PRACTICE MANUAL

PAPER : 2

STRATEGIC FINANCIAL MANAGEMENT

BOARD OF STUDIES
THE INSTITUTE OF CHARTERED ACCOUNTANTS OF INDIA

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A WORD ABOUT PRACTICE MANUAL

The subject of Financial Management has acquired a critical significance now-a-days, due to recent surge in globalization and massive cross border flow of capital. The study of this subject opens new opportunities for Chartered Accountancy students. The paper stresses the importance of applying the knowledge and techniques of financial management to the planning, operating and monitoring of the finance function in particular as well as the organization in general. Further, this paper not only focuses on these aspects at the domestic level but also at the international level as well.

It is desired from the students that they cover the entire syllabus and also do practice on their own while solving questions from this practice manual. Students are also advised to update themselves with the latest changes in the financial sector. For the same they need to refer to academic updates in Students' Journal published by the Board of Studies, the monthly journal 'The Chartered Accountant', financial newspapers etc.

The course Study Material covers the theoretical framework in detail. This Practice Manual has been designed with the need of home-study and distance-learning students in mind. Such students require full coverage of the syllabus topics, and also the facility to undertake extensive question practice. The main aim of this Practice Manual is provide guidance as to the manner of writing an answer in the examination. The main features of this Practice Manual are as follows:

- **Concepts in Brief:** Important definitions, equations and formulae have been given before each topic for quick recapitulation.
- **Previous examinations questions:** Generous compilation of practice questions from the previous eighteen examinations. Students are expected to attempt the questions and then compare their solutions with the solutions provided in the manual.
- **Additions:** In this edition following additions have been made:

  (a) Questions from November, 2015 & May, 2016 Final Examinations and Supplementary (January 2016) have been added under the respective chapters.

  (b) To maintain uniformity, some questions have been inter-changed from one chapter to another chapter.

  (c) Details of additions of the questions. (Annex A).

  (d) Details of the questions, answers of which have been slightly modified (Annex B).

(e) Details of Corrections in Study Material, Edition January 2015 (Annex C).

Thus, with the help of above these three Annexes, (by accessing from ICAI website) students who are referring the January 2015 Edition of Practice Manual and Study Material can upgrade their edition without acquiring this edition of Practice Manual.

In case you need any further clarification/guidance, please send your queries at email-id: ashish.gupta@icai.in or write to the Director of Studies, The Institute of Chartered Accountants of India, A-29, Sector-62, Noida-201 309.

Happy Reading And Best Wishes!

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1

Financial Policy and Corporate Strategy

BASIC CONCEPTS

1. Strategic Management Decision Making Frame Work

Strategic management is a systems approach, which is concerned with where the organization wants to reach and how the organization proposes to reach that position. It intends to run an organization in a systematised fashion by developing a series of plans and policies known as strategic plans, functional policies, structural plans and operational plans.

2. Strategy at Different Levels

Strategies at different levels are the outcomes of different planning needs.

- **Corporate Strategy**: At the corporate level planners decide about the objective or objectives of the firm along with their priorities. A corporate strategy provides with a framework for attaining the corporate objectives under values and resource constraints, and internal and external realities.
- **Business Strategy**: It is the managerial plan for achieving the goal of the business unit. However, it should be consistent with the corporate strategy of the firm and should be drawn within the framework provided by the corporate planners.
- **Functional Strategy**: It is the lowest level plan to carry out principal activities of a business. Functional strategy must be consistent with the business strategy, which in turn must be consistent with the corporate strategy.

3. Basic Issues Addressed Under Financial Planning

Financial planning is the backbone of the business planning and corporate planning. It helps in defining the feasible area of operation for all types of activities and thereby defines the overall planning framework. Outcomes of the financial planning are the financial objectives, financial decision-making and financial measures for the evaluation of the corporate performance.

- **Profit Maximization versus Wealth Maximization**: Profit may be an important consideration for businesses but not its maximization because profit maximization as a financial objective suffers from multiple limitations. Wealth maximisation, on the other hand, is measured in terms of its net present value to

take care of both risk and time factors. Wealth ensures financial strength of the firm, long term solvency and viability. It can be used, as a decision criterion in a precisely defined manner and can reflect the business efficiency without any scope for ambiguity.

- **Cash Flow**: It deals with the movement of cash and as a matter of conventions, refers to surplus of internally generated funds over expenditures.
- **Credit Position**: It describes its strength in mobilizing borrowed money. In case the internal generation of cash position is weak, the firm may exploit its strong credit position to go ahead in the expansion of its activities.
- **Liquidity Position of the Business**: It describes the extent of idle working capital. It measures the ability of the firm in handling unforeseen contingencies.

4. Interface of Financial Policy and Strategic Management

Financial policy of a company cannot be worked out in isolation of other functional policies. It has a wider appeal and closer link with the overall organizational performance and direction of growth.

- Sources of finance and capital structure are the most important dimensions of a strategic plan. The need for fund mobilization to support the expansion activity of firm is utmost important for any business.
- Policy makers should decide on the capital structure to indicate the desired mix of equity capital and debt capital.
- Another important dimension of strategic management and financial policy interface is the investment and fund allocation decisions.
- Dividend policy is yet another area for making financial policy decisions affecting the strategic performance of the company. A close interface is needed to frame the policy to be beneficial for all.

5. Balancing Financial Goals Vis-À-Vis Sustainable Growth

Sustainability means development of the capability for replicating one's activity on a sustainable basis. The weak concept of sustainability requires that the overall stock of capital assets should remain constant. It refers to preservation of critical resources to ensure support for all, over a long time horizon. The strong version is concerned with the preservation of resources under the primacy of ecosystem functioning. In terms of economic dimension, sustainable development rejects the idea that the logistic system of a firm should be knowingly designed to satisfy the unlimited wants of the economic person. A firm has to think more about the collective needs and less about the personal needs. This calls for taking initiatives to modify, to some extent, the human behaviour. The other economics dimension of sustainability is to decouple the growth in output of firm from the environmental impacts of the same.

6. Principles of Valuation

Choice of the degree of sustainability approach for sustainability and modification in the sustainability principle must be based on financial evaluation of the alternative schemes in terms of financial and overall corporate objectives.

- **Valuation Method**: This method depends on demand curve approach by either making use of expressed preferences or making use of revealed preferences.
- **Pricing Method**: This method is a non-demand curve approach that takes into consideration either opportunity costs or alternative costs or shadow projects or government payments or those response methods depending on the nature of the problem and environmental situation.

Valuation methods are in general more complex in implementation than pricing methods. But demand curve methods are more useful for cases where it seems likely that disparity between price and value is high.

Question 1

Discuss the importance of strategic management in today's scenario?

Answer

Importance of Strategic Management

Strategic management intends to run an organization in a systematized fashion by developing a series of plans and policies known as strategic plans, functional policies, structural plans and operational plans. It is a systems approach, which is concerned with where the organization wants to reach and how the organization proposes to reach that position. Thus, strategic management is basically concerned with the futurity of the current decisions without ignoring the fact that uncertainty in the system is to be reduced, to the extent possible, through continuous review of the whole planning and implementation process. It is therefore necessary for an organization interested in long run survival and command over the market, to go for strategic planning and the planning process must be holistic, periodic, futuristic, intellectual and creative with emphasis given on critical resources of the firm otherwise, the organization will fall in the traps of tunneled and myopic vision.

Question 2

Explain the different levels of strategy.

Answer

Strategies at different levels are the outcomes of different planning needs. There are basically three types of strategies:

(a) **Corporate Strategy**: At the corporate level planners decide about the objective or objectives of the firm along with their priorities and based on objectives, decisions are taken on participation of the firm in different product fields. Basically a corporate strategy

provides with a framework for attaining the corporate objectives under values and resource constraints, and internal and external realities. It is the corporate strategy that describes the interest in and competitive emphasis to be given to different businesses of the firm. It indicates the overall planning mode and propensity to take risk in the face of environmental uncertainties.

(b) **Business Strategy**: It is the managerial plan for achieving the goal of the business unit. However, it should be consistent with the corporate strategy of the firm and should be drawn within the framework provided by the corporate planners. Given the overall competitive emphasis, business strategy specifies the product market power i.e. the way of competing in that particular business activity. It also addresses coordination and alignment issues covering internal functional activities. The two most important internal aspects of a business strategy are the identification of critical resources and the development of distinctive competence for translation into competitive advantage.

(c) **Functional Strategy**: It is the low level plan to carry out principal activities of a business. In this sense, functional strategy must be consistent with the business strategy, which in turn must be consistent with the corporate strategy. Thus strategic plans come down in a cascade fashion from the top to the bottom level of planning pyramid and performances of functional strategies trickle up the line to give shape to the business performance and then to the corporate performance.

Question 3

Discuss the methods of valuation in brief.

Answer

The evaluation of sustainable growth strategy calls for interface of financial planning approach with strategic planning approach. Choice of the degree of sustainability approach for sustainability and modification in the sustainability principle must be based on financial evaluation of the alternative schemes in terms of financial and overall corporate objectives. There are two alternative methods for evaluation. They are:

(a) **Valuation Method**: Valuation method depends on demand curve approach by either making use of expressed preferences or making use of revealed preferences.

(b) **Pricing Method**: Pricing method is a non-demand curve approach that takes into consideration either opportunity costs or alternative costs or shadow projects or government payments or those response methods depending on the nature of the problem and environmental situation.

Valuation methods are in general more complex in implementation than pricing methods. But demand curve methods are more useful for cases where it seems likely that disparity between price and value is high.

Question 4

Explain briefly, how financial policy is linked to strategic management.

Answer

The success of any business is measured in financial terms. Maximising value to the shareholders is the ultimate objective. For this to happen, at every stage of its operations including policy-making, the firm should be taking strategic steps with value-maximization objective. This is the basis of financial policy being linked to strategic management.

The linkage can be clearly seen in respect of many business decisions. For example :

(i) Manner of raising capital as source of finance and capital structure are the most important dimensions of strategic plan.

(ii) Cut-off rate (opportunity cost of capital) for acceptance of investment decisions.

(iii) Investment and fund allocation is another important dimension of interface of strategic management and financial policy.

(iv) Foreign Exchange exposure and risk management.

(v) Liquidity management

(vi) A dividend policy decision deals with the extent of earnings to be distributed and a close interface is needed to frame the policy so that the policy should be beneficial for all.

(vii) Issue of bonus share is another dimension involving the strategic decision.

Thus from above discussions it can be said that financial policy of a company cannot be worked out in isolation to other functional policies. It has a wider appeal and closer link with the overall organizational performance and direction of growth.

Question 5

Explain the Interface of Financial Policy and Strategic Management.

Answer

The interface of strategic management and financial policy will be clearly understood if we appreciate the fact that the starting point of an organization is money and the end point of that organization is also money. No organization can run an existing business and promote a new expansion project without a suitable internally mobilized financial base or both internally and externally mobilized financial base.

Sources of finance and capital structure are the most important dimensions of a strategic plan. The generation of funds may arise out of ownership capital and or borrowed capital. A company may issue equity shares and / or preference shares for mobilizing ownership capital.

Along with the mobilization of funds, policy makers should decide on the capital structure to indicate the desired mix of equity capital and debt capital. There are some norms for debt equity ratio. However this ratio in its ideal form varies from industry to industry. It also

depends on the planning mode of the organization under study.

Another important dimension of strategic management and financial policy interface is the investment and fund allocation decisions. A planner has to frame policies for regulating investments in fixed assets and for restraining of current assets. Investment proposals mooted by different business units may be addition of a new product, increasing the level of operation of an existing product and cost reduction and efficient utilization of resources through a new approach and or closer monitoring of the different critical activities.

Now, given these three types of proposals a planner should evaluate each one of them by making within group comparison in the light of capital budgeting exercise.

Dividend policy is yet another area for making financial policy decisions affecting the strategic performance of the company. A close interface is needed to frame the policy to be beneficial for all. Dividend policy decision deals with the extent of earnings to be distributed as dividend and the extent of earnings to be retained for future expansion scheme of the firm.

It may be noted from the above discussions that financial policy of a company cannot be worked out in isolation of other functional policies. It has a wider appeal and closer link with the overall organizational performance and direction of growth. These policies being related to external awareness about the firm, specially the awareness of the investors about the firm, in respect of its internal performance. There is always a process of evaluation active in the minds of the current and future stake holders of the company. As a result preference and patronage for the company depends significantly on the financial policy framework. And hence attention of the corporate planners must be drawn while framing the financial policies not at a later stage but during the stage of corporate planning itself.

Question 6

Write a short note on Balancing Financial Goals vis-a-vis Sustainable Growth.

Answer

The concept of sustainable growth can be helpful for planning healthy corporate growth. This concept forces managers to consider the financial consequences of sales increases and to set sales growth goals that are consistent with the operating and financial policies of the firm. Often, a conflict can arise if growth objectives are not consistent with the value of the organization's sustainable growth. Question concerning right distribution of resources may take a difficult shape if we take into consideration the rightness not for the current stakeholders but for the future stakeholders also. To take an illustration, let us refer to fuel industry where resources are limited in quantity and a judicial use of resources is needed to cater to the need of the future customers along with the need of the present customers. One may have noticed the save fuel campaign, a demarketing campaign that deviates from the usual approach of sales growth strategy and preaches for conservation of fuel for their use across generation. This is an example of stable growth strategy adopted by the oil industry as a whole under resource constraints and the long run objective of survival over years. Incremental growth strategy, profit strategy and pause strategy are other variants of stable

growth strategy.

Sustainable growth is important to enterprise long-term development. Too fast or too slow growth will go against enterprise growth and development, so financial should play important role in enterprise development, adopt suitable financial policy initiative to make sure enterprise growth speed close to sustainable growth ratio and have sustainable healthy development.

The sustainable growth rate (SGR), concept by Robert C. Higgins, of a firm is the maximum rate of growth in sales that can be achieved, given the firm's profitability, asset utilization, and desired dividend payout and debt (financial leverage) ratios. The sustainable growth rate is a measure of how much a firm can grow without borrowing more money. After the firm has passed this rate, it must borrow funds from another source to facilitate growth. Variables typically include the net profit margin on new and existing revenues; the asset turnover ratio, which is the ratio of sales revenues to total assets; the assets to beginning of period equity ratio; and the retention rate, which is defined as the fraction of earnings retained in the business.

