = $\text{Rs. } 25,000 + \text{Rs. } 50,000 = \text{Rs. } 75,000$

Total Benefit = $\text{Rs. } 1,50,000$

Net Benefit = $1,50,000 - 75,000 = \text{Rs. } 75,000$

Accept the new proposal.

Illustration - 6

The Financial Manager of the firm feels that the funds are getting lapped for long periods in the Receivables and therefore wants to tighten the credit policy.

Currently the firm is selling 25,000 units @ Rs.100 each, the variable cost and average cost being Rs.50 per unit and Rs.75 per unit respectively while the average collection period is 90 days and the bad debts amount to 5%.

The proposed credit policy has an average collection period of 40 days. As the collection procedures are tightened the sales are expected to fall by 1,000 units and the firm has to incur Rs.30,000 towards collection charges. Bad debts will be 2% on sales.

Assuming a 25% rate of return on investments, what would be your recommendation.

Solution

	Present Rs.	Future Rs.
Variable Cost (25,000 x 50)	12,50,000	12,00,000 (24,500 x 50)
Fixed Cost (balance)	6,25,000	6,25,000
Total Cost (25,000 x 75)	18,75,000	18,25,000
Sales (25,000 x 100)	25,00,000	24,00,000 (24,000 x 100)
Profit	6,25,000	5,75,000

Decrease in Profit : $6,25,000 - 5,75,000 = \text{Rs. } 50,000$ (cost)

Average Investment in Accounts Receivables :	$\frac{18,75,000}{360/90}$	$\frac{18,25,000}{360/40}$
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Rs.4,68,750 Rs. 2,02,778

Decrease in the investment in Accounts Receivables :

$\text{Rs. } 4,68,750 - \text{Rs. } 2,02,778 = \text{Rs. } 2,65,972$ (funds released)

Return on Investment on funds released = Funds Released x Rate of Return

$2,65,972 \times 25\% = \text{Rs. } 66,493$ (benefit)

Bad Debts = Sales x Bad debts %

$25,00,000 \times 5\%$ $24,00,000 \times 2\%$

$$= \text{Rs. } 1,25,000 \quad = \text{Rs. } 48,000$$

Decrease in bad debts : Rs. 1,25,000 - Rs. 48,000 = Rs. 77,000 (benefit)

Additional Collection Charges = Rs. 30,000 (cost)

Total Cost = Rs. 30,000 + Rs. 50,000 = Rs. 80,000

Total Benefit = Rs. 66,493 + Rs. 77,000 = Rs. 1,43,493

Net Benefit = 1,43,493 - 80,000 = Rs. 63,493

Accept the new proposal.

Illustration - 7

Beta Company Ltd. has an annual sale of Rs.60,00,000 and is currently extending 40 days credit to the dealers. It is felt that sales can pick up considerably if the dealers are willing to carry increased stocks, but the dealers have difficulty in financing their inventory. Beta Company Ltd. is, therefore, considering shifts in credit policy. The following information is available.

The average collection period for the current policy is 20 days

Variable costs @ 75%

Fixed costs Rs.10,00,000

Required return on investment 25%

Credit policy	Average collection	Annual sales (Rupees in lakhs)	Bad debts
A	45	65	0.5
B	60	80	0.75
C	72	100	1.75
D	90	120	6.00

Determine which policy the company should adopt.

Solution

Particulars	Present	Policy A	Policy B	(Rs. In Lakhs)	
				Policy C	Policy D
Sales Revenue	60	65	80	100	120
Less Variable Costs	45	48.75	60	75	90
Contribution	15	16.25	20	25	30
Less Fixed Costs	10	10.00	10	10	10
Profit	5	6.25	10	15	20
a) Increase in profit	-	1.25	5	10	15
Investment Turnover	360/20=18	360/45=8	360/60=6	360/72=5	360/90=4

Investment in Receivables (Rs.)	55/18	58.75/8	70/6	85/5	100/4
	=3.06	=7.34	=11.67	=17	=25
Funds blocked(Rs.) (increase in Investment)	-	4.28	8.61	13.94	21.94
b) Opportunity Cost (Rs.) (Funds blocked X Rate)	-	1.07	2.15	3.49	5.49
c) Bad Debts (Sales X Bad debts %) (Rs.)	-	65 x .5%	80 x .75%	100x1.75%	120 x 6%
	-	0.325	0.60	1.75	7.2
Total Cost (b + c) (Rs.)	-	1.395	2.75	5.24	12.69
Net benefit / loss (Rs.)	-	(-)0.145	2.25	4.76	2.31

Policy C should be adopted as it yields maximum profit.

Illustration - 8

A company currently has sales of 1,00,000 units @Rs.50 with an average collection period of 90 days, the variable cost and the average cost being Rs.30 and Rs.40. Presently the company is contemplating to offer 5% cash discount for payment within 15 days.

It is expected that the change in credit terms will result in increase in sales to 1,50,000 units and the average collection period will fall to 60 days. However, due to increased sales, increased working capital required will be Rs.5,00,000. Assuming that 40% of the total sales will be on cash discount and 25% is the required rate of return on investment should the proposed discount be offered?

Solution

	Present Rs.	Future Rs.
Variable Cost (1,00,000 x 30)	30,00,000	45,00,000 (1,50,000 x 30)
Fixed Cost (balance)	10,00,000	10,00,000
Total Cost (1,00,000 x 40)	40,00,000	55,00,000
Sales (1,00,000 x 50)	50,00,000	75,00,000 (1,50,000 x 50)
Profit	10,00,000	20,00,000

Increase in Profit : 20,00,000 – 10,00,000 = Rs. 10,00,000 (benefit)

Cash Discount Nil 75,00,000 x 5 % x 40 %
= Rs. 1,50,000 (Cost)

Additional Working Capital 5,00,000 x 25% = Rs. 1,25,000 (Cost)

Average Investment in Accounts Receivables :	40,00,000	55,00,000
	360/90	360/60
	Rs.10,00,000	Rs. 9,16,667

Decrease in the investment in Accounts Receivables :

$$\text{Rs.10,00,000} - \text{Rs. 9,16,667} = \text{Rs. 83,333 (funds released)}$$

Return on Investment = Funds Released x Rate of Return

$$83,333 \times 25\% = \text{Rs. 20,833 (benefit)}$$

$$\text{Total Cost} = \text{Rs. 1,25,000} + \text{Rs. 1,50,000} = \text{Rs 2,75,000}$$

$$\text{Total Benefit} = \text{Rs. 10,00,000} + 20,833 = \text{Rs. 10,20,833}$$

$$\text{Net Benefit} = 10,20,833 - 2,75,000 = \text{Rs. 7,45,833}$$

the new proposal.

Illustration – 9

A company has credit sales of Rs.50,00,000 and its average collection period is 50 days. The past experience indicates that bad debts losses are around 0.50% of credit sales. The company spends about Rs.1,50,000 per annum on administering its credit sales. These are avoidable costs. A factor is prepared to buy the firm's receivables. He will charge 1.5% commission. He will also pay advance against receivables to the firm at an interest rate of 15% after withholding 5% as reserve. What is the cost of factoring?

Solution

$$\begin{aligned} \text{Calculation of Average Receivables} &= \frac{50,00,000}{360 / 50} \\ &= \text{Rs. 6,94,444} \end{aligned}$$

$$\begin{aligned} \text{Factoring Commission} &= 1.5 \% \text{ of Average Receivables} \\ &= 6,94,444 \times 1.5 \% = \text{Rs. 10,416.67} \end{aligned}$$

$$\text{Reserve @ 5 \% of Receivables} = 6,94,444 \times 5 \% = \text{Rs. 34,722.20}$$

$$\text{Advance payable by Factor} = 6,94,444 - 10,416 - 34,722 = \text{Rs. 6,49,306}$$

$$\text{Interest Chargeable @ 15 \%} = 6,49,306 \times 15 \% \times 50/360 = \text{Rs. 13,527}$$

$$\text{Net Amount of Advance} = 6,49,306 - 13,527 = \text{Rs. 6,35,779}$$

Cost of Factoring :

Commission	Rs. 10,416.67
Interest	Rs. 13,527.00
Total	<u>Rs. 23,943.67</u>

Annualised Cost $23,943 \times 360 / 50 =$ Rs. 1,72,394.42

Less:

Savings in bad debts $50,00,000 \times 0.5 \% =$ Rs. 25,000.00

Administrative Cost $=$ Rs. 50,000.00

Net Cost $=$ Rs. 97,394.42

Effective Rate of Cost $= (97,394.42 \times 100) / 6,49,306 = 14.99 \%$ or 15 %

16.11 SUMMARY

Accounts Receivable is the firm's extension of credit to its customers. Trade credit is a technique to increase the sales of the firm. It helps to retain the present customers and attract the new ones. The objective of the firm is to manage its trade credit in such a way as to expand its sales with an acceptable level of risk. It is necessary to maintain an optimum level of receivables by making a trade off between the costs of extending credit and benefits accruing from it.