SGR = ROE x (1- Dividend payment ratio)

Sustainable growth models assume that the business wants to: 1) maintain a target capital structure without issuing new equity; 2) maintain a target dividend payment ratio; and 3) increase sales as rapidly as market conditions allow. Since the asset to beginning of period equity ratio is constant and the firm's only source of new equity is retained earnings, sales and assets cannot grow any faster than the retained earnings plus the additional debt that the retained earnings can support. The sustainable growth rate is consistent with the observed evidence that most corporations are reluctant to issue new equity. If, however, the firm is willing to issue additional equity, there is in principle no financial constraint on its growth rate.

2

Project Planning and Capital Budgeting

BASIC CONCEPTS AND FORMULAE

1. Feasibility Study

Project feasibility is a test by which an investment is evaluated.

2. Types of Feasibilities

(a) Market Feasibility: Demand and price estimates are determined from the market feasibility study. The market feasibility study for a product already selling in the market consists of:

- Study of economic factors and indicators;
- Demand estimation;
- Supply estimation;
- Identification of critical success factors; and
- Estimation of demand-supply gap, which is as follows:

  Demand Surplus: Minimum = Min demand – Max supply

  Likely = Likely demand – Likely supply

  Maximum = Max demand – Likely supply

(b) Technical Feasibility: The commercial side of technical details has to be studied along with the technical aspects so that commercial viability of the technology can be evaluated. Project costs along with operating costs are derived from technical feasibility study.

(c) Financial Feasibility: Financial feasibility study requires detailed financial analysis based on certain assumptions, workings and calculations like Projections for prices and cost, Period of estimation, Financing alternatives, Financial statements and Computation of ratios such as debt-service coverage ratio (DSCR), net present value (NPV) or internal rate of return (IRR), Projected balance sheet and cash flow statement.

3. Contents of a Project Report

- Details about Promoters;
- Industry Analysis;
- Economic Analysis;
- Cost of Project;
- Inputs regarding raw material, suppliers, etc;
- Technical Analysis;
- Financial Analysis;
- Social Cost Benefit Analysis;
- SWOT Analysis; and
- Project Implementation Schedule.

4. Post Completion Audit

Post-completion audit evaluates actual performance with projected performance. It verifies both revenues and costs.

5. Social Cost Benefit Analysis

Social cost benefits analysis is an approach for evaluation of projects. A technique for appraising isolated projects from the point of view of society as a whole. It assesses gains/losses to society as a whole from the acceptance of a particular project.

Estimation of shadow prices forms the core of social cost benefit methodology. Economic resources have been categorized into goods, services, labour, foreign exchange, shadow price of investment vis-à-vis consumption, shadow price of future consumption vis-à-vis present consumption viz. social rate of discount.

6. Capital Budgeting Under Risk and Uncertainty

Risk denotes variability of possible outcomes from what was expected. Standard Deviation is perhaps the most commonly used tool to measure risk. It measures the dispersion around the mean of some possible outcome.

(a) *Risk Adjusted Discount Rate Method*- The use of risk adjusted discount rate is based on the concept that investors demands higher returns from the risky projects. The required return of return on any investment should include compensation for delaying consumption equal to risk free rate of return, plus compensation for any kind of risk taken on.

(b) *Certainty Equivalent Approach*- This approach allows the decision maker to incorporate his or her utility function into the analysis. In this approach a set of

risk less cash flow is generated in place of the original cash flows.

(c) Other Methods-

(i) Sensitivity Analysis: Also known as "What if" Analysis. This analysis determines how the distribution of possible NPV or internal rate of return for a project under consideration is affected consequent to a change in one particular input variable. This is done by changing one variable at one time, while keeping other variables (factors) unchanged.

(ii) Scenario Analysis: Although sensitivity analysis is probably the most widely used risk analysis technique, it does have limitations. Therefore, we need to extend sensitivity analysis to deal with the probability distributions of the inputs. In addition, it would be useful to vary more than one variable at a time so we could see the combined effects of changes in the variables.

(iii) Simulation Analysis (Monte Carlo): Monte Carlo simulation ties together sensitivities and probability distributions. The method came out of the work of first nuclear bomb and was so named because it was based on mathematics of Casino gambling. Fundamental appeal of this analysis is that it provides decision makers with a probability distribution of NPVs rather than a single point estimates of the expected NPV. Following are main steps in simulation analysis:

- Modelling the project. The model shows the relationship of NPV with parameters and exogenous variables;
- Specify values of parameters and probability distributions of exogenous variables;
- Select a value at random from probability distribution of each of the exogenous variables;
- Determine NPV corresponding to the randomly generated value of exogenous variables and pre-specified parameter variables;
- Repeat steps (3) & (4) a large number of times to get a large number of simulated NPVs; and
- Plot frequency distribution of NPV.

(iv) Decision Trees - By drawing a decision tree, the alternations available to an investment decision are highlighted through a diagram, giving the range of possible outcomes.

The stages set for drawing a decision tree is based on the following rules:

- It begins with a decision point, also known as decision node, represented by a rectangle while the outcome point, also known as

chance node, denoted by a circle.

- Decision alternatives are shown by a straight line starting from the decision node.
- The Decision Tree Diagram is drawn from left to right. Rectangles and circles have to be next sequentially numbered.
- Values and Probabilities for each branch are to be incorporated next.
- The expected monetary value (EMV) at the chance node with branches emanating from a circle is the aggregate of the expected values of the various branches that emanate from the chance node.
- The expected value at a decision node with branches emanating from a rectangle is the highest amongst the expected values of the various branches that emanate from the decision node.

7. Capital Budgeting Under Capital Rationing

Investment appraisals under capital rationing should be to maximise NPV of the set of investments selected. Due to disparity in the size of the projects, the objective cannot be fulfilled by merely choosing projects on the basis of individual NPV ranking till the budget is exhausted. Combinations approach is adopted in such decisions, which is as follows:

(a) Find all combinations of projects, which are feasible given the capital budget restriction and project interdependencies; and

(b) Select the feasible combination having highest NPV.

8. Capital Budgeting Under Inflation

Adjustment for inflation is a necessity for capital investment appraisal as inflation will raise the revenues and costs of the project. Costs of capital considered for investment appraisals contain a premium for anticipated inflation. Due to inflation investors require the nominal rate of return to be equal to:

Required Rate of Return in real terms plus Rate of Inflation.

Formula

$R_N = R_R + P$

$R_N \rightarrow$ Required rate of return in nominal terms.

$R_R \rightarrow$ Required rate of return in real terms.

$P \rightarrow$ Anticipated inflation rate.

If cost of capital (required rate of return) contains a premium for anticipated inflation, the inflation factor has to be reflected in the projected cash flows.

If there is no inflation, then it has to be discounted at required rate of return in real

terms.

NPV based on consideration that inflation rate for revenue and cost are different shall be computed as follows:

$$NPV = {}^{n}\Sigma_{t=1} [\{R_t (1+i_r) - C_t{}^{t}\Sigma_{r=1}(1+i_c)\} (1-T) + D_t T] / (1+k)^t - I_0$$

R_t → revenues for the year 't' with no inflation.

i_r → annual inflation rate in revenues for 'r th ' year.

C_t → costs for year 't' with no inflation.

i_c → annual inflation rate of costs for year 'r'.

T → tax rate.

D_t → depreciation charge for year 't'.

I_0 → initial outlay.

k → cost of capital (with inflation premium).

9. Capital Asset Pricing Model Approach to Capital Budgeting

It is based on the presumption that total risk of an investment consists of two components (1) Systematic risk (2) Unsystematic risk.

10. Estimating the Beta of a Capital Project: CAPM can be used to calculate appropriate discount taking into account the systematic risk of the project.

Systematic risk is indicated by β any can be calculated as follows:

(i) Regression Method: This model is based on the assumption that a linear relationship exists between a dependent variable and an independent variable. The formula of regression equation is as follows:

$ER_I = \alpha + \beta R_m$

ER_I = Expected return security

α = Estimated return from security if market return as zero

R_m = Market Return

β = Beta of security

(ii) Correlation Method: As per this method, the Beta of any security can be calculated as follows:

$$\beta_j = \frac{r_{jm}\sigma_j\sigma_m}{\sigma_m^2}$$

σ_{jm}= Coefficient of co-relation between return of security and market return

σ_j = Standard Deviation of Return on investment

σ_m = Standard Deviation of Return on Market return (Market Portfolio or Index)

With the help of β of any security the expected return of any security can be calculated using Capital Asset Pricing Model (CAPM) as follows:

$ER = R_f + \beta(R_m - R_f)$

Where,

ER = Expected return

R_f = Risk free rate of return

R_m = Market return

β = Beta of security

$R_m - R_f$ = Market risk premium

12. Replacement Decision

A decision concerning whether an existing asset should be replaced by a newer version of the same machine or even a different type of machine that does the same thing as the existing machine.

Replacement decision follows certain steps:

Step I. Net cash outflow (assumed at current time /[Present value of cost]):

a. (Book value of old equipment - market value of old equipment) × Tax Rate = Tax payable/savings from sale

b. Cost of new equipment – [Tax payable/savings from sale + market value of old equipment] = Net cash outflow

Step II. Estimate change in cash flow per year, if replacement decision is implemented.

Change in cash flow = [(Change in sales + Change in operating costs) - Change in depreciation] (1 - tax rate) + Change in depreciation

Step III. Present value of benefits = Present value of yearly cash flows + Present value of estimated salvage of new system

Step IV. Net present value = Present value of benefits - Present value of costs

Step V. Decision rule:

Accept when present value of benefits > present value of costs.

Reject when the opposite is true.

13. Real Option in Capital Budgeting

Real Options methodology is an approach to capital budgeting that relies on option pricing theory to evaluate projects. Real options approach is intended to supplement, and not replace, capital budgeting analyses based on standard DCF methodologies.

Options in Capital Budgeting

The following is a list of options that may exist in a capital budgeting project.

Long call:

- Right to invest at some future date, at a certain price
- Generally, any flexibility to invest, to enter a business, to expand a business

Long put:

- Right to sell at some future date at a certain price
- Right to abandon at some future date at zero or some certain price
- Generally, any flexibility to disinvest, to exit from a business.

Short call:

- Promise to sell if the counterparty wants to buy
- Generally, any commitment to disinvest upon the action of another party

Short put:

- Promise to buy if the counterparty wants to sell
- Generally, any commitment to invest upon the action of another party

Valuation of Real Options

Broadly, following methods are employed in Valuation of Financial Options.

(a) Binomial Model

(b) Risk Neutral Method

(c) Black-Scholes Model

Type of Real Options

Following are broad type of Real Options

(a) Growth Options

(b) Abandonment Option

(c) Timing Option

Question 1

Distinguish between Net Present-value and Internal Rate of Return.

Answer

NPV and IRR: NPV and IRR methods differ in the sense that the results regarding the choice of an asset under certain circumstances are mutually contradictory under two methods. IN case of mutually exclusive investment projects, in certain situations, they may give contradictory results such that if the NPV method finds one proposal acceptable, IRR favours another. The different rankings given by the NPV and IRR methods could be due to size disparity problem, time disparity problem and unequal expected lives.

The net present value is expressed in financial values whereas internal rate of return (IRR) is expressed in percentage terms.

In net present value cash flows are assumed to be re-invested at cost of capital rate. In IRR re-investment is assumed to be made at IRR rates.

Question 2

Write short note on Certainty Equivalent Approach.

Answer

Certainty Equivalent Approach (CE): This approach recognizes risk in capital budgeting analysis by adjusting estimated cash flows and employs risk free rate to discount the adjusted cash-flows. Under this method, the expected cash flows of the project are converted to equivalent riskless amounts. The greater the risk of an expected cash flow, the smaller the certainty equivalent values for receipts and longer the CE value for payment. This approach is superior to the risk adjusted discounted approach as it can measure risk more accurately.

This is yet another approach for dealing with risk in capital budgeting to reduce the forecasts of cash flows to some conservative levels. In certainty Equivalent approach we incorporate risk to adjust the cash flows of a proposal so as to reflect the risk element. The certainty Equivalent approach adjusts future cash flows rather than discount rates. This approach explicitly recognizes risk, but the procedure for reducing the forecasts of cash flows is implicit and likely to be inconsistent from one investment to another.

Question 3

What is the sensitivity analysis in Capital Budgeting?

Answer

Sensitivity Analysis in Capital Budgeting: Sensitivity analysis is used in Capital budgeting for more precisely measuring the risk. It helps in assessing information as to how sensitive are the estimated parameters of the project such as cash flows, discount rate, and the project life to the estimation errors. Future being always uncertain and estimations are always subject to error, sensitivity analysis takes care of estimation errors by using a number of possible

outcomes in evaluating a project. The methodology adopted in sensitivity analysis is to evaluate a project by using a number of estimated cash flows so as to provide to the decision maker an insight into the variability of outcome. Thus, it is a technique of risk analysis which studies the responsiveness of a criterion of merit like NPV or IRR to variation in underlying factors like selling price, quantity sold, returns from an investment etc.

Sensitivity analysis answers questions like,

(i) What happens to the present value (or some other criterion of merit) if flows are, say ₹ 50,000 than the expected ₹ 80,000?

(ii) What will happen to NPV if the economic life of the project is only 3 years rather than expected 5 years?

Therefore, wherever there is an uncertainty, of whatever type, the sensitivity analysis plays a crucial role. However, it should not be viewed as the method to remove the risk or uncertainty, it is only a tool to analyse and measure the risk and uncertainty. In terms of capital budgeting the possible cash flows are based on three assumptions:

(a) Cash flows may be worst (pessimistic)

(b) Cash flows may be most likely.

(c) Cash flows may be most optimistic.

Sensitivity analysis involves three steps

(1) Identification of all those variables having an influence on the project's NPV or IRR.

(2) Definition of the underlying quantitative relationship among the variables.