Trade credit results in certain costs like opportunity cost, cost of collection, bad debts and increased administrative expenses. At the same time, it expands sales resulting in increase in profit. Therefore, a trade off between liquidity and profitability is a must. The point of intersection of liquidity and profitability curves determine the optimum credit policy.

Normally, the firms follow a credit policy which is in between lenient and stringent credit policy to maximize the overall return of the firm.

The important aspects of credit policy are credit terms, credit standards and collection policies. A change in any of these variables will have an impact on the revenues and costs, thus affecting the profitability of the firm. A change in these variables is desirable only when the benefits exceed the costs.

Instead of having a separate collection department in the concern, large concerns may find it more economical to entrust the accounts receivables to the specialized agency called as 'Factor'. Here, the factor takes up the responsibility of monitoring and collecting the receivables and thus relieves the management of administrative work and releases the funds blocked in accounts receivables.

16.12 SELF ASSESSMENT QUESTIONS

A. Short Answer Questions

1. What do you mean by 'Accounts Receivables'? What are its objectives?
2. Briefly explain the five Cs of credit analysis and discuss their role in the credit selection process.
3. What do you mean by 'credit terms'? How do they affect the firm's accounts receivables?

B. Long Answer Questions

1. Discuss the effects of change in credit policy.
2. How do you determine the optimum credit policy?
3. Explain the various aspects of credit policy.
4. What do you understand by 'Factoring'? Explain the different types of factoring.

Exercises

1. From the following calculate average age of receivables.

XYZ Co. on an average sells 8,00,000 units @ Rs.50 p.a. 20% of sales are credit sales. The balance of sundry debtors and bills receivables on January 1st was Rs20,00,000 and Rs.2,00,000 and the balance on 31st December was Rs10,00,000 and 2,00,000 respectively.

(Answer : 2.55 months)

2. A firm is considering whether collection policies should be made strict. Currently it is selling 1,50,000 units at Rs.30 each. Bad debts expenses are 6%, collection expenditures is Rs.50,000, the average collection period is 45 days. The variable and average cost being Rs.20 and Rs.25 respectively.

With additional collection charges of Rs.50,000, it is expected that the bad debt expenses will be only 2% and the average collection period will decline to 30 days. Due to rigorous collection procedure, the sales are expected to fall by 20%. If the required rate of return is 20%, what advice would you give to the firm.

(Answer : Benefit Rs. 2,39,250 and Cost Rs. 3,50,000)

3. A company has an annual credit sales of Rs.45,00,000. It allows 40 days credit to its customers with no cash discount. It is contemplating to offer a discount of "3/10" net 40. It is expected that this will reduce the average collection period to one month and 40% of the customers (in value) will take advantage of this benefit. The selling price is Rs.45 per unit, while the average cost per unit comes to Rs.10.

You are required to advise the firm regarding this new scheme presuming that the required rate of return on investment is 25%.

(Answer : Benefit Rs. 6,944 and Cost Rs. 54,000)

4. The present credit terms of a company are 2/20 net 40 days. Its annual sales are Rs.10,00,000, its average collection period is 25 days. Its variable costs and average total costs to sales are 0.75 and 0.80 respectively and its cost of capital is 25%. The proportion of sales on which customers currently take 0.75. The company is considering relaxing its discount terms to 4/10 net 25 days. Such relaxation is expected to increase sales by 50%, reduce the average collection period to 10 days and increase the proportion of discount sales to 0.9. What will be the effect of relaxing the discount policy on company's profit? Take year as 360 days.

(Answer : Benefit Rs. 1,30,729 and Cost Rs. 39,000)

5. The sales of a company is Rs.80,00,000 . Debtors are allowed 40 days credit. A factor is willing to advance 80% of the bills raised on credit for a fee of 3% a month plus a commission of 2% on the total amount of debts. R. Ltd. as a result of this arrangement is likely to save Rs.50,000 annually in management costs and avoid bad debts at 2% on the credit sales.

Advice whether the company should go for factoring or bank loan @ 18%.

(Answer : Net Factoring Cost Rs. 15,833 (Fee Rs. 20,000 + Commission Rs. 13,333 – Saving in cost Rs. 4,167 – Bad debts Rs. 13,333)

Bank Cost Rs. 26,667 (Interest Rs. 13,333 + Bad debt Rs. 13,333)

16.13 FURTHER READINGS

- Khan & Jain : **Financial Management**, Tata Mc Graw Hill
- I.M. Pandey : **Financial Management**, Vikas Publishing House (P) Ltd.
- P.V. Kulkarni : **Financial Management**
- R.P. Rustagi : **Financial Management : Theory, concepts and problems**, Galgotia Publishing Co., New Delhi.
- James C. Van Horne : **Financial Management Policy**, Twelfth Pearson Education, New Delhi.
- James C. Van Horne & John M. Wachowicz, JR : **Fundamentals of Financial Management**, Pearson Education, New Delhi.

16.14 KEY WORDS

- Receivables** : Debt due to the firm from the customers for the sale of goods or services rendered.
- Lenient Credit Policy** : The firm extends credit to the customers whose credit worthiness is doubtful and for a very long period.
- Stringent Credit Policy** : Credit is extended only to those customers whose credit worthiness is proved.
- Credit Terms** : The repayment terms required of all the firms credit customers. They include credit period, cash discount and cash discount period.
- Character** : The willingness of the customers to pay the bill.

Capacity

: The ability of the customer to pay the bill.

Collection Policy

: The procedure adopted by the firm to collect the amount due from its receivables.

BRAOU

UNIT – 17 : INVENTORY MANAGEMENT

Objectives

The objectives of this Unit are to:

- understand the importance of inventory ; and
- study the various techniques of inventory control.

Structure

- 17.0 Introduction
- 17.1 Meaning
- 17.2 Objectives of Inventory Management
- 17.3 Inventory Control Techniques
 - 17.3.1 Deciding the various Stock Levels of Inventory
 - 17.3.2 Determination of Reorder Quantity or Economic Order Quantity
 - 17.3.3 Always Better Control Analysis
 - 17.3.4 Perpetual Inventory Control
 - 17.3.5 Stock Turnover Ratio
 - 17.3.6 VED Classification
 - 17.3.7 FSN Classification
 - 17.3.8 Re-Order Point
 - 17.3.9 Safety Stock
- 17.4 Summary
- 17.5 Self Assessment Questions
- 17.6 Further Readings
- 17.7 Key Words

17.0 INTRODUCTION

Inventories form a link between the production and sale of a product. A manufacturing firm must maintain a certain amount of inventory, known as work-in-progress, during production. Although other types of inventory-in-transit, raw materials and finished goods inventories – are not necessary in the strictest sense, they allow the firm to be flexible.

Excessive inventories increase the cost of the firm, while inadequate inventories disrupt the production and sales activity. Hence, efficient and effective inventory management aims at maintaining just adequate stocks which are neither excessive nor inadequate.

17.1 MEANING

The word inventory refers to stock of goods. It includes the value of raw materials, consumables, spares, work-in-progress, finished goods and scrap in which the funds of the company have been invested.