(3) Analysis of the impact of the changes in each of the variables on the NPV of the project.

The decision maker, in sensitivity analysis always asks himself the question – what if?

Question 4

Write short note on Social Cost Benefit analysis.

Answer

Social Cost Benefit Analysis: It is increasingly realised that commercial evaluation of projects is not enough to justify commitment of funds to a project especially when the project belongs to public utility and irrespective of its financial viability it needs to be implemented in the interest of the society as a whole. Huge amount of funds are committed every year to various public projects of all types–industrial, commercial and those providing basic infrastructure facilities. Analysis of such projects has to be done with reference to the social costs and benefits since they cannot be expected to yield an adequate commercial rate of return on the funds employed at least during the short period. A social rate of return is more important. The actual costs or revenues do not necessarily reflect the monetary measurement of costs or benefits to the society. This is because the market price of goods and services are

often grossly distorted due to various artificial restrictions and controls from authorities, hence a different yardstick has to be adopted for evaluating a particular project of social importance and its costs and benefits are valued at 'opportunity cost' or shadow prices to judge the real impact of their burden as costs to the society. Thus, social cost benefit analysis conducts a monetary assessment of the total cost and revenues or benefits of a project, paying particular attention to the social costs and benefits which do not normally feature in conventional costing.

United Nations Industrial Development Organisation (UNIDO) and Organisation of Economic Cooperation and Development (OECD) have done much work on Social Cost Benefit analysis. A great deal of importance is attached to the social desirability of projects like employment generation potential, value addition, foreign exchange benefit, living standard improvement etc. UNIDO and OECD approaches need a serious consideration in the calculation of benefits and costs to the society. This technique has got more relevance in the developing countries where public capital needs precedence over private capital.

Question 5

Comment briefly on the social cost benefit analysis in relation to evaluation of an Industrial project.

Answer

Social Cost-Benefit Analysis of Industrial Projects: This refers to the moral responsibility of both PSU and private sector enterprises to undertake socially desirable projects – that is, the social contribution aspect needs to be kept in view.

Industrial capital investment projects are normally subjected to rigorous feasibility analysis and cost benefit study from the point of view of the investors. Such projects, especially large ones often have a ripple effect on other sections of society, local environment, use of scarce national resources etc. Conventional cost-benefit analysis ignores or does not take into account or ignores the societal effect of such projects. Social Cost Benefit (SCB) is recommended and resorted to in such cases to bring under the scanner the social costs and benefits.

SCB sometimes changes the very outlook of a project as it brings elements of study which are unconventional yet very relevant. In a study of a famous transportation project in the UK from a normal commercial angle, the project was to run an annual deficit of more than 2 million pounds. The evaluation was adjusted for a realistic fare structure which the users placed on the services provided which changed the picture completely and the project got justified. Large public sector/service projects especially in under-developed countries which would get rejected on simple commercial considerations will find justification if the social costs and benefits are considered.

SCB is also important for private corporations who have a moral responsibility to undertake socially desirable projects, use scarce natural resources in the best interests of society, generate employment and revenues to the national exchequer.

Indicators of the social contribution include

(a) Employment potential criterion;

(b) Capital output ratio – that is the output per unit of capital;

(c) Value added per unit of capital;

(d) Foreign exchange benefit ratio.

Question 6

Write a brief note on project appraisal under inflationary conditions.

Answer

Project Appraisal under Inflationary Conditions: Project Appraisal normally involves feasibility evaluation from technical, commercial, economic and financial aspects. It is generally an exercise in measurement and analysis of cash flows expected to occur over the life of the project. The project cash outflows usually occur initially and inflows come in the future.

During inflationary conditions, the project cost increases on all heads viz. labour, raw material, fixed assets such as equipments, plant and machinery, building material, remuneration of technicians and managerial personnel etc. Beside this, inflationary conditions erode purchasing power of consumers and affect the demand pattern. Thus, not only cost of production but also the projected statement of profitability and cash flows are affected by the change in demand pattern. Even financial institutions and banks may revise their lending rates resulting in escalation in financing cost during inflationary conditions. Under such circumstances, project appraisal has to be done generally keeping in view the following guidelines which are usually followed by government agencies, banks and financial institutions.

(i) It is always advisable to make provisions for cost escalation on all heads of cost, keeping in view the rate of inflation during likely period of delay in project implementation.

(ii) The various sources of finance should be carefully scruitinised with reference to probable revision in the rate of interest by the lenders and the revision which could be effected in the interest bearing securities to be issued. All these factors will push up the cost of funds for the organization.

(iii) Adjustments should be made in profitability and cash flow projections to take care of the inflationary pressures affecting future projections.

(iv) It is also advisable to examine the financial viability of the project at the revised rates and assess the same with reference to economic justification of the project. The appropriate measure for this aspect is the economic rate of return for the project which will equate the present value of capital expenditures to net cash flows over the life of the projects. The rate of return should be acceptable which also accommodates the rate of inflation per annum.

(v) In an inflationary situation, projects having early payback periods should be preferred

because projects with long payback period are more risky.

Under conditions of inflation, the project cost estimates that are relevant for a future date will suffer escalation. Inflationary conditions will tend to initiate the measurement of future cash flows. Either of the following two approaches may be used while appraising projects under such conditions:

(i) Adjust each year's cash flows to an inflation index, recognising selling price increases and cost increases annually; or

(ii) Adjust the 'Acceptance Rate' (cut-off) suitably retaining cash flow projections at current price levels.

An example of approach (ii) above can be as follows:

Normal Acceptance Rate	:	15.0%
Expected Annual Inflation	:	5.0%
Adjusted Discount Rate	:	15.0 × 1.05 or 15.75%

It must be noted that measurement of inflation has no standard approach nor is easy. This makes the job of appraisal a difficult one under such conditions.

Question 7

What is Capital rationing?

Answer

Capital Rationing: When there is a scarcity of funds, capital rationing is resorted to. Capital rationing means the utilization of existing funds in most profitable manner by selecting the acceptable projects in the descending order or ranking with limited available funds. The firm must be able to maximize the profits by combining the most profitable proposals. Capital rationing may arise due to (i) external factors such as high borrowing rate or non-availability of loan funds due to constraints of Debt-Equity Ratio; and (ii) Internal Constraints Imposed by management. Project should be accepted as a whole or rejected. It cannot be accepted and executed in piecemeal.

IRR or NPV are the best basis of evaluation even under Capital Rationing situations. The objective is to select those projects which have maximum and positive NPV. Preference should be given to interdependent projects. Projects are to be ranked in the order of NPV. Where there is multi-period Capital Rationing, Linear Programming Technique should be used to maximize NPV. In times of Capital Rationing, the investment policy of the company may not be the optimal one.

In nutshell Capital Rationing leads to:

(i) Allocation of limited resources among ranked acceptable investments.

(ii) This function enables management to select the most profitable investment first.

(iii) It helps a company use limited resources to the best advantage by investing only in the

projects that offer the highest return.

(iv) Either the internal rate of return method or the net present value method may be used in ranking investments.

Question 8

Explain the concept 'Zero date of a Project' in project management.

Answer

Zero Date of a Project means a date is fixed from which implementation of the project begins. It is a starting point of incurring cost. The project completion period is counted from the zero date. Pre-project activities should be completed before zero date. The pre-project activities should be completed before zero date. The pre-project activities are:

a. Identification of project/product

b. Determination of plant capacity

c. Selection of technical help/collaboration

d. Selection of site.

e. Selection of survey of soil/plot etc.

f. Manpower planning and recruiting key personnel

g. Cost and finance scheduling.

Question 9

Explain in brief the contents of a Project Report.

Answer

Steps for simulation analysis.

1. Modelling the project- The model shows the relationship of N.P.V. with parameters and exogenous variables. (Parameters are input variables specified by decision maker and held constant over all simulation runs. Exogenous variables are input variables, which are stochastic in nature and outside the control of the decision maker).
2. Specify values of parameters and probability distributions of exogenous variables.
3. Select a value at random from probability distribution of each of the exogenous variables.
4. Determine N.P.V. corresponding to the randomly generated value of exogenous variables and pre-specified parameter variables.
5. Repeat steps (3) & (4) a large number of times to get a large number of simulated N.P.V.s.
6. Plot frequency distribution of N.P.V.

Question 10

Explain in brief the contents of a Project Report.

Answer

The following aspects need to be taken into account for a Project Report -

1. Promoters: Their experience, past records of performance form the key to their selection for the project under study.
2. Industry Analysis: The environment outside and within the country is vital for determining the type of project one should opt for.
3. Economic Analysis: The demand and supply position of a particular type of product under consideration, competitor's share of the market along with their marketing strategies, export potential of the product, consumer preferences are matters requiring proper attention in such type of analysis.
4. Cost of Project: Cost of land, site development, buildings, plant and machinery, utilities e.g. power, fuel, water, vehicles, technical know how together with working capital margins, preliminary/pre-operative expenses, provision for contingencies determine the total value of the project.
5. Inputs: Availability of raw materials within and outside the home country, reliability of suppliers cost escalations, transportation charges, manpower requirements together with effluent disposal mechanisms are points to be noted.
6. Technical Analysis: Technical know-how, plant layout, production process, installed and operating capacity of plant and machinery form the core of such analysis.
7. Financial Analysis: Estimates of production costs, revenue, tax liabilities profitability and sensitivity of profits to different elements of costs and revenue, financial position and cash flows, working capital requirements, return on investment, promoters contribution together with debt and equity financing are items which need to be looked into for financial viability.
8. Social Cost Benefit Analysis: Ecological matters, value additions, technology absorptions, level of import substitution form the basis of such analysis.
9. SWOT Analysis: Liquidity/Fund constraints in capital market, limit of resources available with promoters, business/financial risks, micro/macro economic considerations subject to government restrictions, role of Banks/Financial Institutions in project assistance, cost of equity and debt capital in the financial plan for the project are factors which require careful examinations while carrying out SWOT analysis.
10. Project Implementation Schedule: Date of commencement, duration of the project, trial runs, cushion for cost and time over runs and date of completion of the project through Network Analysis have all to be properly adhered to in order to make the project feasible.

Question 11

A manufacturing unit engaged in the production of automobile parts is considering a proposal of purchasing one of the two plants, details of which are given below:

Particulars	***Plant A***	***Plant B***
Cost	*₹ 20,00,000*	*₹ 38,00,000*
Installation charges	*₹ 4,00,000*	*₹ 2,00,000*
Life	*20 years*	*15 years*
Scrap value after full life	*₹ 4,00,000*	*₹ 4,00,000*
Output per minute (units)	*200*	*400*

The annual costs of the two plants are as follows:

Particulars	***Plant A***	***Plant B***
Running hours per annum	*2,500*	*2,500*
Costs:	***(In ₹)***	***(In ₹)***
Wages	*1,00,000*	*1,40,000*
Indirect materials	*4,80,000*	*6,00,000*
Repairs	*80,000*	*1,00,000*
Power	*2,40,000*	*2,80,000*
Fixed Costs	*60,000*	*80,000*

Will it be advantageous to buy Plant A or Plant B? Substantiate your answer with the help of comparative unit cost of the plants. Assume interest on capital at 10 percent. Make other relevant assumptions:

Note: *10 percent interest tables*

	20 Years	***15 Years***
Present value of ₹ 1	*0.1486*	*0.2394*
Annuity of ₹ 1 (capital recovery factor with 10% interest)	*0.1175*	*0.1315*

Answer

Working Notes:

Calculation of Equivalent Annual Cost

	Machine A	Machine B
Cash Outlay	₹ 24,00,000	₹ 40,00,000
Less:PV of Salvage Value		
4,00,000 x 0.1486	₹ 59,440	
4,00,000 x 0.2394		₹ 95,760
Annuity Factor	0.1175	0.1315
	₹ 2,75,016	₹ 5,13,408

Computation of Cost Per Unit

	Machine A	Machine B
Annual Output (a)	2500 x 60 x 200	2500 x 60 x 400
	= 3,00,00,000	= 6,00,00,000
Annual Cost (b)	₹	₹
Wages	1,00,000	1,40,000
Indirect Material	4,80,000	6,00,000
Repairs	80,000	1,00,000
Powers	2,40,000	2,80,000
Fixed Cost	60,000	80,000
Equivalent Annual Cost	2,75,016	5,13,408
Total	12,35,016	17,13,408
Cost Per Unit (b)/(a)	0.041167	0.02860

Decision: As the unit cost is less in proposed Plant B, it may be recommended that it is advantageous to acquire Plant B.

Question 12

XYZ Ltd., an infrastructure company is evaluating a proposal to build, operate and transfer a section of 35 kms. of road at a project cost of ₹ 200 crores to be financed as follows:

Equity Shares Capital ₹ 50 crores, loans at the rate of interest of 15% p.a. from financial institutions ₹ 150 crores. The Project after completion will be opened to traffic and a toll will be collected for a period of 15 years from the vehicles using the road. The company is also required to maintain the road during the above 15 years and after the completion of that

period, it will be handed over to the Highway authorities at zero value. It is estimated that the toll revenue will be ₹ 50 crores per annum and the annual toll collection expenses including maintenance of the roads will amount to 5% of the project cost. The company considers to write off the total cost of the project in 15 years on a straight line basis. For Corporate Income-tax purposes the company is allowed to take depreciation @ 10% on WDV basis. The financial institutions are agreeable for the repayment of the loan in 15 equal annual instalments – consisting of principal and interest.

Calculate Project IRR and Equity IRR. Ignore Corporate taxation.