The purpose of carrying inventory is to uncouple the operations of the firm i.e., to make each function of the firm independent of the other functions so that the delays in one area do not affect the production and sales activities. Through the inventory is more directly related to production and marketing departments, still financial manager has to play an active role in the management of inventory.

Investment in inventory involves two aspects. The first aspect is blocking up of capital and thus incurring opportunity cost. Another aspect of holding inventory is to see to it that the demand of the customers for goods is met and there is no production interruption for want of raw materials.

Inventory constitutes the principal item in the working capital of the majority of trading and industrial concerns. Therefore, managing working capital is synonymous with controlling inventories as major portion of working capital is locked up in inventories.

There should be neither too much inventory nor too little inventory. There should be a correct balance between these two extremes. Too much inventory means locking up of capital, earning no interest. Too little inventory results in loss of customers who shift to the competitors for the purchase of finished goods and also production would be interrupted for want of raw materials. Therefore, there should be a proper management of inventory. The sum total of all those activities, which are necessary for the acquisition, storage, sale and disposal, or use of material may be considered as inventory management.

17.2 OBJECTIVES OF INVENTORY MANAGEMENT

The main objectives of inventory management are:

- To have necessary stock of material as and when they are required so that production is not interrupted.
- To meet the demand of the customers for finished goods without creating excess stock levels.
- To enjoy the benefit of discounts while purchasing the materials.
- To maintain adequate accountability of inventory.
- To keep down investment in inventory, carrying cost and obsolescence losses to the minimum.
- To prevent loss of material due to pilferage, theft etc.

17.3 INVENTORY CONTROL TECHNIQUES

For the proper management and control of inventory, various techniques are employed. They are discussed, in detail, hereunder.

17.3.1 DECIDING THE VARIOUS STOCK LEVELS OF INVENTORY

Most of the large companies fix up various stock levels to guard against under stocking and over-stocking. The various levels are:

1. **Maximum Level:** It indicates the maximum quantity of the inventory items, which can be stored at any given point of time. The basic objective of setting up this level is to ensure

that, capital is not unnecessarily blocked in stores and also to avoid loss due to obsolescence and deterioration.

$$\text{Maximum Level} = (\text{Reorder Level} + \text{Reorder Quantity}) - (\text{Minimum Consumption} \times \text{Minimum Reorder Period})$$

2. **Minimum Level:** It is that level below which stock should not be allowed to fall. It indicates the minimum stock to be maintained so that there is no risk of stoppage of production. This is also called safety stock or buffer stock level.

$$\text{Minimum Level} = \text{Reorder Level} - (\text{Normal consumption} \times \text{Normal Reorder Period})$$

3. **Reorder Level:** It is the level at which fresh order should be placed for replenishment of stock. It is fixed so between the minimum and maximum stock levels. Reorder level is fixed in such a way that before the material ordered is received, there is sufficient material on hand (minimum level) to cover both normal and abnormal circumstances. The factors generally considered for fixing this level are rate of consumption of material, minimum level and delivery time.

$$\text{Reorder Level} = \text{Maximum Consumption} \times \text{Maximum Reorder Period}$$

4. **Average Stock Level:** It is the average of minimum and maximum levels.

$$\text{Average Stock Level} = \frac{\text{Minimum Level} + \text{Maximum Level}}{2}$$

It is also calculated by taking Minimum Level + $\frac{1}{2}$ of Reorder Quantity

5. **Danger Level:** Danger level of stock is fixed below the minimum stock level. It indicates the urgent action needed for the replacement of stock so that production stoppage can be avoided.

$$\text{Danger Level} = \text{Average Consumption} \times \text{Max. lead time for emergency purchase}$$

Illustration - 1

Maximum consumption = 300 units per day

Minimum consumption = 200 units per day

Re-order period = 8 to 10 days

Calculate Re-order level.

Solution

Re-Ordering level = Maximum consumption \times Maximum re-order period

$$300 \times 10 = 3000 \text{ units}$$

Ordering level = Minimum level + Consumption during the time required to get Fresh delivery

Illustration - 2

Calculate the Ordering level of material A from the following particulars:

- i) Minimum limit 500 units
- ii) Maximum limit 2500 units
- iii) Daily requirements of material 100 units
- iv) Time required for fresh delivery 10 days

Solution

Ordering level = Minimum level + Consumption during the time required
for fresh delivery

$$\begin{aligned} &= 500 \text{ units} + (100 \times 10) \\ &= 1500 \text{ units} \end{aligned}$$

Order for the purchase of the material should be placed when the material in stock reaches 1500 units.

Illustration - 3

Calculate the Minimum Stock level, Maximum Stock level and Re-ordering level from the following information:

Minimum Consumption = 100 units per day

Maximum Consumption = 150 units per day

Normal Consumption = 120 units per day

Re-order period = 10-15 days

Re-order quantity = 1500 units

Normal Re-order period = 12 days

Solution

Re-Order level = Maximum consumption x Maximum Re-Order period

$$\begin{aligned} &= 150 \text{ units} \times 15 \text{ days} \\ &= 2250 \text{ units} \end{aligned}$$

Minimum Stock level = Re-Order level - (Normal Consumption x Normal Re-Order period)

$$\begin{aligned} &= 2250 - (120 \times 12) \\ &= 810 \text{ units} \end{aligned}$$

Maximum Stock level = Re-Order level + Re-order quantity - (Minimum Consumption x Maximum Re-Order Period)

$$\begin{aligned} &= 2250 + 1500 - (100 \times 10) \\ &= 2270 \text{ units} \end{aligned}$$

Illustration - 4

In manufacturing its products a company uses three raw materials a, b,c in respect of which the following will apply:

Raw materials	Usage per Unit of Product(lb.)	Re-Order quantity (lb.)	Price per lb. (Paise) (week)	Delivery period (lb.)	Order Level (lb.)	Minimum Level
A	10	10,000	10	1-3	8000	
B	4	5,000	30	3-5	4750	
C	6	10,000	15	2-4		2000

Weekly production varies from 175 to 225 units averaging 200. What would you expect the quantities of the following to be?

- Minimum Stock of A
- Maximum Stock of B
- Re-Order level of C and
- Average Stock of A

Solution

- a) Minimum stock of A:

$$\begin{aligned} \text{Re-Order level} &= (\text{Normal Consumption} \times \text{Normal reorder period}) \\ &= 8000 - (2000 \times 2) = 4000 \text{ lbs.} \end{aligned}$$

$$\text{Normal production per week} = (175 + 225)/2 = 200 \text{ units}$$

$$\text{Normal usage of material per unit} = 10 \text{ lbs.}$$

$$\text{Normal consumption of material per week} = 200 \times 10 = 2000 \text{ lbs.}$$

$$\text{Normal re-order period} = (\text{Minimum Delivery Period} + \text{Maximum Delivery period}) / 2$$

$$= (1 \text{ week} + 3 \text{ weeks}) / 2$$

$$= 2 \text{ weeks}$$

- b) Maximum Stock of B:

$$\text{Re-order level} + \text{Reorder quantity} = (\text{Minimum consumption} \times \text{Minimum Re-Order period})$$

$$= 4750 + 5000 - (700 \times 3) = 7650 \text{ lbs.}$$

$$\text{Minimum production per week} = 175 \text{ units}$$

$$\text{Usage per unit of product} = 4 \text{ lbs.}$$

$$\text{Minimum consumption of raw material per week} = 175 \times 4 = 700 \text{ lbs.}$$

c) Re-Order level of C:

Maximum consumption x Maximum Re-Order period

$$= 1350 \times 4 = 5400 \text{ lbs.}$$

Maximum production per week = 225 units

Usage per unit = 6 lbs.

Maximum consumption of C material = $225 \times 6 = 1350$ lbs.

d) Average Stock level of A

Minimum stock level of A + $\frac{1}{2}$ Re-Order Quantity of A

$$= 4000 + \frac{1}{2} (10000)$$

$$= 9000 \text{ lbs.}$$

Illustration - 5

You have been asked to calculate the following levels for part no. 809013 from the information given here under.

- a) Reordering level
- b) Maximum level
- c) Minimum level
- d) Danger level
- e) Average stock level

The reordering quantity is to be calculated from the following data.