Explain the difference in Project IRR and Equity IRR

Answer

Computation of Project IRR

Project IRR is computed by using the following equation:

Where,

CO_0 = Cash outflow at time zero

CF_i = Net cash inflow at different points of time

N = Life of the project and

R = Rate of discount (IRR)

Now,

CO_0 = ₹ 200 crores

CF_i = ₹ 40 crores p.a. for 15 years

(Refer to working note (i))

Therefore,

$$₹\ 200 \text{ crore} = \frac{₹\ 40 \text{ crores}}{(1 + r)^{15}}$$

The value of IRR of the project:

1. An approximation of IRR is made on the basis of cash flow data. A rough approximation may be made with reference to the payback period. The payback period in the given case is 5 years i.e. $\left(\frac{₹\ 200 \text{ crores}}{₹\ 40 \text{ crores}}\right)$. From the PVAF table the closest figures are given in rate 18% (5.092) and the rate 19% (4.876). This means the IRR of the project is expected to be between 18% and 19%.
2. The estimate of IRR cash inflow of the project for both these rates is as follows:

   At 18% = ₹ 40 crores × PVAF (18%, 15 years)

   = ₹ 40 crores × 5.092

= ₹ 203.68 crores

At 19% = ₹ 40 crores × PVAF (19%, 15 years)

= ₹ 40 crores × 4.876

= ₹ 195.04 crores

3. The exact IRR by interpolating between 18% and 19% is worked out as follows:

$$IRR = 18\% + \frac{₹\ 203.68 \text{ crores} - ₹200 \text{ crores}}{₹\ 203.68 \text{ crores} - ₹\ 195.04 \text{ crores}} \times 1\%$$

$$= 18\% + \frac{₹\ 3.68 \text{ crores}}{₹\ 8.64 \text{ crores}} \times 1\%$$

= 18% + 0.426%

= 18.43%

Therefore, the IRR of the project is 18.43%.

Working Notes:

(i) Net cash inflow of the project

Cash inflow	₹
Toll revenue	50 crores p.a. for 15 years
Cash outflow	₹
Toll collection expenses including maintenance of the roads (5% of ₹ 200 crores)	10 crores p.a. for 15 years
Net cash inflow	40 crores p.a. for 15 years

Note: Since corporate taxes is not payable. The impact of depreciation need not be considered.

Computation of Equity IRR

Equity IRR is computed by using the following equation:

$$\text{Cash inflow at zero date from equity shareholders} = \frac{\text{Cash inflow available for equity shareholders}}{(1+r)^n}$$

Where,

r = Equity IRR

n = Life of the project

Here, Cash inflow at zero date from equity shareholders = ₹ 50 crores

Cash inflow for equity shareholders = ₹ 14.35 crores p.a.

(*Refer to working note)*

Therefore:

$$₹ 50 \text{ crores} = \frac{₹ 14.35 \text{ crores}}{(1 + r)^{15}}$$

The value of equity IRR of the project is calculated as follows:

1. An approximation of IRR is made on the basis of cash flow data. A rough approximation may be made with reference to the payable period. The payback period in the given case is $3.484\left(\frac{₹ 50 \text{ crores}}{₹ 14.35 \text{ crores}}\right)$. From the PVAF table the closest figure may be about 25% and 30%. This means the equity IRR of project must be between 25% and 30%.
2. The estimated NPV of the project at 25% = ₹ 14.35 crores X 3.859 = ₹ 55.3766 crores The estimated NPV of the project at 30% = ₹ 14.35 crores X 3.268 = ₹ 46.896 crores
3. IRR by using Interpolation Formula will be

$$= 25\% + \frac{55.377 - 50}{55.3766 - 46.896} X 5\%$$

$$= 25\% + \frac{5.377}{8.4806} X 5\%$$

= 25%+ 3.17% =28.17%

(ii) Equated annual instalment (i.e. principal + interest) of loan from financial institution:

Amount of loan from financial institution	₹ 150 crores
Rate of interest	15% p.a.
No. of years	15
Cumulative discount factor for 1-15 years	5.847

Hence, equated yearly instalment will be ₹ 150 crores/5.847 i.e. ₹ 25.65 crores.

(iii) Cash inflow available for equity shareholders

Net cash inflow of the project	₹ 40.00 crores
[Refer to working note (i)]	
Equated yearly instalment of the project	₹ 25.65 crores
[Refer to working note (ii)]	
Cash inflow available for equity shareholders	₹ 14.35 crores

Difference in Project IRR and Equity IRR:

The project IRR is 18.4% whereas Equity IRR is 28%. This is attributed to the fact that XYZ Ltd. is earning 18.4% on the loan from financial institution but paying only 15%. The difference between the return and cost of funds from financial institution has enhanced equity IRR. The 3.4% (18.4% - 15%) earnings on ₹ 150 crores goes to equity shareholders who have invested ₹ 50 crore i.e.

$$3.4\% \times \frac{₹\ 150\ \text{crores}}{₹\ 50\ \text{crores}} = 10.2\%$$ is added to the project IRR which gives equity IRR of 28%.

Question 13

ABC Chemicals is evaluating two alternative systems for waste disposal, System A and System B, which have lives of 6 years and 4 years respectively. The initial investment outlay and annual operating costs for the two systems are expected to be as follows:

	System A	***System B***
Initial Investment Outlay	*₹ 5 million*	*₹ 4 million*
Annual Operating Costs	*₹ 1.5 million*	*₹ 1.6 million*
Salvage value	*₹ 1 million*	*₹ 0.5 million*

If the hurdle rate is 15%, which system should ABC Chemicals choose?

The PVIF @ 15% for the six years are as below:

Year	*1*	*2*	*3*	*4*	*5*	*6*
PVIF	*0.8696*	*0.7561*	*0.6575*	*0.5718*	*0.4972*	*0.4323*

Answer

PV of Total Cash Outflow under System A

	₹
Initial Outlay	50,00,000
PV of Annual Operating Cost (1-6 years) 15,00,000 x 3.7845	56,76,750
Less: PV of Salvage Value ₹ 10,00,000 x 0.4323	(4,32,300)
	1,02,44,450
PVAF (15%, 6)	3.7845
Equivalent Annual Cost (1,02,44,450/3.7845)	27,06,949

PV of Total Cash Outflow under System B

Initial Outlay	40,00,000
PV of Annual Operating Cost (1-4 years) 16,00,000 x 2.855	45,68,000

Less: PV of Salvage Value ₹ 5,00,000 x 0.5718	(2,85,900)
	82,82,100
PVAF (15%, 4)	2.855
Equivalent Annual Cost (82,82,100/2.855)	29,00,911

Since Equivalent Annual Cost (EAC) is least in case of system A hence same should be opted.

Question 14

X Ltd. an existing profit-making company, is planning to introduce a new product with a projected life of 8 years. Initial equipment cost will be ₹ 120 lakhs and additional equipment costing ₹ 10 lakhs will be needed at the beginning of third year. At the end of the 8 years, the original equipment will have resale value equivalent to the cost of removal, but the additional equipment would be sold for ₹ 1 lakhs. Working Capital of ₹ 15 lakhs will be needed. The 100% capacity of the plant is of 4,00,000 units per annum, but the production and sales-volume expected are as under:

Year	*Capacity in percentage*
1	*20*
2	*30*
3-5	*75*
6-8	*50*

A sale price of ₹ 100 per unit with a profit-volume ratio of 60% is likely to be obtained. Fixed Operating Cash Cost are likely to be ₹ 16 lakhs per annum. In addition to this the advertisement expenditure will have to be incurred as under:

Year	*1*	*2*	*3-5*	*6-8*
Expenditure in ₹ lakhs each year	*30*	*15*	*10*	*4*

The company is subject to 50% tax, straight-line method of depreciation, (permissible for tax purposes also) and taking 12% as appropriate after tax Cost of Capital, should the project be accepted?

Answer

Computation of initial cash outlay

	(₹ in lakhs)
Equipment Cost (0)	120
Working Capital (0)	15
	135

Calculation of Cash Inflows:

Year	1	2	3-5	6-8
Sales in units	80,000	1,20,000	3,00,000	2,00,000
	₹	₹	₹	₹
Contribution @ ₹ 60 p.u.	48,00,000	72,00,000	1,80,00,000	1,20,00,000
Fixed cost	16,00,000	16,00,000	16,00,000	16,00,000
Advertisement	30,00,000	15,00,000	10,00,000	4,00,000
Depreciation	15,00,000	15,00,000	16,50,000	16,50,000
Profit/(loss)	(13,00,000)	26,00,000	1,37,50,000	83,50,000
Tax @ 50%	(6,50,000)*	13,00,000	68,75,000	41,75,000
Profit/(loss) after tax	(6,50,000)	13,00,000	68,75,000	41,75,000
Add: Depreciation	15,00,000	15,00,000	16,50,000	16,50,000
Cash Inflow	8,50,000	28,00,000	85,25,000	58,25,000

* Tax Benefit as loss shall be adjusted against taxable profit.

Computation of PV of CIF

Year	CIF	PV Factor @ 12%	
	₹		₹
1	8,50,000	0.893	7,59,050
2	28,00,000	0.797	22,31,600
3	85,25,000	0.712	60,69,800
4	85,25,000	0.636	54,21,900
5	85,25,000	0.567	48,33,675
6	58,25,000	0.507	29,53,275
7	58,25,000	0.452	26,32,900
8	58,25,000	0.404	23,53,300
WC	15,00,000	0.404	6,06,000
SV	1,00,000	0.404	40,400
			2,79,01,900
	PV of COF		1,35,00,000
	Additional Investment = ₹ 10,00,000 × 0.797		7,97,000
			1,42,97,000
	NPV		1,36,04,900

Recommendation: Accept the project in view of positive NPV.

Question 15

DL Services is in the business of providing home Services like plumbing, sewerage line cleaning etc. There is a proposal before the company to purchase a mechanized sewerage cleaning line for a sum of ₹ 20 lacs. The life of the machine is 10 years. The present system of the company is to use manual labour for the job. You are provided the following information:

Cost of machine	*20 lakhs*
Depreciation	*20% p.a. straight line*
Operating cost	*₹ 5 lacs per annum*
Present system	
Manual labour	*200 persons*
Cost of Manual labour	*₹ 10,000 (ten thousand) per person per annum*

The company has an after tax cost of funds of 10% per annum. The applicable rate of tax inclusive of surcharge and cess is 35%.

Based on the above you are required to:

(i) State whether it is advisable to purchase the machine.

(ii) Compute the savings/additional cost as applicable, if the machine is purchased.

Answer

Present System

Cost per annum	
200 persons @ ₹10,000 per annum	20,00,000
Cumulative Annuity factor at 10%	6.1446
Present value of cash outflow over a period of ten years at 10%	122,89,200
Less: Tax benefit at 35% for 10 years	43,01,220
Net cost over ten years	**79,87,980**
If machine is purchased	
Cost of Machine	20,00,000
Depreciation per annum	4,00,000
Annual cost of operation	5,00,000
Present value of operating cost for 10 years at 10%	30,72,300
Less: Tax saving on operating cost at 35% for 10 years	10,75,305
Net operating cost	19,96,995
Annuity factor for 5 years at 10%	3.7908

Tax saving on depreciation at 35%	5,30,712
Summary	
Outflow on machine	20,00,000
Less: Tax saving on depreciation of Machine	-5,30,712
Add: Operating cost over 10 years	19,96,995
Total cost of machine over 10 years	**34,66,283**
Total saving	45,21,697

Since there is a saving of ₹ 45.21 lacs it is advisable to purchase the machine.

Alternative Solution:

Calculation of Savings in operating cost if the mechanized cleaning line is purchased:

Annual Cost of the present system – cost of manual labour	₹ lakhs
200 persons × ₹10,000	20.00
Less: Operating cost with the new line	5.00
Annual Savings	15.00

Calculation of incremental cash inflows if the mechanized cleaning line is purchased:

Year 1 - 5		*₹ lakhs*
Annual Savings in operating cost (before tax)		15.00
Less: Annual depreciation @ 20% on cost		4.00
Taxable annual incremental income		11.00
Less: Tax @ 35%		3.85
After-tax annual incremental income		7.15
Add: Annual depreciation		4.00
Annual incremental cash-in-flow		11.15
Present Value Factor (of an Annuity for a period of 5 years @ 10%)		3.79
Present Value of 5-year annual incremental cash-in-flow *(₹ Lakhs)*		42.26

Year 6 – 10		*₹ lakhs*
Annual Savings in operating cost (before tax)		15.00
Less: Tax @ 35%		5.25
After-tax annual incremental income/cash in flow		9.75
Present Value Factor (of an Annuity between year 6 and 10)		2.35
Present Value of cash-in-flow in years 6 to 10 *(₹ Lakhs)*		22.91
(Salvage value presumed 'nil')		

₹ in lakhs

Calculation of Net Present Value:		
Aggregate Present Value of Cash inflows in years 1 – 10		
(42.26 + 22.91)		65.17
Less: Initial investment – cost of machine		20.00
Net Present Value	(+)	45.17

Advise: Since the NPV is positive, it is advisable to purchase the mechanized line.

Question 16

Skylark Airways is planning to acquire a light commercial aircraft for flying class clients at an investment of ₹ 50,00,000. The expected cash flow after tax for the next three years is as follows: *(₹)*

Year 1		*Year 2*		*Year 3*	
CFAT	*Probability*	*CFAT*	*Probability*	*CFAT*	*Probability*
14,00,000	*0.1*	*15,00,000*	*0.1*	*18,00,000*	*0.2*
18,00,000	*0.2*	*20,00,000*	*0.3*	*25,00,000*	*0.5*
25,00,000	*0.4*	*32,00,000*	*0.4*	*35,00,000*	*0.2*
40,00,000	*0.3*	*45,00,000*	*0.2*	*48,00,000*	*0.1*

The Company wishes to take into consideration all possible risk factors relating to airline operations. The company wants to know:

(i) The expected NPV of this venture assuming independent probability distribution with 6 per cent risk free rate of interest.

(ii) The possible deviation in the expected value.

(iii) How would standard deviation of the present value distribution help in Capital Budgeting decisions?

Answer

(i) Expected NPV

(₹ in lakhs)

Year I			*Year II*			*Year III*		
CFAT	P	CF×P	CFAT	P	CF×P	CFAT	P	CF×P
14	0.1	1.4	15	0.1	1.5	18	0.2	3.6
18	0.2	3.6	20	0.3	6.0	25	0.5	12.5
25	0.4	10.0	32	0.4	12.8	35	0.2	7.0

40	0.3	12.0	45	0.2	9	48	0.1	4.8
	$\bar{x}$ or $\overline{CF}$	27.0		$\bar{x}$ or $\overline{CF}$	29.3			$\bar{x}$ or $\overline{CF}$ 27.9

NPV	*PV factor @ 6%*	*Total PV*
27	0.943	25.461
29.3	0.890	26.077
27.9	0.840	23.436
	PV of cash inflow	74.974
	Less: Cash outflow	50.000
	NPV	24.974

(ii) Possible deviation in the expected value

Year I				
$X - \bar{X}$	$X - \bar{X}$	$(X - \bar{X})^2$	P_1	$(X - \bar{X})^2 P^1$
14 – 27	-13	169	0.1	16.9
18 – 27	-9	81	0.2	16.2
25 – 27	-2	4	0.4	1.6
40 – 27	13	169	0.3	50.7
				85.4

$\sigma_1 = \sqrt{85.4}$ = 9.241

Year II				
$X - \bar{X}$	$X - \bar{X}$	$(X - \bar{X})^2$	P_2	$(X - \bar{X})^2 \times P_2$
15-29.3	-14.3	204.49	0.1	20.449
20-29.3	-9.3	86.49	0.3	25.947
32-29.3	2.7	7.29	0.4	2.916
45-29.3	15.7	246.49	0.2	49.298
				98.61

$\sigma_2 = \sqrt{98.61} = 9.930$

Year III				
$X - \bar{X}$	$X - \bar{X}$	$(X - \bar{X})^2$	P_3	$(X - \bar{X})^2 \times P_3$
18-27.9	-9.9	98.01	0.2	19.602

25-27.9	-2.9	8.41	0.5	4.205
35-27.9	7.1	50.41	0.2	10.082
48-27.9	20.1	404.01	0.1	40.401
				74.29

$\sigma_3 = \sqrt{74.29} = 8.619$

Standard deviation about the expected value:

$$= \sqrt{\frac{85.4}{(1.06)^2} + \frac{98.61}{(1.06)^4} + \frac{74.29}{(1.06)^6}} = 14.3696$$

(iii) Standard deviation is a statistical measure of dispersion; it measures the deviation from a central number i.e. the mean.

In the context of capital budgeting decisions especially where we take up two or more projects giving somewhat similar mean cash flows, by calculating standard deviation in such cases, we can measure in each case the extent of variation. It can then be used to identify which of the projects is least riskier in terms of variability of cash flows.

A project, which has a lower coefficient of variation will be preferred if sizes are heterogeneous.

Besides this, if we assume that probability distribution is approximately normal we are able to calculate the probability of a capital budgeting project generating a net present value less than or more than a specified amount.

Question 17

(a) Cyber Company is considering two mutually exclusive projects. Investment outlay of both the projects is ₹ 5,00,000 and each is expected to have a life of 5 years. Under three possible situations their annual cash flows and probabilities are as under:

		Cash Flow (₹)	
Situation	*Probabilities*	*Project A*	*Project B*
Good	*0.3*	*6,00,000*	*5,00,000*
Normal	*0.4*	*4,00,000*	*4,00,000*
Worse	*0.3*	*2,00,000*	*3,00,000*

The cost of capital is 7 per cent, which project should be accepted? Explain with workings.

(b) A company is considering Projects X and Y with following information:

Project	*Expected NPV (₹)*	*Standard deviation*
X	*1,22,000*	*90,000*
Y	*2,25,000*	*1,20,000*

(i) Which project will you recommend based on the above data?

(ii) Explain whether your opinion will change, if you use coefficient of variation as a measure of risk.

(iii) Which measure is more appropriate in this situation and why?

Answer

(a) Project A

Expected Net Cash flow (ENCF)

0.3 (6,00,000) + 0.4 (4,00,000) + 0.3 (2,00,000) = 4,00,000

σ^2=0.3 (6,00,000– 4,00,000)^2 + 0.4 (4,00,000 – 4,00,000)^2 + 0.3 (2,00,000 – 4,00,000)^2

$\sigma = \sqrt{24,00,00,00,000}$

σ = 1,54,919.33

Present Value of Expected Cash Inflows = 4,00,000 × 4.100 = 16,40,000

NPV = 16,40,000 – 5,00,000 = 11,40,000

Project B

ENCF = 0.3 (5,00,000) + 0.4 (4,00,000) + 0.3 (3,00,000) = 4,00,000

σ^2=0.3 (5,00,000 – 4,00,000)^2 + 0.4 (4,00,000 – 4,00,000)^2 + 0.3 (3,00,000 – 4,00,000)^2

$\sigma = \sqrt{6,00,00,00,000}$

σ = 77,459.66

Present Value of Expected Cash Inflows = 4,00,000 × 4.100 = 16,40,000

NPV = 16,40,000 – 5,00,000 = 11,40,000

Recommendation: NPV in both projects being the same, the project should be decided on the basis of standard deviation and hence project 'B' should be accepted having lower standard deviation, means less risky.

(b) (i) On the basis of standard deviation project X be chosen because it is less risky than Project Y having higher standard deviation.

(ii) $CV_x = \frac{SD}{ENPV} = \frac{90,000}{1,22,000} = 0.738$

$CV_y = \frac{1,20,000}{2,25,000} = 0.533$

On the basis of Co-efficient of Variation (C.V.) Project X appears to be more risky and Y should be accepted.

(iii) However, the NPV method in such conflicting situation is best because the NPV method is in compatibility of the objective of wealth maximisation in terms of time value.

Question 18

Project X and Project Y are under the evaluation of XY Co. The estimated cash flows and their probabilities are as below:

Project X : Investment (year 0) ₹ 70 lakhs

Probability weights	*0.30*	*0.40*	*0.30*
Years	*₹ lakhs*	*₹ lakhs*	*₹ lakhs*
1	*30*	*50*	*65*
2	*30*	*40*	*55*
3	*30*	*40*	*45*

Project Y: Investment (year 0) ₹ 80 lakhs.

Probability weighted	*Annual cash flows through life*
	₹ lakhs
0.20	*40*
0.50	*45*
0.30	*50*

(a) Which project is better based on NPV, criterion with a discount rate of 10%?

(b) Compute the standard deviation of the present value distribution and analyse the inherent risk of the projects.

Answer

(a) Calculation of NPV of XY Co.:

Project X		*Cash flow*	*PVF*	*PV*
Year 1	(30 × 0.3) + (50 × 0.4) + (65 × 0.3)	48.5	0.909	44.09

2	(30 × 0.3) + (40 × 0.4) + (55 × 0.3)	41.5	0.826	34.28
3	(30 × 0.3) + (40 × 0.4) + (45 × 0.3)	38.5	0.751	28.91
				107.28
	NPV: (107.28 – 70.00) =			(+) 37.28

Project Y (For 1-3 Years)

1-3	(40 × 0.2) + (45 × 0.5) + (50 × 0.3)	45.5	2.487	113.16
	NPV (113.16 – 80.00)			(+) 33.16

(b) Calculation of Standard deviation σ

As per Hiller's model

$$M = \sum_{i=0}^{n} (1+r)^{-1} Mi$$

$$\sigma^2 = \sum_{i=0}^{n} (1+r)^{-2i} \sigma_i^2$$

Hence

Project X

Year

1 $\sqrt{(30-48.5)^2 0.30 + (50-48.5)^2 0.40 + (65-48.5)^2 0.30} = \sqrt{185.25}$ =13.61

2 $\sqrt{(30-41.5)^2 0.30 + (40-41.5)^2 0.40 + (55-41.5)^2 0.30} = \sqrt{95.25}$ = 9.76

3 $\sqrt{(30-38.5)^2 0.30 + (40-38.5)^2 0.40 + (45-38.5)^2 0.30} = \sqrt{35.25}$ = 5.94

Standard Deviation about the expected value

$$= \sqrt{\frac{185.25}{(1+0.10)^2} + \frac{95.25}{(1+0.10)^4} + \frac{35.25}{(1+0.10)^6}}$$

$$= \sqrt{\frac{185.25}{1.21} + \frac{95.25}{1.4641} + \frac{35.25}{1.7716}} = \sqrt{153.10+65.06+19.90}$$

$$= \sqrt{238.06} = 15.43$$

Project Y (For 1-3 Years)

$\sqrt{(40-45.5)^2 0.20 + (45-45.5)^2 0.50 + (50-45.5)^2 0.30} = \sqrt{12.25}$ = 3.50

Standard Deviation about the expected value

$$= \sqrt{\frac{12.25}{(1+0.10)^2} + \frac{12.25}{(1+0.10)^4} + \frac{12.25}{(1+0.10)^6}}$$

$$= \sqrt{\frac{12.25}{1.21} + \frac{12.25}{1.4641} + \frac{12.25}{1.7716}} = \sqrt{10.12+8.37+6.91}$$

$$= \sqrt{25.4} = 5.03$$

Analysis: Project Y is less risky as its Standard Deviation is less than Project X.

Question 19

Shivam Ltd. is considering two mutually exclusive projects A and B. Project A costs ₹ 36,000 and project B ₹ 30,000. You have been given below the net present value probability distribution for each project.

Project A		*Project B*	
NPV estimates (₹)	*Probability*	*NPV estimates (₹)*	*Probability*
15,000	*0.2*	*15,000*	*0.1*
12,000	*0.3*	*12,000*	*0.4*
6,000	*0.3*	*6,000*	*0.4*
3,000	*0.2*	*3,000*	*0.1*

(i) Compute the expected net present values of projects A and B.

(ii) Compute the risk attached to each project i.e. standard deviation of each probability distribution.

(iii) Compute the profitability index of each project.

(iv) Which project do you recommend? State with reasons.

Answer

(i) Statement showing computation of expected net present value of Projects A and B:

Project A			*Project B*		
NPV Estimate (₹)	*Probability*	*Expected Value*	*NPV Estimate*	*Probability*	*Expected Value*
15,000	0.2	3,000	15,000	0.1	1,500
12,000	0.3	3,600	12,000	0.4	4,800
6,000	0.3	1,800	6,000	0.4	2,400
3,000	0.2	600	3,000	0.1	300
	1.0	EV = 9,000		1.0	EV = 9,000

(ii) Computation of Standard deviation of each project

Project A

P	X	(X – EV)	P (X-EV)²
0.2	15,000	6,000	72,00,000
0.3	12,000	3,000	27,00,000
0.3	6,000	- 3,000	27,00,000
0.2	3,000	- 6,000	72,00,000
			Variance = 1,98,00,000

Standard Deviation of Project A = $\sqrt{1,98,00,000}$ = ₹4,450

Project B

P	X	(X – EV)	P (X-EV)²
0.1	15,000	6,000	36,00,000
0.4	12,000	3,000	36,00,000
0.4	6,000	- 3,000	36,00,000
0.1	3,000	- 6,000	36,00,000
			Variance = 1,44,00,000

Standard Deviation of Project A = $\sqrt{1,44,00,000}$ = ₹3,795

(iii) Computation of profitability of each project

Profitability index = Discount cash inflow / Initial outlay

In case of Project A : PI = $\frac{9,000+36,000}{36,000}=\frac{45,000}{36,000}=1.25$

In case of Project B : PI = $\frac{9,000+30,000}{30,000}=\frac{39,000}{30,000}=1.30$

(iv) Measurement of risk is made by the possible variation of outcomes around the expected value and the decision will be taken in view of the variation in the expected value where two projects have the same expected value, the decision will be the project which has smaller variation in expected value. In the selection of one of the two projects A and B, Project B is preferable because the possible profit which may occur is subject to less variation (or dispersion). Much higher risk is lying with project A.

Question 20

Aeroflot airlines is planning to procure a light commercial aircraft for flying class clients at an investment of ₹ 50 lakhs. The expected cash flow after tax for next three years is as follows:

(₹ in lakh)

Year 1		Year 2		Year 3	
CFAT	**Probability**	**CFAT**	**Probability**	**CFAT**	**Probability**
15	.1	15	.1	18	.2
18	.2	20	.3	22	.5
22	.4	30	.4	35	.2
35	.3	45	.2	50	.1

The company wishes to consider all possible risk factors relating to an airline.

The company wants to know-

(i) the expected NPV of this proposal assuming independent probability distribution with 6 per cent risk free rate of interest, and

(ii) the possible deviation on expected values.

Answer

(i) Determination of expected CFAT

₹ in lakh

Year-1			Year-2			Year - 3		
CFAT	P_1	Cash flow	CFAT	P_2	Cash flow	CFAT	P_3	Cash flow
15	0.1	1.5	15	0.1	1.5	18	0.2	3.6
18	0.2	3.6	20	0.3	6	22	0.5	11
22	0.4	8.8	30	0.4	12	35	0.2	7
35	0.3	10.5	45	0.2	9	50	0.1	5
		$\overline{CF_1}$ 24.4			$\overline{CF_2}$ 28.5			$\overline{CF_3}$ 26.6

CFAT (₹ in lakh)	PV factor @ 6%	Total PV (₹ in lakh)
24.4	0.943	23.009
28.5	0.890	25.365
26.6	0.840	22.344
		70.718
	Less Cash flow	50.000
	= NPV	20.718

(ii) Determination of Standard deviation for each year

Year 1

$(CF_1 - \overline{CF_1})^2$	$(CF_1 - \overline{CF_1})^2$	P_1	
$(15-24.4)^2$	88.36	0.1	8.836
$(18-24.4)^2$	40.96	0.2	8.192
$(22-24.4)^2$	5.76	0.4	2.304
$(35-24.4)^2$	112.36	0.3	33.708
			53.04

$$\sigma = \sqrt{53.04} = 7.282$$

Year 2

$(CF_2 - \overline{CF_2})^2$	$(CF_2 - \overline{CF_2})^2$	P_2	
$(15-28.5)^2$	182.25	0.1	18.225
$(20-28.5)^2$	72.25	0.3	21.675
$(30-28.5)^2$	2.25	0.4	0.9
$(45-28.5)^2$	272.25	0.2	54.45
			95.25

$$\sigma = \sqrt{95.25} = 9.76$$

Year -3

$(CF_3 - \overline{CF_3})^2$	$(CF_3 - \overline{CF_3})^2$	P_3	
$(18-26.6)^2$	73.96	0.2	14.792
$(22-26.6)^2$	21.16	0.5	10.58
$(35-26.6)^2$	70.56	0.2	14.112
$(50-26.6)^2$	547.56	0.1	54.756
			94.24

$$\sigma = \sqrt{94.24} = 9.70$$

Standard deviation of the expected Values

$$\sqrt{\sum_{t=1}^{n} \frac{\sigma^2_t}{(1+i)^{2t}}}$$

$$\sigma = \sqrt{\frac{53.04}{(1+0.06)^2} + \frac{95.25}{(1+0.06)^4} + \frac{94.24}{(1+0.06)^6}}$$

$$\sigma = \sqrt{47.21+75.45+66.44} = \sqrt{189.10} = 13.75$$

Question 21

Following are the estimates of the net cash flows and probability of a new project of M/s X Ltd.:

	Year	*P=0.3*	*P=0.5*	*P=0.2*
Initial investment	*0*	*4,00,000*	*4,00,000*	*4,00,000*
Estimated net after tax cash inflows per year	*1 to 5*	*1,00,000*	*1,10,000*	*1,20,000*
Estimated salvage value (after tax)	*5*	*20,000*	*50,000*	*60,000*

Required rate of return from the project is 10%. Find:

(i) The expected NPV of the project.