Total cost of purchasing relating to the order Rs. 20

Number of units to be purchased during the year 5,000

Purchase price per unit including transportation cost Rs. 50

Annual cost of storage of one unit Rs. 5

Lead-time : Average 10 days

Maximum 15 days

Minimum 6 days

Maximum for emergency purchases 4 days

Rate of consumption : Average 15 units, maximum 20 units

Solution

a) Reordering level : Maximum usage x maximum lead time

$$20 \times 15 = 300 \text{ units}$$

b) Maximum level : Reordering level + Reorder quantity – (minimum usage x minimum lead time)

$$300 + 200 - (10 \times 6) = 440 \text{ units}$$

c) Minimum level : Reordering level – (Average consumption x average lead-time)

$$300 - (15 \times 10) = 150 \text{ units}$$

d) Danger level : Average consumption x maximum lead-time for emergency purchases

$$15 \times 4 = 60 \text{ units}$$

f) Average Stock level : Minimum level + $\frac{1}{2}$ Reorder Quantity

$$150 + \frac{1}{2} \text{ of } 200 = 250 \text{ units}$$

$$\text{Reorder Quantity : } \sqrt{2 QR / CP} = \sqrt{2 \times 5000 \times 20 / 10\% \text{ of } 50} = 200 \text{ units}$$

Where Q = Annual purchase = 5000

R = Ordering cost = Rs. 20

C = Storage cost

Price per unit Rs. 50

Working Notes

Minimum usage has been calculated as follows :

$$\text{Average usage} = (\text{Minimum usage} + \text{maximum usage}) / 2$$

Or

$$2 \times \text{average usage} = \text{minimum usage} + \text{maximum usage}$$

$$2 \times 15 = \text{minimum usage} + 20 \text{ units}$$

$$\text{Minimum usage} = 30 \text{ units} - 20 \text{ units} = 10 \text{ units}$$

Illustration - 6

In ABC Ltd., Material consumption was as follows:

Average daily requirements = 12 units

Usual time required for obtaining supply = 2 weeks

Maximum requirement in a month of 4 weeks = 400 units

Minimum requirement in a month of 4 weeks = 200 units

Economic Order size = 240 units

Time sufficient for emergency supply 2 days

Find out

a) Re-Ordering level;

b) Minimum level;

- c) Maximum level;
- d) Danger level;
- e) Average Stock level

Solution

$$\begin{aligned} \text{Reordering level} &= \text{Maximum usage} \times \text{maximum Lead time} \\ &= (400/4) \times 2 = 200 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Minimum level} &= \text{reorder level} - (\text{Normal usage} \times \text{Normal Lead time}) \\ &= 200 - (72 \times 2) = 56 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Maximum level} &= \text{Reorder level} + \text{Reorder quantity} - (\text{Minimum usage} \times \\ &\quad \text{minimum Lead time}) \\ &= 200 + 240 - (200/4) \times 2 = 340 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Danger level} &= \text{Average daily consumption} \times \text{Maximum Lead time for emergency} \\ &\quad \text{purpose} \\ &= 12 \times 2 = 24 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{Average Stock level} &= \text{Minimum Stock level} + \frac{1}{2} \text{Reorder quantity} \\ &= 56 + (\frac{1}{2} \times 240) = 176 \text{ units} \end{aligned}$$

Note: In the absence of information usual time required 2 weeks is treated as maximum, minimum and average lead-time.

Maximum and Minimum usage are converted per week

$$\text{Normal Usage per week} = 12 \times 6 = 72 \text{ units (taking 6 days in a week)}$$

Activity – I

List out the various stock levels.

.....

.....

.....

.....

17.3.2 DETERMINATION OF REORDER QUANTITY OR ECONOMIC ORDER QUANTITY (EOQ)

The Economic Order Quantity refers to that number of units which should be ordered at one time so as to minimize the total of cost of placing orders and cost of storing the goods as well as interest on the capital invested. It is the quantity, which is most economic to order (EOQ).

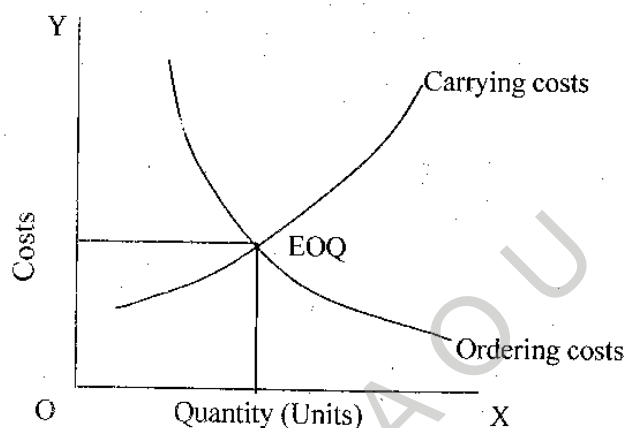
In determining the EOQ, the problem is one to set a balance between the two opposing costs viz., the ordering cost and carrying costs. **Ordering cost** is the cost of placing an order with the supplier. It includes the cost of stationery, salaries of those engaged in receiving and

inspection, salaries of those engaged in placing orders etc. **Carrying cost** is the cost of holding the stock in storage. Examples : cost of operating the stores (salaries, rent etc.), insurance, warehousing and storage, material handling and clerical charges, deterioration, spoilage and wastage of material etc.

The management is tempted on one hand to order huge quantity to reduce the ordering cost by reducing the number of orders but on the other hand, the carrying cost will go up as the stock will remain longer in stores. Hence, the management tries to reconcile them and this reconciliatory point is EOQ.

As the number of units per order increases, the ordering cost comes down, while the carrying cost increases. The EOQ, which is the ideal order size is at a point where the total cost is minimum. The same is represented in the figure below.

Figure - 1



The graphic method shown above may not provide the accurate EOQ. The same can be determined with the help of a formula.

$$EOQ = \sqrt{2AO/C}$$

Where -

A = Annual consumption in rupees

O = Cost of ordering per order

C = Carrying cost per unit

Where carrying cost is given in percentages,

$$EOQ = \sqrt{2AO / \text{Cost per unit} \times \text{Carrying cost per cent}}$$

EOQ can also be determined in tabular form showing the various costs for different ordering quantities thus enabling us to find out the most economic size of the quantity to be ordered where the total cost is the least of all.

Illustration - 7

After inviting tenders, two quotations are received as follows :

A : Rs. 1.20 per unit

B : Rs. 1.10 per unit + Rs. 4,000 fixed charges to be added irrespective of units ordered.

Advise, with your arguments, with whom orders should be placed and what quantity is to be ordered.

The following additional information may be of interest.

	Units
Present Stock	35,000
Average monthly requirement	10,000
Maximum level	80,000
Minimum level	30,000

Sales tax problem may be ignored.

Solution

It is evident that, tender A is more economical for lesser quantity of purchase. Tender B becomes economical only when sufficient quantity is ordered to justify the fixed charges of Rs. 4,000. Tender B is cheaper by Re. 0.10 per unit. (i.e. Rs. 1.20 - 1.10)

Therefore, to justify the fixed charge of Rs. 4,000, the minimum order quantity should be $4000 / 0.10 = 40,000$ units. Hence, an order quantity above 40,000 units become economical in case of tender B. Ascertainment of quantity to be ordered or the economical order size is given below.

Economic Order Size = Maximum level - Ordering level + Minimum rate of consumption during the time to get fresh supplies.

Present stock = 35,000 units.

Minimum level = 30,000 units.

Excess = 5,000 units.

These 5,000 units will be consumed within 15 days because average consumption per month = 10,000 units. Therefore, 15 days should be considered to be the time to get fresh supplies.

Ordering level = Minimum stock + (Average rate of consumption x time to get fresh supplies)

$$= 30,000 + (10,000/30 \times 15 \text{ days}) = 35,000 \text{ units.}$$

The minimum rate of consumption considering the rate of consumption to be uniform is the same as the average rate of consumption. So the minimum rate of consumption during the time to get supplies is 5,000 units.

Now, applying the formula

Economic Order Size = $80,000 - 35,000 + 5,000 = 50,000$ units.

Quantity to be ordered = 50,000 units

Tender B will be more economical because the quantity to be ordered is more than 40,000 units justifying the fixed charges of Rs. 4,000.

Illustration - 8

Find out the Economic Order Quantity from the following particulars:

Annual usage = 6000 units

Cost of material per unit = Rs.20

Cost of placing and receiving one order = Rs. 60

Annual carrying cost of one unit = 10 % of Inventory value

Solution

$$\begin{aligned} \text{EOQ} &= \sqrt{2AO/C} \\ &= \sqrt{2 \times 6000 \times 60 / 2} \\ &= \sqrt{3,60,000} \\ &= 600 \text{ units} \end{aligned}$$

Illustration - 9

Find out the EOQ from the following particulars.

Annual usage = Rs. 1,20,000

Annual Carrying Cost = 10 % of Inventory value

Cost of placing and receiving one order = Rs. 60

Purchase price Rs. 10 per unit

Solution

$$\begin{aligned} \text{EOQ} &= \sqrt{2AO/C} \\ &= \sqrt{2 \times 1,20,000 \times 60 / (10\% \text{ of } 1.50)} \\ &= \sqrt{14,40,00,000} \\ &= \text{Rs. } 12,000 \end{aligned}$$

Illustration - 10

The Shyam Borewells Company uses about 75,000 valves per annum and the usage is fairly constant at 6,250 per month. The valves cost Re. 1.50 per unit when bought in large quantities

and the carrying cost is estimated to be 20 % of an average inventory investment on an annual basis. The cost to place an order and process the delivery is Rs. 18. Determine EOQ and the frequency of orders.

Solution

$$\begin{aligned} \text{EOQ} &= \sqrt{2AO/C} \\ &= \sqrt{2 \times 75,000 \times 18 / (20 \% \text{ of } 1)} \\ &= \sqrt{90,00,000} \\ &= 3,000 \text{ units} \end{aligned}$$

Frequency of orders : Annual usage / EOQ
 $= 75,000 / 3,000 = 25 \text{ orders per day}$

Illustration - 11

A Ltd. Company is committed to supply 24,0000 bearings p.a. to B Ltd. Company on a steady daily basis. It is estimated that it costs Re. 0.10 as inventory holding cost per bearing p.m. and that the set up cost per run of bearing manufacture is Rs. 324. Calculate the (a) Optimum run size or bearing manufacture and (b) Average inventory holding cost per batch.

a) $\text{EOQ} = \sqrt{2 \times 24,0000 \times 324 / (0.10 \times 12)}$
 $= \sqrt{1,29,60,000}$
 $= 3,600 \text{ units}$

b) Average Inventory Holding cost per batch :
 $= (3,600 / 2) \times 0.10 \times 12 = 2,160 \text{ units}$

Illustration - 12

A manufacturing company used Rs. 50,000 material per year. The administration cost per purchase is Rs. 50 and the carrying cost is 20 % of the average inventory. The company currently has an optimum purchasing policy but has been offered as 0.4 % discount if they purchase five times per year. Should the offer be accepted? If no, what counter offer should be made? Presently 10 orders are made.

Solution

Cost if the order is for EOQ i.e. Rs. 50,000

	Rs.
Material cost	50,000
Ordering cost (10 orders of Rs. 5000 each @ Rs. 50 per order)	500
Carrying cost (50,000/10 x 1/2 x 20%)	500
Total cost	<u>51,000</u>

Cost if purchases are made five times a year:

	Rs.
Material cost (50,000 – 4% of 50,000)	49,800
Ordering cost (5 orders @ Rs. 50 per order)	250
Carrying cost (49,800/5 x ½ x 20%)	996
Total cost	51,046

For getting a discount of Rs. 200, rate of discount is 0.4% . Therefore, for getting a further discount of Rs. 46, further rate of discount should be 0.1% i.e. $4 \times 46 / 200$

Thus, the rate of discount should be more than 5 % to make the offer attractive.

Illustration - 13

Your factory buys and uses a component for production at Rs. 10 per piece. Annual requirement is 2000 units. Carrying cost of inventory is 10 % p.a. and ordering cost is Rs. 40 per order. The purchase manager argues that as the ordering cost is very high, it is advantageous to place a single order for the entire annual requirement. He also says that if we order 2000 units at a time, we can get a 2 % discount from the supplier. Evaluate this proposal and make your recommendations.

Solution

$$\begin{aligned} \text{EOQ} &: \sqrt{2 \times 2000 \times 40 / (10 \times 10\%)} \\ &= 400 \text{ units} \end{aligned}$$

$$\text{Frequency of orders : } 2000 / 400 = 5 \text{ orders}$$

	EOQ (400 units) Rs.	Single order (2000 units) Rs.
Cost of material	20,000	20,000
(-) 2 % discount	-	400
	20,000	19,600
Ordering cost (@ Rs.40 per order)	200	40
	20,200	19,640
Add Carrying cost (10% of inv.)	200	980
	20,400	20,620

Average inventory $400/2 = 200$ $2000/2 = 1000$

Carrying Cost : $200 \times 10\% \times 10 = \text{Rs. } 200$

$1000 \times 10\% \times 10 = \text{Rs. } 1,000$

$1000 - 2 \% \text{ of } 1,000 \text{ for discount} = \text{Rs. } 980$

As the cost is high under single order, it is advisable to purchase EOQ.

Illustration - 14

A firm obtains quantity discounts on its orders of materials as follows :

Price per ton	Tons
Rs. 6.00	less than 250
Rs. 5.90	250 to less than 800
Rs. 5.80	800 to less than 2000
Rs. 5.70	2000 to less than 4000
Rs. 5.60	4000 and over

The annual demand for the material is 4000 tons. Stock holding costs are 20 % of material cost p.a. The delivery cost per order is Rs. 6.00. You are required to calculate the best quantity to order.

	250 units Rs.	800 units. Rs.	2000 units Rs.	4000 units Rs.
Cost of Material	23,600	23,200	22,800	22,400
Order Cost	96	30	12	6
Carrying Cost	147.50	464	1,140	2,240
Total Cost	23,843.50	23,694	23,952	24,646

Number of orders :

$$4000/250 = 16$$

$$4000/800 = 5$$

$$4000/2000 = 2$$

$$4000/4000 = 1$$

Material Cost :

$$250 \times 5.90 \times 16 = \text{Rs. } 23,600$$

$$800 \times 5.80 \times 5 = \text{Rs. } 23,200$$

$$2000 \times 5.70 \times 2 = \text{Rs. } 22,800$$

$$4000 \times 5.60 \times 1 = \text{Rs. } 22,400$$

Carrying Cost is calculated on average inventory : Minimum Stock (0) + 50 % of ordered quantity.

$$(0 + 125) = 125 \times 5.9 \times 20\% = \text{Rs. } 147.50$$

$$(0 + 400) = 400 \times 5.8 \times 20\% = \text{Rs. } 464.00$$

$$(0 + 1000) = 1000 \times 5.7 \times 20\% = \text{Rs. } 1140.00$$

$$(0 + 2000) = 2000 \times 5.6 \times 20\% = \text{Rs. } 2240.00$$

From the above, we can say that the best one is 800 units as the cost of acquiring is lower when compared to other quantities.

17.3.3 ALWAYS BETTER CONTROL (ABC) ANALYSIS

It is a simple but effective technique of inventory control. The main purpose of this tool is to concentrate on the high value items rather than on all the items indiscriminately. All items of material are classified into three categories - high, medium and low value items and named as, A, B and C items respectively. The 'A' items should be under the tightest control and it is the responsibility of the most experienced personnel. The 'B' items should be under the normal control procedures and the 'C' items should be under the simple and economic methods of control. This technique is based on the principle of 'management by exception'. It is also known as the Selective Method of Inventory Control. It aims at concentrating efforts on those items where attention is needed the most.

Under this method, the items are listed and ranked in the order of their descending importance (based on cost/value) showing quantity and value of each item.