(ii) The best case and the worst case NPVs.

(iii) The probability of occurrence of the worst case if the cash flows are perfectly dependent overtime and independent overtime.

(iv) Standard deviation and coefficient of variation assuming that there are only three streams of cash flow, which are represented by each column of the table with the given probabilities.

(v) Coefficient of variation of X Ltd. on its average project which is in the range of 0.95 to 1.0. If the coefficient of variation of the project is found to be less risky than average, 100 basis points are deducted from the Company's cost of Capital

Should the project be accepted by X Ltd?

Answer

(a) (i) Expected cash flows:-

Year			*Net cash flows*	*P.V.*	*PV. @ 10%*
0	(4,00,000 x 1)	=	(-)4,00,000	1.000	(-)4,00,000
1 to 4	(1,00,000x0.3+1,10,000x0.5 + 1,20,000 x 0.2)	=	1,09,000	3.170	3,45,530
5	[1,09,000 + (20,000 x 0.3 + 50,000 x 0.5 + 60,000 x 0.2)]	=	1,52,000	0.621	94,392
			NPV=		39,922

(ii) ENPV of the worst case

1,00,000 x 3.790 = ₹3,79,000 (Students may have 3.791 also the values will change accordingly)

20,000 x 0.621 = ₹12,420/-

ENPV = (-) 4,00,000 + 3,79,000 + 12,420 = (-) ₹8,580/-

ENPV of the best case

ENPV = (-) 4,00,000 + 1,20,000 x 3.790 + 60,000 x 0.621 = ₹92,060/-.

(iii) (a) Required probability = 0.3

(b) Required probability = $(0.3)^5 = 0.00243$

(iv) The base case NPV = (-) 4,00,000 + (1,10,000 x 3.79) + (50,000 x 0.621)

= ₹47,950/-

ENPV = 0.30 x (-) 8580 + 0.5 x 47950 + 92060 x 0.20

= ₹39,813/-

Therefore,

$\sigma_{ENPV} = \sqrt{0.3(-8580-39{,}813)^2 + 0.5(47950-39813)^2 + 0.2(92{,}060-39{,}813)^2}$ = ₹35,800/-

Therefore, CV = 35,800/39,813 = 0.90

(v) Risk adjusted out of cost of capital of X Ltd. = 10% - 1% = 9%.

NPV

Year	Expected net cash flow	PV @ 9%	
0	(-)4,00,000	1.000	(-)4,00,000
1 to 4	1,09,000	3.240	3,53,160
5	1,52,000	0.650	98,800
		ENPV =	51,960

Therefore, the project should be accepted.

Question 22

XYZ Ltd. is considering a project for which the following estimates are available:

	₹
Initial Cost of the project	*10,00,000*
Sales price/unit	*60*
Cost/unit	*40*

Sales volumes	
Year 1	*20000 units*
Year 2	*30000 units*
Year 3	*30000 units*

Discount rate is 10% p.a.

You are required to measure the sensitivity of the project in relation to each of the following parameters:

(a) Sales Price/unit

(b) Unit cost

(c) Sales volume

(d) Initial outlay and

(e) Project lifetime

Taxation may be ignored.

Answer

Calculation of NPV

$$\text{NPV} = -10,00,000 + \frac{20,000\times 20}{1.1} + \frac{30,000\times 20}{1.21} + \frac{30,000\,x\,20}{1.331}$$

= - 10,00,000 + 3,63,636 + 4,95,868 + 4,50,789

= 13,10,293 – 10,00,000

= ₹3,10,293/-.

Measurement of sensitivity is as follows:

(a) Sales Price:-

Let the sale price/Unit be S so that the project would break even with 0 NPV.

$$\therefore 10,00,000 = \frac{20,000\times(S-40)}{1.1} + \frac{30,000\times(S-40)}{1.21} + \frac{30,000(S-40)}{1.331}$$

S – 40 = 10,00,000/65,514

S – 40 = ₹15.26

S = ₹55.26 which represents a fall of (60-55.26)/60

Or 0.079 or 7.9%

Alternative Method

$\frac{10,00,000 \times 20}{13,10,293}$ = ₹ 15.26

S= ₹40 + ₹15.26

= ₹55.26

Alternative Solution

If sale Price decreased by say 10%, then NPV (at Sale Price of ₹ 60 – ₹ 6 = ₹ 54)

$$NPV = -10,00,000 + \frac{20000 \times 14}{(1.1)^1} + \frac{30000 \times 14}{(1.1)^2} + \frac{30000 \times 14}{(1.1)^3}$$

= -10,00,000 +2,54,545 + 3,47,107 + 3,15,552

= -82,796

$$\text{NPV decrease (\%)} = \frac{3,10,293 - (-82,796)}{3,10,293} \text{ X } 100 = 126.68\%$$

(b) Unit Cost:-

If sales price = ₹ 60 the cost price required to give a margin of ₹15.26 is (₹60 – ₹15.26) or ₹44.74 which would represent a rise of 11.85% i.e., $\left(\frac{44.74 - 40}{40} \times 100\right)$

Alternative Solution

If unit cost increased by say 10%. The new NPV will be as follows:

$$NPV = -10,00,000 + \frac{20000 \times 16}{(1.1)^1} + \frac{30000 \times 16}{(1.1)^2} + \frac{30000 \times 16}{(1.1)^3}$$

= -10,00,000 +2,90,909 + 3,96,694 + 3,60,631

= 48,234

$$\text{NPV decrease (\%)} = \frac{3,10,293 - (48,234)}{3,10,293} \text{ X } 100 = 84.46\%$$

(c) Sales volume:-

The requisite percentage fall is:-

3,10,293/13,10,293 $\times$ 100 = 23.68%

Alternative Solution

If sale volume decreased by say 10%. The new NPV will be as follows:

NPV = -10,00,000 + $\frac{18000\times 20}{(1.1)^1}+\frac{27000\times 20}{(1.1)^2}+\frac{27000\times 20}{(1.1)^3}$

= -10,00,000 + 3,27,272 + 4,46,281 + 4,05,710

= 1,79,263

NPV decrease (%) = $\frac{3,10,293 - 1,79,263}{3,10,293}$ X 100 = 42.22%

(d) Since PV of inflows remains at ₹13,10,293 the initial outlay must also be the same.

∴ Percentage rise = 3,10,293/10,00,000 × 100 = 31.03%.

Alternative Solution

If initial outlay increased by say 10%. The new NPV will be as follows:

NPV = -11,00,000 + $\frac{20000\times 20}{(1.1)^1}+\frac{30000\times 20}{(1.1)^2}+\frac{30000\times 20}{(1.1)^3}$

= -11,00,000 + 3,63,636 + 4,95,868 + 4,50,789 = 2,10,293

NPV decrease (%) = $\frac{3,10,293 - 2,10,293}{3,10,293}$ X 100 = 32.22%

(e) Present value for 1st two years.

= - 10,00,000 + 4,00,000 x 0.909 + 6,00,000 x 0.826

= - 10,00,000 + 3,63,600 + 4,95,600

= - 10,00,000 + 8,59,200

= - 1,40,800

∴ The project needs to run for some part of the third year so that the present value of return is ₹1,40,800. It can be computed as follows:

(i) 30,000 units x ₹ 20 x 0.751 = ₹4,50,600

(ii) Per day Production in (₹) assuming a year of 360 days =

$\frac{₹\,4,50,600}{360} = ₹\,1,252$

(iii) Days needed to recover ₹1,40,800 = $\frac{₹\,1,40,800}{₹\,1,252} = 112$

Thus, if the project runs for 2 years and 112 days then break even would be achieved representing a fall of $\frac{(3 - 2.311)}{3}\times 100$ = 22.97%.

Question 23

From the following details relating to a project, analyse the sensitivity of the project to changes in initial project cost, annual cash inflow and cost of capital:

Initial Project Cost (₹)	*1,20,000*
Annual Cash Inflow (₹)	*45,000*
Project Life (Years)	*4*
Cost of Capital	*10%*

To which of the three factors, the project is most sensitive? (Use annuity factors: for 10% 3.169 and 11% 3.103).

Answer

CALCULATION OF NPV

	₹
PV of cash inflows (₹ 45,000 x 3.169)	1,42,605
Initial Project Cost	1,20,000
NPV	22,605
If initial project cost is varied adversely by 10%*	
NPV (Revised) (₹ 1,42,605 - ₹ 1,32,000)	₹ 10,605
Change in NPV (₹ 22,605 – ₹ 10,605)/ ₹ 22,605 i.e.	53.08 %
If annual cash inflow is varied adversely by 10%*	
Revised annual inflow	₹ 40,500
NPV (Revised) (₹ 40,500 x 3.169) – (₹ 1,20,000)	(+) ₹ 8,345
Change in NPV (₹ 22,605 – ₹ 8,345) / ₹ 22,605	63.08 %
If cost of capital is varied adversely by 10%*	
NPV (Revised) (₹ 45,000 x 3.103) – ₹ 1,20,000	(+) ₹ 19,635
Change in NPV (₹ 22,605 – ₹ 19,635) / ₹ 22,605	13.14 %

Conclusion: Project is most sensitive to 'annual cash inflow'.

*Note: Students may please note that they may assume any other percentage rate other than 10 % say 15%, 20 % 25 % etc.

Question 24

Red Ltd. is considering a project with the following Cash flows:

₹

Years	Cost of Plant	Recurring Cost	Savings
0	10,000		
1		4,000	12,000
2		5,000	14,000

The cost of capital is 9%. Measure the sensitivity of the project to changes in the levels of plant value, running cost and savings (considering each factor at a time) such that the NPV becomes zero. The P.V. factor at 9% are as under:

Year	Factor
0	1
1	0.917
2	0.842

Which factor is the most sensitive to affect the acceptability of the project?

Answer

P.V. of Cash Flows

Year 1	Running Cost	₹ 4,000 x 0.917	= (₹ 3,668)
	Savings	₹ 12,000 x 0.917	= ₹ 11,004
Year 2	Running Cost	₹ 5,000 x 0.842	= (₹ 4,210)
	Savings	₹ 14,000 x 0.842	= ₹ 11,788
			₹ 14,914
Year 0	*Less:* P.V. of Cash Outflow	₹ 10,000 x 1	₹ 10,000
		NPV	₹ 4,914

Sensitivity Analysis

(i) Increase of Plant Value by ₹ 4,914

$$\therefore \frac{4,914}{10,000} \times 100 = 49.14\%$$

(ii) Increase of Running Cost by ₹ 4,914

$$\frac{4,914}{3,668+4,210} = \frac{4,914}{7,878} \times 100 = 62.38\%$$

(iii) Fall in Saving by ₹ 4,914

$$\frac{4,914}{11,004+11,788} = \frac{4,914}{22,792} \text{ x } 100 = 21.56\%$$

Hence, savings factor is the most sensitive to affect the acceptability of the project as in comparison of other two factors as a slight % change in this factor shall more affect the NPV than others.

Alternative Solution

P.V. of Cash Flows

Year 1	Running Cost	₹ 4,000 x 0.917	= (₹ 3,668)
	Savings	₹ 12,000 x 0.917	= ₹ 11,004
Year 2	Running Cost	₹ 5,000 x 0.842	= (₹ 4,210)
	Savings	₹ 14,000 x 0.842	= ₹ 11,788
			₹ 14,914
Year 0	Less: P.V. of Cash Outflow	₹ 10,000 x 1	₹ 10,000
		NPV	₹ 4,914

Sensitivity Analysis

(i) If the initial project cost is varied adversely by say 10%*.

NPV (Revised) (₹ 4,914 – ₹ 1,000) = ₹ 3,914

Change in NPV $\frac{₹\ 4,914 - ₹\ 3,914}{₹\ 4,914} = 20.35\%$

(ii) If Annual Running Cost is varied by say 10%*.

NPV (Revised) (₹ 4,914 – ₹ 400 X 0.917 – ₹ 500 X 0.843)

= ₹ 4,914 – ₹ 367 – ₹ 421= ₹ 4,126

Change in NPV $\frac{₹\ 4,914 - ₹\ 4,126}{₹\ 4,914} = 16.04\%$

(iii) If Saving is varied by say 10%*.

NPV (Revised) (₹ 4,914 – ₹ 1,200 X 0.917 – ₹ 1,400 X 0.843)

= ₹ 4,914 – ₹ 1,100 – ₹ 1,180 = ₹ 2,634

Change in NPV $\frac{₹\ 4,914 - ₹\ 2,634}{₹\ 4,914} = 46.40\%$

Hence, savings factor is the most sensitive to affect the acceptability of the project.

* Any percentage of variation other than 10% can also be assumed.

Question 25

The Easygoing Company Limited is considering a new project with initial investment, for a product "Survival". It is estimated that IRR of the project is 16% having an estimated life of 5 years.

Financial Manager has studied that project with sensitivity analysis and informed that annual fixed cost sensitivity is 7.8416%, whereas cost of capital (discount rate) sensitivity is 60%.