Uses : The main uses of this technique are :

- It ensures closer and stricter control on those items, which represent larger amounts of capital invested.
- It helps in maintaining enough stock for 'C' category items.
- It assists in the maintenance of high stock turnover rate.
- It minimizes cost of placing orders and carrying costs with proper economic order quantities.
- It regulates investment in inventory and thus releasing working capital, which can be utilized in the best possible way.

Illustration – 15

The following is the information regarding the consumption and price per unit of different items of inventory. Classify the items as per ABC analysis.

Item No.	Consumption	Rate per unit Rs.	Total Value Rs.
1	12,000	100	12,00,000
2	20,000	65	13,00,000
3	10,000	50	5,00,000
4	50,000	2	1,00,000
5	8,000	25	2,00,000
6	30,000	10	3,00,000
7	50,000	6	3,00,000
8	20,000	5	1,00,000
	2,00,000		40,00,000

Solution

ABC analysis requires the annual value of different items to be placed in order of decreasing total value. First, rank the items in order of the total value and then group them into A, B and C categories.

Rank	Item No.	Annual Value Rs.	Annual Value Percentage	Units	Units Percentage
1	2	13,00,000	32.5	20,000	10
2	1	12,00,000	30.0	12,000	6
3	3	5,00,000	12.5	10,000	5
			<u>75</u>		<u>21</u> 'A' Category
4	6	3,00,000	7.5	30,000	15
5	7	3,00,000	7.5	50,000	25
6	5	2,00,000	5.0	8,000	4
			<u>20</u>		<u>44</u> 'B' Category
7	4	1,00,000	2.5	50,000	25
8	8	1,00,000	2.5	20,000	10
			<u>5</u>		<u>35</u> 'C' Category
		40,00,000		2,00,000	

17.3.4 PERPETUAL INVENTORY CONTROL

According to ICMA, London, perpetual inventory control is, "a system of records maintained by the controlling department which reflects the physical movements of stock and their current balance".

According to Wheldon, it is "a method of recording stores balances after every receipt and issue, to facilitate regular checking and to obviate closing down for stocktaking".

Thus, the perpetual inventory system means maintenance of stores records such as Bin Card and Stores Ledger. The object of Perpetual Inventory Control is to facilitate stocktaking. It includes continuous stocktaking.

A **Bin Card** is a card attached to the bin in which material is stored. The storekeeper records the quantity of material received and issued and strikes the balance after each receipt or issue. All these entries are supported by the documents such as goods received note, material returned note, stores requisition note etc.

BIN CARD

Description	Bin No.
Minimum Level	Code No.
Ordering Level	Unit
Order Quantity	Stores Ledger Folio

Receipts		Issues		Balance		Stock		Verification	
Date	Ref.No.	Qty	Ref.No.	Quantity	Quantity	Date	Initials		

Stores Ledger is the chief accounting record for material. It is maintained by the Cost Accounting Department. It is like Bin Card in form except that it contains column for money values also. The entries in the receipts and issue columns are made from the same documents, which are used, for posting in Bin Card. This ledger constitutes a check on the quantity shown in Bin Card.

STORES LEDGER

Name	.....	Bin No.	....	Max. Level	....
Code No.	.....	Location Code	....	Min. Level	....
Description	.....	Unit of Qty	....	Reorder Qty	....
Reorder level	....			

RECEIPTS				ISSUES				BALANCE			
Date	GRNo.	Quantity	Rate	Amount	GRNo.	Quantity	Rate	Amount	Quantity	Rate	Amount

Under **Perpetual Inventory Control**, the balance of an item of store as shown in Bin Card should agree with that shown in Stores Ledger. Any difference between these two figures may be due to wrong posting or non-posting in either of the perpetual records or due to some arithmetic error in working out the balance. The book balance as shown by the records should agree with actual physical balances in store. This is ensured by continuous stock taking where physical verification of every item of stores is done by counting, weighing or measuring. Under this system, a few items of stores are counted daily or at frequent intervals and compared with the perpetual records by the stores auditors. If any difference, an enquiry is made and the difference is adjusted in the records to make them correspond with the physical count.

The main advantages of this technique are :

1. Stock records are kept upto date, thus, enabling the preparation of interim financial statements.
2. Internal check is done automatically as Stores Ledger is maintained in addition to Bin Card.
3. Accurate and reliable inventory balance enables to make proper claim for insurance in case of accident.
4. It avoids dislocation in production, which arises in the case of periodic stocktaking at the end of each year.

Activity – II

Drawn stores ledger with the help of hypothetical fissures.

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17.3.5 STOCK TURNOVER RATIO

Another tool for exercising control over inventory is the application of ratio analysis to inventory. Stock turnover is the ratio of the value of material consumed during a period to the average stock of raw material during the period.

$$\text{Stock Turnover} = \text{Cost of raw material consumed} \div \text{Average stock}$$

It is the indicator of the rate of consumption. A high ratio indicates fast moving material and the low ratio indicates slow moving stock. The turnover of different material may be compared to detect those items, which do not move regularly and avoid keeping capital locked up in such undesirable items of material.

Stock Turnover Ratio (STR) can also be calculated in terms of days.

$$\text{Stock Turnover Ratio in days} = \text{Days of the period} \div \text{Stock Turnover Ratio}$$

If the length of the Stock Turnover period is short, the material is said to be fast moving. STR is a good measure of the efficiency of the material utilization.

To detect and control slow and non-moving items, a standard material turnover rate should be computed for each item of material and the actual rate is to be compared with the standard rate. If the actual rate is less than the standard, it implies that the actual rate of consumption of the item is less than the standard and the item is thus slow moving. Periodic reports on such material should be prepared and presented to the management for the control purpose.

Illustration - 16

Calculate the material turnover ratio for the year 2003 from the following details.

	Material X Rs.	Material Y Rs.
Opening Stock	12,500	43,750
Closing Stock	7,500	31,250
Purchases	95,000	62,500

Determine the fast moving material.

Solution

Material Turnover : Cost of raw material consumed / Average stock of material

Average Stock of material : $(\text{Opening stock of material} + \text{Closing stock of material}) / 2$

Material X : $(12,500 + 7,500) / 2 = \text{Rs. } 10,000$

Material Y : $(43,750 + 31,250) / 2 = \text{Rs. } 37,500$

Cost of Raw material consumed = Opening Stock + Purchases – Closing Stock

Material X : $12,500 + 95,000 - 7,500 = \text{Rs. } 1,00,000$

Material Y : $43,750 + 62,500 - 31,250 = \text{Rs. } 75,000$

Material X : $1,00,000 / 10,000 = 10$ times

Material Y : $75,000 / 37,500 = 2$ times

Material X is fast moving.

17.3.6 VED CLASSIFICATION

Another technique for control of inventory is VED classification. It refers to **Vital, Essential and Desirable**. This technique is largely applied to spare parts where the vital spares are stocked adequately, essential parts rather sparingly used and desirable spares may be dispensed with if the lead-time for their procurement is low. **Lead-time** refers to the time elapsed from the time of placing an order with the supplier till the time the ordered material is received.

17.3.7 FSN CLASSIFICATION

It refers to the **fast, slow and non-moving stock**. This technique helps in the timely prevention of obsolescence by disposing of the material which is non-moving and also by not storing such material. The fast moving material is purchased in large quantities and stocked as they are frequently required by the organization. They are used up fast in the production of goods and are in high demand. A moderate stock of slow moving material is maintained.

17.3.8 RE-ORDER POINT

Under the EOQ model, the assumption is that materials can be procured instantaneously and hence, the firm may place an order for replenishment as and when the inventory level drops to zero. But, in reality, procurement of materials takes time and therefore, the order level must be such that the inventory at the time of ordering should be sufficient to meet the needs of production during the procurement period.

If the usage rate of material and lead time for procurement are known with certainty, then the ordering level would be : Lead time in days x Average daily usage.

If the usage rate and lead-time are likely to vary, then:

Re-order level : Normal Consumption + Safety Stock

Illustration - 17

From the following particulars, calculate the re-order point.

Annual demand : 26,000 units

Lead-time : 4 weeks

Safety stock : 1000 units

Solution

Weekly usage = $26,000 / 52 \text{ weeks} = 500 \text{ units}$

Lead time = 4 weeks

Reorder Point = $500 \text{ units} \times 4 \text{ weeks} = 2,000 \text{ units (with Zero Safety Stock)}$

Reorder Point = $2,000 \text{ units} + 1,000 \text{ units} = 3,000 \text{ units (with Safety Stock)}$

17.3.9 SAFETY STOCK

Safety Stock refers to the stock which gives protection against stock out situation. It is also known as the buffer or minimum stock. It is the minimum additional inventory to serve as a safety margin or buffer or cushion to meet an unexpected increase in usage / demand or unexpected delay in the supply of inventory or both.

Safety Stock = (Maximum Usage Rate – Average Usage Rate) Lead Time

When both the lead time and usage rate vary and the variation is wide, then, the firm requires an excessively large amount of safety stock for the protection against stock out.

Illustration - 18

Lead time 60 days to 180 days

Average time 90 days

Usage rate 75 units to 125 units per day

Average rate 100 units per day

Calculate Safety Stock

Solution

Maximum possible usage = Maximum daily usage x Maximum lead time

$$125 \text{ units} \times 180 \text{ days} = 22,500 \text{ units}$$

Normal Usage = Average daily usage x Average lead time

$$100 \times 90 = 9,000 \text{ units}$$

Safety Stock = $22,500 - 9,000 = 13,500 \text{ units}$

17.4 SUMMARY

Inventory includes the value of raw materials, consumables, spares, work-in-progress, finished goods and scrap in which the funds of the company have been invested. As inventory constitutes the principal item in the working capital of the majority of trading and industrial concerns, there should be a proper management of inventory.

The sum total of all those activities which are necessary for the acquisition, storage, sale and disposal or use of material may be considered as inventory management. There should be neither too much inventory nor too little inventory. There should be a correct balance between these two extremes. Too much inventory means locking up of capital earning no interest. Too little inventory results in loss of customers who shift to the competitors for the purchase of finished goods and also production would be interrupted for want of raw materials.

For the proper management and control of inventory, various techniques like stock levels, EOQ, ABC, Perpetual inventory control, stock turnover ratios, VED analysis, FSN etc. are employed. It is desirable to have a selective control approach in the problems of controlling inventories. It is not worthwhile to adopt a universal approach for controlling all the items of inventory. The technique of selective inventory control serves as a useful weapon for the control of inventory and contributes significantly to the health of the organizations.

17.5 SELF ASSESSMENT QUESTIONS

A. Short Answer Questions

1. What is inventory?
2. Explain the objectives of inventory management.
3. What do you understand by Material Control? State its objectives.
4. Explain the factors to be taken into consideration in determining the following?
 - (a) Minimum Level
 - (b) Maximum Level
 - (c) Reorder Level
5. What do you understand by ABC analysis? What are its advantages?

B. Long Answer Questions

1. What do you mean by EOQ? How it is calculated?
2. Describe the procedure for purchasing the material.
3. Distinguish between Bin Card and Stores Ledger.
4. Explain the following and say on what basis each should be determined.
 - (a) Safety stock
 - (b) Maximum Stock
 - (c) Re-order Point

Exercises

1. Calculate Reorder Level and Reorder Quantity from the information given below.
 - Maximum Stock Level 8,000 units
 - Budgeted consumption : Maximum 1200 units per month

Minimum 80 units per month

Estimated delivery time : Maximum 4 months

Minimum 3 months

(Answer : Re order Level : 4,800 units and Reorder Quantity : 3,440 units)

Note : First calculate Minimum Level (2,560 units) and obtain Re-Order Quantity by substituting the values in Maximum Level formula.

2. A company uses raw material 'A' for a particular product for which the following information is available. Re-order Quantity is 10,000 kgs and usage per unit of product is 10 kgs.

Delivery period in weeks : Minimum 1

Average 2

Maximum 3

Weekly production varies from 175 to 225 units, averaging 200 units. You are required to calculate :

- a) Minimum Stock level
- b) Maximum Stock level
- c) Average Stock level and
- d) Re-ordering level

(Answer : Re-ordering level = 6,750 kgs; Minimum Stock level = 2,750 kgs.; Maximum Stock level = 15,000 kgs and Average Stock level = 7,750 kgs.)

3. Two materials of X and Y are used as follows :

Minimum usage 100 units per each week

Maximum usage 300 units per each week

Normal usage 200 units per each week

Ordering quantity : X 1200 units

 Y 2000 units

Reorder period : X 4 to 6 weeks

 Y 2 to 4 weeks

Calculate for each material : (a) Minimum level and (b) Maximum level

(Answer: a) Minimum level : X = 800 units and Y = 600 units and (b) Maximum level : X = 2,600 units and Y = 3000 units)

4. Two materials X & Y are used as follows:-

Minimum usage	=	100 units per each week.
Maximum usage	=	300 units per each week
Normal usage	=	200 units per each week
Order quantity : X	=	1200 units
Y	=	2000 units
Reorder period : X	=	4 to 6 weeks.
Y	=	2 to 4 weeks.

Calculate A) Minimum level, B) Maximum level.

(Answer: (Material X):

- A) Minimum level 800 units
- B) Maximum level 2600 units

(Note:- Reorder level 1800 units)

(Material Y):

- A) Minimum level 600 units
- B) Maximum level 3000 units

(Note:- Reorder level 1200 units).

5. The particulars of material A are as follows:

Normal usage	10 units per week.
Minimum usage	5 units per week.
Maximum usage	15 units per week.
Reorder quantity	60 units per week.
Reorder period	3 to 5 weeks.

Calculate :

- a) Reorder level
- b) Minimum level
- c) Maximum level
- d) Average stock level

(Answer: (a) Reorder level 75 units (b) Minimum level 35 units (c) Maximum level 120 units (d) Average Stock level 65 units)

6. A Company is purchasing 2,000 units of an item per annum at a cost of Rs. 20 per unit. Given ordering cost Rs. 50 and carrying cost 25 %, find out the EOQ. (March 1997 O.U)

(Answer: EOQ = 200 units)

7. From the following figures calculate the E.O.Q.

Annual consumption = 4000 kgs

Cost of placing one order = Rs 5

Cost per unit = 2 per kg.

Storage & carrying cost = 8% of average inventory.

(Answer: EOQ 500 kgs.)

8. From the following figures, calculate the EOQ.

Annual consumption 4,000 kgs

Cost of placing one order Rs. 5

Cost per unit Rs. 2 per kg.

Storage and carrying cost 8 % of average inventory

(Answer: EOQ = 500 kgs)

9. A company is purchasing 2000 units of an item per annum at a cost of Rs. 20 per unit. Given ordering cost Rs 50 & carrying cost 25%. Find out the EOQ?

(Answer: EOQ : 200 units)

10. From the following details, draw a plan of ABC Selective Control.

Item	Units	Unit Cost (Rs.)
1	14,000	5
2	48,000	3
3	3,000	10
4	1,200	12
5	76,000	2
6	40,000	5
7	60,000	4
8	3,000	6
9	1,000	8
10	29,000	0.40
11	12,000	7.10
12	4,100	6.20

11. A firm has 5 different items in its inventory. The relative details are given below. Suggest a break down of the items into A, B and C classification.

Item	Units	Unit Cost (Rs.)
1	20,000	60
2	10,000	100
3	32,000	11
4	28,000	10
5	60,000	3.40

(Answer: Items 1 & 2 in Category 'A'; Items 3 & 4 in Category 'B' and item 5 in Category 'C')

12. From the following data, calculate inventory turnover ratio.

Stock on 1st January Rs. 36,000

Stock on 31st December Rs. 20,000

Purchases during the year Rs. 1,52,000

(Answer: Inventory turnover ratio : 6 times)

13. Minimum stock level 4,000 units

Re-order quantity 6,000 units

Maximum stock level 12,000 units

Issues 24,000 units

Calculate Inventory turnover.