Other information available are:

Profit Volume Ratio (P/V) is 70%,

Variable cost ₹60/- per unit

Annual Cash Flow ₹57,500/-

Ignore Depreciation on initial investment and impact of taxation.

Calculate

(i) Initial Investment of the Project

(ii) Net Present Value of the Project

(iii) Annual Fixed Cost

(iv) Estimated annual unit of sales

(v) Break Even Units

Cumulative Discounting Factor for 5 years

8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127

Answer

(i) Initial Investment

IRR = 16% (Given)

At IRR, NPV shall be zero, therefore

Initial Cost of Investment = PVAF (16%,5) x Cash Flow (Annual)

= 3.274 x ₹ 57,500

= ₹ 1,88,255

(ii) Net Present Value (NPV)

Let Cost of Capital be X, then $\frac{16-X}{X}=60\%$

X = 10%

Thus NPV of the project

= Annual Cash Flow x PVAF (10%, 5) – Initial Investment

= ₹ 57,500 x 3.791 – ₹ 1,88,255

= ₹ 2,17,982.50 – ₹ 1,88,255 **=** ₹ 29,727.50

(iii) Annual Fixed Cost

Let change in the Fixed Cost which makes NPV zero is X. Then,

₹ 29,727.50 – 3.791X = 0

Thus X = ₹ 7,841.60

Let original Fixed Cost be Y then,

Y × 7.8416% = ₹ 7,841.60

Y = ₹ 1,00,000

Thus Fixed Cost is equal to ₹ 1,00,000

(iv) Estimated Annual Units of Sales

$$\text{Selling Price per unit} = \frac{₹\,60}{100\% - 70\%} = ₹\,200$$

$$\frac{\text{Annual Cash Flow + Fixed Cost}}{\text{P/V Ratio}} = \text{Sales Value}$$

$$\frac{₹\,57,500 + ₹\,1,00,000}{0.70} = ₹\,2,25,000$$

$$\text{Sales in Units} = \frac{₹\,2,25,000}{₹\,200} = 1,125 \text{ units}$$

(v) Break Even Units

$$\frac{\text{Fixed Cost}}{\text{Contribution Per Unit}} = \frac{1,00,000}{140} = 714.285 \text{ units}$$

Question 26

Unnat Ltd. is considering investing ₹ 50,00,000 in a new machine. The expected life of machine is five years and has no scrap value. It is expected that 2,00,000 units will be produced and sold each year at a selling price of ₹ 30.00 per unit. It is expected that the variable costs to be ₹ 16.50 per unit and fixed costs to be ₹ 10,00,000 per year. The cost of capital of Unnat Ltd. is 12% and acceptable level of risk is 20%.

You are required to measure the sensitivity of the project's net present value to a change in the following project variables:

(a) sale price;

(b) sales volume;

(c) variable cost;

(d) On further investigation it is found that there is a significant chance that the expected sales volume of 2,00,000 units per year will not be achieved. The sales manager of Unnat Ltd. suggests that sales volumes could depend on expected economic states which could be assigned the following probabilities:

State of Economy	*Annual Sales (in Units)*	*Prob.*
Poor	*1,75000*	*0·30*
Normal	*2,00,000*	*0·60*
Good	*2,25,000*	*0·10*

Calculate expected net present value of the project and give your decision whether company should accept the project or not.

Answer

Calculation of NPV

= - ₹ 50,00,000 + [2,00,000 (₹ 30 – ₹ 16.50) – ₹ 10,00,000] PVIAF (12%,5)

= - ₹ 50,00,000 + [2,00,000 (₹ 13.50) – ₹ 10,00,000] 3.605

= - ₹ 50,00,000 + [₹ 27,00,000 – ₹ 10,00,000] 3.605

=- ₹ 50,00,000 + ₹ 61,28,500 = ₹ 11,28,500

Measurement of Sensitivity Analysis

(a) Sales Price:-

Let the sale price/Unit be S so that the project would break even with 0 NPV.

∴ ₹ 50,00,000 = [2,00,000 (S – ₹ 16.50) – ₹ 10,00,000] PVIAF (12%,5)

₹ 50,00,000 = [2,00,000S – ₹ 33,00,000 – ₹ 10,00,000] 3.605

₹ 50,00,000 = [2,00,000S – ₹ 43,00,000] 3.605

₹ 13,86,963 = 2,00,000S – ₹ 43,00,000

₹ 56,86,963 = 2,00,000S

S = ₹ 28.43 which represents a fall of (30 - 28.43)/30 or 0.0523 or 5.23%

(b) Sales volume:-

Let V be the sale volume so that the project would break even with 0 NPV.

∴ ₹ 50,00,000 = [V (₹ 30 – ₹ 16.50) – ₹ 10,00,000] PVIAF (12%,5)

₹ 50,00,000 = [V (₹ 13.50) – ₹ 10,00,000] PVIAF (12%,5)

₹ 50,00,000 = [₹ 13.50V – ₹ 10,00,000] 3.605

₹ 13,86,963 = ₹ 13.50V – ₹ 10,00,000

₹ 23,86,963 = ₹ 13.50V

V = 1,76,812 which represents a fall of (2,00,000 - 1,76,812)/2,00,000 or 0.1159 or 11.59%

(c) Variable Cost:-

Let the variable cost be V so that the project would break even with 0 NPV.

 ₹ 50,00,000 = [2,00,000(₹ 30 – V) – ₹ 10,00,000] PVIAF(12%,5)

₹ 50,00,000 = [₹ 60,00,000 – 2,00,000 V – ₹ 10,00,000] 3.605

₹ 50,00,000 = [₹ 50,00,000 – 2,00,000 V] 3.605

₹ 13,86,963 = ₹ 50,00,000 – 2,00,000 V

₹ 36,13,037 = 2,00,000V

V = ₹ 18.07 which represents a fall of (18.07 – 16.50)/16.50 or 0.0951 or 9.51%

(d) Expected Net Present Value

(1,75,000 X 0.30) + (2,00,000 X 0.60) + (2,25,000 X 0.10) =1,95,000

NPV = [1,95,000 X ₹ 13.50 – ₹ 10,00,000] 3.605 – ₹ 50,00,000 = ₹ 8,85,163

Further NPV in worst and best cases will be as follows:

Worst Case:

[1,75,000 X ₹ 13.50 – ₹ 10,00,000] 3.605 – ₹ 50,00,000 = - ₹ 88,188

Best Case:

[2,25,000 X ₹ 13.50 – ₹ 10,00,000] 3.605 – ₹ 50,00,000 = ₹ 23,45,188

Thus there are 30% chances that the rise will be a negative NPV and 70% chances of positive NPV. Since acceptable level of risk of Unnat Ltd. is 20% and there are 30% chances of negative NPV hence project should not be accepted.

Question 27

XY Ltd. has under its consideration a project with an initial investment of ₹ 1,00,000. Three probable cash inflow scenarios with their probabilities of occurrence have been estimated as below:

Annual cash inflow (₹)	*20,000*	*30,000*	*40,000*
Probability	*0.1*	*0.7*	*0.2*

The project life is 5 years and the desired rate of return is 20%. The estimated terminal values for the project assets under the three probability alternatives, respectively, are ₹ 0, 20,000 and 30,000.

You are required to:

(i) Find the probable NPV;

(ii) Find the worst-case NPV and the best-case NPV; and

(iii) State the probability occurrence of the worst case, if the cash flows are perfectly positively correlated over time.

Answer

The expected cash flows of the project are as follows:

Year	*Pr = 0.1*	*Pr = 0.7*	*Pr = 0.2*	*Total*
	₹	₹	₹	₹
0	-10,000	-70,000	-20,000	-1,00,000
1	2,000	21,000	8,000	31,000
2	2,000	21,000	8,000	31,000
3	2,000	21,000	8,000	31,000
4	2,000	21,000	8,000	31,000
5	2,000	21,000	8,000	31,000
5	0	14,000	6,000	20,000

(i) NPV based on expected cash flows would be as follows:

$$=-₹\ 1,00,000 + \frac{₹\ 31,000}{(1+0.20)^1}+\frac{₹\ 31,000}{(1+0.20)^2}+\frac{₹\ 31,000}{(1+0.20)^3}+\frac{₹\ 31,000}{(1+0.20)^4}+\frac{₹\ 31,000}{(1+0.20)^5}+\frac{₹\ 20,000}{(1+0.20)^5}$$

= - ₹ 1,00,000 + ₹ 25,833.33 + ₹ 21,527.78 + ₹ 17,939.81 + ₹ 14,949.85+ ₹ 12,458.20 + ₹ 8,037.55

NPV = ₹ 746.52

(ii) For the worst case, the cash flows from the cash flow column farthest on the left are used to calculate NPV

$$= - ₹\ 100,000 + \frac{₹20,000}{(1+0.20)^1} + \frac{₹20,000}{(1+0.20)^2} + \frac{₹20,000}{(1+0.20)^3} + \frac{₹20,000}{(1+0.20)^4} + \frac{₹20,000}{(1+0.20)^5}$$

= - ₹ 100,000 + ₹ 16,666.67+ ₹ 13,888.89 + ₹ 11,574.07 + ₹ 9,645.06+ ₹ 8037.76

NPV = - ₹ 40,187.76

For the best case, the cash flows from the cash flow column farthest on the right are used to calculated NPV

$$= - ₹\ 100,000 + \frac{₹\ 40,000}{(1+0.20)^1} + \frac{₹\ 40,000}{(1+0.20)^2} + \frac{₹\ 40,000}{(1+0.20)^3} + \frac{₹\ 40,000}{(1+0.20)^4} + \frac{₹\ 40,000}{(1+0.20)^5} + \frac{₹\ 30,000}{(1+0.20)^5}$$

= - ₹ 1,00,000 + ₹ 33,333.33+ ₹ 27,777.78 + ₹ 23,148.15+ ₹ 19,290.12 + ₹ 16,075.10 + ₹ 12,056.33

NPV = ₹ 31,680.81

(iii) If the cash flows are perfectly dependent, then the low cash flow in the first year will mean a low cash flow in every year. Thus the possibility of the worst case occurring is the probability of getting ₹ 20,000 net cash flow in year 1 is 10%.

Question 28

The Textile Manufacturing Company Ltd., is considering one of two mutually exclusive proposals, Projects M and N, which require cash outlays of ₹ 8,50,000 and ₹ 8,25,000 respectively. The certainty-equivalent (C.E) approach is used in incorporating risk in capital budgeting decisions. The current yield on government bonds is 6% and this is used as the risk free rate. The expected net cash flows and their certainty equivalents are as follows:

Project M			*Project N*	
Year-end	*Cash Flow ₹*	*C.E.*	*Cash Flow ₹*	*C.E.*
1	*4,50,000*	*0.8*	*4,50,000*	*0.9*
2	*5,00,000*	*0.7*	*4,50,000*	*0.8*
3	*5,00,000*	*0.5*	*5,00,000*	*0.7*

Present value factors of ₹ 1 discounted at 6% at the end of year 1, 2 and 3 are 0.943, 0.890 and 0.840 respectively.

Required:

(i) Which project should be accepted?

(ii) If risk adjusted discount rate method is used, which project would be appraised with a higher rate and why?

Answer

(i) Statement Showing the Net Present Value of Project M

Year end	*Cash Flow (₹) (a)*	*C.E. (b)*	*Adjusted Cash flow (₹) (c) = (a) × (b)*	*Present value factor at 6% (d)*	*Total Present value (₹) (e) = (c) × (d)*
1	4,50,000	0.8	3,60,000	0.943	3,39,480
2	5,00,000	0.7	3,50,000	0.890	3,11,500
3	5,00,000	0.5	2,50,000	0.840	2,10,000
					8,60,980
Less: Initial Investment					8,50,000
Net Present Value					10,980

Statement Showing the Net Present Value of Project N

Year end	*Cash Flow (₹)* (a)	C.E. (b)	Adjusted Cash flow (₹) (c) = (a) × (b)	Present value factor (d)	Total Present value (₹) (e) = (c) × (d)
1	4,50,000	0.9	4,05,000	0.943	3,81,915
2	4,50,000	0.8	3,60,000	0.890	3,20,400
3	5,00,000	0.7	3,50,000	0.840	2,94,000
					9,96,315
Less: Initial Investment					8,25,000
Net Present Value					1,71,315

Decision: Since the net present value of Project N is higher, so the project N should be accepted.

(ii) Certainty - Equivalent (C.E.) Co-efficient of Project M (2.0) is lower than Project N (2.4). This means Project M is riskier than Project N as "higher the riskiness of a cash flow, the lower will be the CE factor". If risk adjusted discount rate (RADR) method is used, Project M would be analysed with a higher rate.

RADR is based on the premise that riskiness of a proposal may be taken care of, by adjusting the discount rate. The cash flows from a more risky proposal should be discounted at a relatively higher discount rate as compared to other proposals whose cash flows are less risky. Any investor is basically risk averse. However, he may be ready to take risk provided he is rewarded for undertaking risk by higher returns. So,

more risky the investment is, the greater would be the expected return. The expected return is expressed in terms of discount rate which is also the minimum required rate of return generated by a proposal if it is to be accepted. Therefore, there is a positive correlation between risk of a proposal and the discount rate.

Question 29

Determine the risk adjusted net present value of the following projects:

	X	Y	Z
Net cash outlays (₹)	2,10,000	1,20,000	1,00,000
Project life	5 years	5 years	5 years
Annual Cash inflow (₹)	70,000	42,000	30,000
Coefficient of variation	1.2	0.8	0.4

The Company selects the risk-adjusted rate of discount on the basis of the coefficient of variation:

Coefficient of Variation	Risk-Adjusted Rate of Return	P.V. Factor 1 to 5 years At risk adjusted rate of discount
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433
1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

Answer

Statement showing the determination of the risk adjusted net present value

Projects	Net cash outlays	Coefficient of variation	Risk adjusted discount rate	Annual cash inflow	PV factor 1-5 years	Discounted cash inflow	Net present value
	₹			₹		₹	₹
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii) = (v) × (vi)	(viii) = (vii) – (ii)
X	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180

Y	1,20,000	0.80	14%	42,000	3.433	1,44,186	24,186
Z	1,00,000	0.40	12%	30,000	3.605	1,08,150	8,150

Question 30

New Projects Ltd. is evaluating 3 projects, P-I, P-II, P-III. Following information is available in respect of these projects:

	P-I	*P-II*	*P-III*
Cost	*₹15,00,000*	*₹11,00,000*	*₹19,00,000*
Inflows-Year 1	*6,00,000*	*6,00,000*	*4,00,000*
Year 2	*6,00,000*	*4,00,000*	*6,00,000*
Year 3	*6,00,000*	*5,00,000*	*8,00,000*
Year 4	*6,00,000*	*2,00,000*	*12,00,000*
Risk Index	*1.80*	*1.00*	*0.60*

Minimum required rate of return of the firm is 15% and applicable tax rate is 40%. The risk free interest rate is 10%.