(Answer: 3.43 times)

Hint : Average Stock = Minimum level + $\frac{1}{2}$ Reorder Quantity.

14. Calculate inventory turnover form the following information.

Maximum stock level 10,000 kgs.

Minimum stock level 4,000 kgs.

Issues during the year 24,000 kgs.

(Answer: 3.4 times)

Hint : Average Stock = (Maximum level + Minimum level) / 2

17.6 FURTHER READINGS

- Khan & Jain : **Financial Management**, Tata Mc Graw Hill.
- I.M. Pandey : Financial Management, Vikas Publishing House (P) Ltd.
- P.V. Kulkarni : **Financial Management**.

- R.P. Rustagi : **Financial Management Theory: Concepts and Problems**, Galgotia Publishing Co., New Delhi.
- Prasanna Chandra : **Financial Management**.

17.7 KEY WORDS

- Inventory** : The value of raw materials, consumables, spares, work-in-progress, finished goods and scrap in which the funds of the company have been invested.
- Inventory Management** : All those activities which are necessary for the acquisition, storage, sale and disposal or use of material.
- Maximum Level** : The maximum quantity of the inventory items which can be stored at any given point of time.
- Minimum Level** : That level below which stock should not be allowed to fall.
- Reorder Level** : The level at which fresh order should be placed for replenishment of stock.
- Average Stock Level** : The average of maximum and minimum level.
- Danger Level** : Indicates the urgent action needed for the replacement of stock so that production stoppage can be avoided.
- Economic Order Quantity** : The number of units which should be ordered at one time so as to minimise the total of cost of placing orders and cost of storing the goods as well as interest on the capital invested. It is the quantity, which is most economic to order.
- Bin Card** : A card attached to the bin in which material is stored.
- Stock Turnover** : It is the ratio of the value of material consumed during a period to the average stock of raw material during the period.
- VED** : Vital, Essential and Desirable stocks.
- Lead Time** : The time elapsed from the time of placing an order with the supplier till the time the ordered material is received.
- FSN** : Fast, slow and Non-moving stocks.

Re-Order Point

: The level at which an order for material is to be placed.

Safety Stock

: The stock which gives protection against stock out situation.

BRAOU

MODEL QUESTION PAPER
Dr. B.R. AMBEDKAR OPEN UNIVERSITY
M.Com (Previous)
COURSE : FINANCIAL MANAGEMENT
PAPER - 3

Time : 3 Hrs.

Max. Marks : 70

SECTION - A 5 x 4 = 20

NOTE : Answer any FIVE of the following questions

1. Write a note on inter-relationship between investment, financing and dividend decisions.
2. M/s. Sundaram Finance Corporation has a financial plan, which consists of an immediate cash outlay of Rs. 15,000 followed by a cash inflow of Rs. 17,900 after 3 years. What is the plan's rate of return?
3. What is Capital Budgeting? List out the steps in Capital Budgeting?
4. Describe any two methods used for decision-making with uncertainty.
5. Assuming that the firm pays tax at a 40% rate, compute the after tax cost of capital in the following cases:
 1. A 15% preference share sold at par.
 2. A perpetual bond sold at par, coupon rate being 16%.
 3. A common share selling at a market price of Rs. 120 and paying a current dividend of Rs. 9 per share which is expected to grow at a rate of 8%.
6. Discuss any five factors relevant in determining capital structure.
7. An analytical statement of AB Company is given below: It is based on an output level of 80,000 units.

Sales	9,60,000
Variable cost	<u>5,60,000</u>
Revenue before fixed cost	4,00,000
Fixed costs	<u>2,40,000</u>
	1,60,000
Interest	<u>60,000</u>
Earnings before tax	1,00,000
Tax	<u>50,000</u>
Net Income	<u>50,000</u>

Calculate the degree of (1) operating leverage (2) financial leverage (3) the combined leverage from the above data.

8. The following data is available for Ramakrishna Plastics:

Earnings per share	: ps. 10
Rate of return on investment	: 15%
Rate of return required by share holders	: 12%

If the Gordon's Valuation model holds, what will be the price per share when the dividend payout ration is 25% and 50%?

9. What is credit policy? Explain briefly the elements of a credit policy?

10. ABC Ltd., sells its products on a gross profit of 20% on sales. The following information is extracted from its annual accounts for the current year ended 31st December.

	Rs.
Sales at 3 months credit	40,00,000
Raw Material	12,00,000
Wages paid - Aug (time lag 15 days)	9,60,000
Manufacturing expenses paid - 1 month in arrears	12,00,000
Administrative expenses paid - 1 month in arrears	4,80,000
Sales promotion expenses - Payable half yearly in advance	2,00,000

The company enjoys on month's credit from the suppliers of raw materials and maintains a 2 month's stock of raw materials and one and half month's stock of finished goods. The cash balance is maintained at Rs. 1,00,000 as a precautionary measure. Assuming 10 per cent margin, find out the working capital requirements of ABC Ltd.

SECTION - B $5 \times 10 = 50$

NOTE : Answer ALL the questions

11. a) Evaluate "Maximisation of Profit" and "Maximisation of share-holders wealth" as the objectives of Financial Management.

OR

b) An investor deposits a sum of Rs. 1,00,000 in a bank account on which interest is credited @ 10% p.a. How much amount can be withdrawn annually for a period of 15 years?

12. a) Modi Industries Ltd., is considering the purchase of a machine. Two machines 'X' and 'Y' each costing Rs. 50,000 are available. The cost of capital is 10%. The cash inflows after taxation are expected to be as follows:

Year	Machine 'X'	Machine 'Y'
1	15,000	5,000
2	20,000	15,000
3	25,000	20,000
4	15,000	30,000
5	10,000	20,000

You are required to evaluate each of the above projects according to the following methods.

- Pay-back method
- Return on average investment method
- Net present value method.

OR

A company is considering the proposal of buying one of the two machines to manufacture a new product. Each of these machines requires an investment of Rs. 30,000 and is expected to provide benefits over a period of 4 years. After the expiry of the useful life of the machine, the sellers of both the machines have guaranteed to buy back the machines of Rs. 5,000. The management of the company uses certainty equivalent approach to evaluate risky investments.

The company's risk adjusted discount rate is 16% and the risk-free rate is 10%. The expected values of net cash flows (CFAT) with their respective certainty - equivalents (CE) are:

Year	Machine 'X'		Machine 'Y'	
	CFAT Rs.	CE	CFAT Rs.	CE
1	30,000	0.8	18,000	0.9
2	30,000	0.7	36,000	0.8
3	30,000	0.6	24,000	0.7
4	30,000	0.5	32,000	0.4

Which machine, should be purchased by the company?

- A company wants to acquire a new machine for the use of its plant for 5 years. Two options are available. The 1st option is to buy outright for Rs. 25,00,000 with bank loan at 16% interest payable annually and the principal amount to be repaid at the end of 5 years. The machine will have a resale value of Rs. 8,00,000. The 2nd option will be to get the machine under lease agreement for 5 years the annual rentals being Rs. 7,50,000 payable at the beginning of each year. The corporate rate of taxation is 30% and straight line depreciation method is followed.

You are required to recommend the best option.

OR

- b) Explain briefly 'Net Operating Income' approach and Modigliani Miller Approach to capital structure.
14. a) What is 'stable dividend policy'? Do you recommend a stable dividend policy? Explain the reasons for your answer.

OR

- b) The EPS of a company is ps. 8 and the rate of capitalisation applicable is 10 per cent. The company has before it an option of adopting (1) 50% (2) 75% (3) 100% dividend pay out ratio. Compute the market price of the company's quoted shares as per Walter model if it can earn a return of (1) 15% (2) 10% and (3) 5% on its retained earnings.
15. a) Explain briefly techniques of inventory control used in manufacturing organisations and also calculate the Economic Order Quantity (EQO), no. of orders per year and time between two consecutive orders for the following information. In a manufacturing organisation the annual demand for an item is 3,200 units. The unit cost is Rs. 6 and inventory carrying charges 25% p.a. The cost of one procurement is Rs. 150.

OR

- b) Explain in detail the different approaches to financing of working capital requirements?