Required:

(i) Find out the risk-adjusted discount rate (RADR) for these projects.

(ii) Which project is the best?

Answer

(i) The risk free rate of interest and risk factor for each of the projects are given. The risk adjusted discount rate (RADR) for different projects can be found on the basis of CAPM as follows:

Required Rate of Return = I_{Rf} + (ke-I_{RF}) Risk Factor

For P-I : RADR = 0.10 + (0.15 – 0.10) 1.80 = 19%

For P-II : RADR = 0.10 + (0.15 – 0.10) 1.00 = 15 %

For P-III : RADR = 0.10 + (0.15 – 0.10) 0.60 = 13 %

(ii) The three projects can now be evaluated at 19%, 15% and 13% discount rate as follows:

Project P-I

Annual Inflows	₹ 6,00,000
PVAF (19 %, 4)	2.639
PV of Inflows (₹ 6,00,000 x 2.639)	₹ 15,83,400
Less: Cost of Investment	₹ 15,00,000
Net Present Value	**₹ 83,400**

Project P-II

Year	Cash Inflow (₹)	PVF (15%,n)	PV (₹)
1	6,00,000	0.870	5,22,000
2	4,00,000	0.756	3,02,400
3	5,00,000	0.658	3,29,000
4	2,00,000	0.572	1,14,400
Total Present Value			12,67,800
Less: Cost of Investment			11,00,000
Net Present Value			**1,67,800**

Project P-III

Year	Cash Inflow (₹)	PVF (13%,n)	PV (₹)
1	4,00,000	0.885	3,54,000
2	6,00,000	0.783	4,69,800
3	8,00,000	0.693	5,54,400
4	12,00,000	0.613	7,35,600
Total Present Value			21,13,800
Less: Cost of Investment			19,00,000
Net Present Value			**2,13,800**

Project P-III has highest NPV. So, it should be accepted by the firm

Question 31

A firm has projected the following cash flows from a project under evaluation:

Year	*₹ lakhs*
0	*(70)*
1	*30*
2	*40*
3	*30*

The above cash flows have been made at expected prices after recognizing inflation. The firm's cost of capital is 10%. The expected annual rate of inflation is 5%.

Show how the viability of the project is to be evaluated.

Answer

It is stated that the cash flows have been adjusted for inflation; hence they are "nominal". The cost of capital or discount rate is "real". In order to be compatible, the cash flows should be converted into "real flow". This is done as below:

Year	*Nominal cash flows*	*Adjusted Inflation* factor*	*Real cash flows*	*PVF @ 10%*	*PV of cash flows*
0	(70)	–	(70)	1.000	(70)
1	30	0.952	28.56	0.909	25.96
2	40	0.907	36.28	0.826	29.97
3	30	0.864	25.92	0.751	19.47
				Total	75.40
Less: Cash out flow					70.00
NPV (+)					5.40

* 1/1.05; $1/(1.05)^2$; $1/(1.05)^3$;

Advise: With positive NPV, the project is financially viable.

Alternatively, instead of converting cash flows into real terms, the discount rate can be converted into nominal rate. Result will be the same.

An alternative solution is presented herewith

Alternative solution:

Year	*Nominal cash flows*	*PVF @ 15.50% adjusted by the inflation factor i.e. 5%**	*PV of cash flows*
1	30	0.866	25.98
2	40	0.749	29.96
3	30	0.649	19.47
		Cash inflow	75.41
		Less: Cash out flow	70.00
		Net present value	5.41

* $\frac{0.909}{1.05}=0.866, \frac{0.826}{1.1025}=0.749, \frac{0.751}{1.1576}=0.649$

Advise: With positive NPV, the project is financially viable.

Question 32

Shashi Co. Ltd has projected the following cash flows from a project under evaluation:

Year	*0*	1	2	3
₹ (in lakhs)	*(72)*	*30*	40	30

The above cash flows have been made at expected prices after recognizing inflation. The firm's cost of capital is 10%. The expected annual rate of inflation is 5%. Show how the

viability of the project is to be evaluated. PVF at 10% for 1-3 years are 0.909, 0.826 and 0.751.

Answer

Here the given cash flows have to be adjusted for inflation. Alternatively, the discount rate can be converted into nominal rate, as follows:-

Year 1 = $\frac{0.909}{1.05}$ = 0.866; Year 2 = $\frac{0.826}{(1.05)^2}$ or $\frac{0.826}{1.1025}$ = 0.749

Year 3 = $\frac{0.751}{(1.05)^3} = \frac{0.751}{1.1576}$ = 0.649

Year	Nominal Cash Flows (₹ in lakhs)	Adjusted PVF as above	PV of Cash Flows (₹ in lakhs)
1	30	0.866	25.98
2	40	0.749	29.96
3	30	0.649	19.47
	Cash Inflow		75.41
	Less: Cash Outflow		72.00
	Net Present Value		3.41

With positive NPV, the project is financially viable.

Alternative Solution

Assumption: The cost of capital given in the question is "Real'.

Nominal cost of capital = (1.10) (1.05) -1 = 0.155 =15.50%

DCF Analysis of the project

				(₹ Lakhs)
	Period	PVF @15.50%	CF	PV
Investment	0	1	-72	-72.00
Operation	1	0.866	30	+25.98
---do---	2	0.750	40	+30.00
---do---	3	0.649	30	+19.47
NPV				+3.45

The proposal may be accepted as the NPV is positive.

Question 33

A firm has an investment proposal, requiring an outlay of ₹ 80,000. The investment proposal is expected to have two years economic life with no salvage value. In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 50,000 and 0.6 probability that cash inflow after tax will be ₹ 60,000. The probability assigned to cash inflow after tax for the year 2 is as follows:

The cash inflow year 1	*₹ 50,000*	*₹ 60,000*
The cash inflow year 2	*Probability*	*Probability*
	₹ 24,000 0.2	*₹ 40,000 0.4*
	₹ 32,000 0.3	*₹ 50,000 0.5*
	₹ 44,000 0.5	*₹ 60,000 0.1*

The firm uses a 10% discount rate for this type of investment.

Required:

(i) Construct a decision tree for the proposed investment project and calculate the expected net present value (NPV).

(ii) What net present value will the project yield, if worst outcome is realized? What is the probability of occurrence of this NPV?

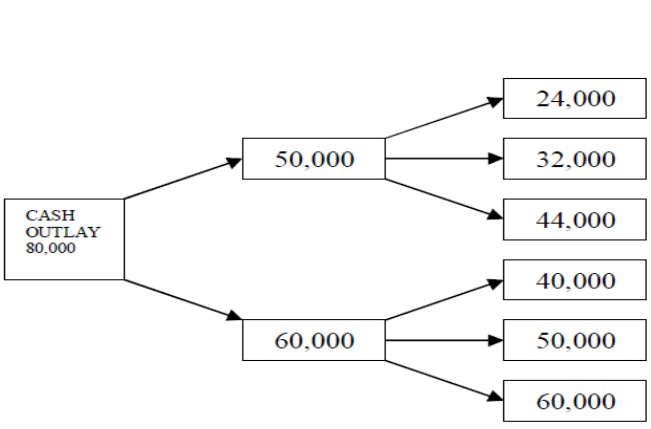
(iii) What will be the best outcome and the probability of that occurrence?

(iv) Will the project be accepted?

(Note: 10% discount factor 1 year 0.909; 2 year 0.826)

Answer

(i) The decision tree diagram is presented in the chart, identifying various paths and outcomes, and the computation of various paths/outcomes and NPV of each path are presented in the following tables:



Path No.	Joint probability Year 1 x year 2
1	.08
2	0.12
3	0.20
4	0.24
5	0.30
6	0.06
	1.00

The Net Present Value (NPV) of each path at 10% discount rate is given below:

Path	*Year 1 Cash Flows* (₹)	*Year 2 Cash Flows* (₹)	*Total Cash Inflows (PV)* (₹)	*Cash Inflows NPV* (₹)	(₹)
1	50,000×.909 = 45,450	24,000×.826 = 19,824	65,274	80,000	(−) 14,726
2	45,450	32,000×.826 = 26,432	71,882	80,000	(−) 8,118
3	45,450	44,000×.826 = 36,344	81,794	80,000	1,794
4	60,000×.909 = 54,540	40,000×.826 = 33,040	87,580	80,000	7,580
5	54,540	50,000×.826 = 41,300	95,840	80,000	15,840
6	54,540	60,000×.826 = 49,560	1,04,100	80,000	24,100

Statement showing Expected Net Present Value

₹

z	*NPV(₹)*	*Joint Probability*	Expected NPV
1	−14,726	0.08	−1,178.08
2	−8,118	0.12	−974.16
3	1,794	0.20	358.80
4	7,580	0.24	1,819.20
5	15,840	0.30	4,752.00
6	24,100	0.06	1,446.00
			6,223.76

(ii) If the worst outcome is realized the project will yield NPV of – ₹ 14,726. The probability of occurrence of this NPV is 8% and a loss of ₹ 1,178 (path 1).

(iii) The best outcome will be path 6 when the NPV is at ₹ 24,100. The probability of occurrence of this NPV is 6% and a expected profit of ₹ 1,446.

(iv) The project should be accepted because the expected NPV is positive at ₹ 6,223.76 based on joint probability.

Question 34

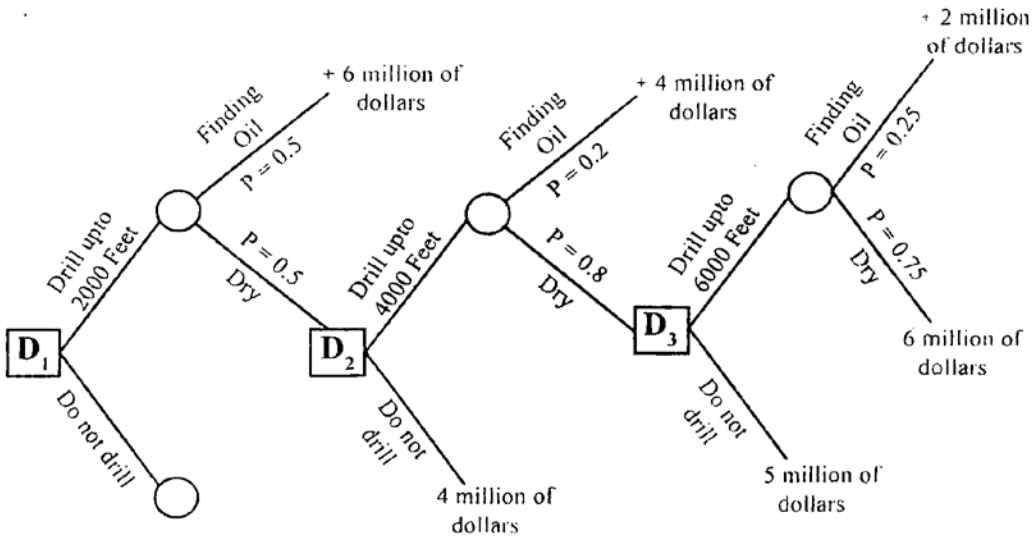
Big Oil is wondering whether to drill for oil in Westchester Country. The prospectus is as follows:

Depth of Well Feet	*Total Cost Millions of Dollars*	*Cumulative Probability of Finding Oil*	*PV of Oil (If found) Millions of Dollars*
2,000	*4*	*0.5*	*10*
4,000	*5*	*0.6*	*9*
6,000	*6*	*0.7*	*8*

Draw a decision tree showing the successive drilling decisions to be made by Big Oil. How deep should it be prepared to drill?

Answer

The given data is easily represented by the following decision tree diagram:



There are three decision points in the tree indicated by D_1, D_2 and D_3.

Using rolling back technique, we shall take the decision at decision point D_3 first and then use it to arrive decision at a decisions point D_2 and then use it to arrive decision at a decision point D_1.

Statement showing the evaluation of decision at Decision Point D_3

	Decision	*Event*	*Probability*	*P.V. of Oil (if found) (Millions of dollars)*	*Expected P.V. of Oil (if found) (Millions of dollars)*
1.	Drill upto	Finding Oil	0.25	+ 2	0.50

	6,000 feet	Dry	0.75	–6	–4.50
		(Refer to working note)			
					–4.00
2.	Do not drill				–5.00

Since the Expected P.V. of Oil (if found) on drilling upto 6,000 feet – 4 millions of dollars is greater than the cost of not drilling – 5 millions of dollars. Therefore, Big Oil should drill upto 6,000 feet.

Statement showing the evaluation of decision at Decision Point D_2

	Decision	*Event*	*Probability*	*P.V. of Oil (if found) (Millions of dollars)*	*Expected P.V. of Oil (if found) (Millions of dollars)*
1.	Drill upto	Finding Oil	0.2	4	0.80
	4,000 feet	Dry	0.8	–5	–4.00
		(Refer to working note)			
					–3.20
2.	Do not drill				–4

Since the Expected P.V. of Oil (if found) on drilling upto 4,000 feet – 3.20 millions of dollars is greater than the cost of not drilling – 4 millions of dollars. Therefore, Big Oil should drill upto 4,000 feet.

Statement showing the evaluation of decision at Decision Point D_1

	Decision	*Event*	*Probability*	*P.V. of Oil (if found) (Millions of dollars)*	*Expected P.V. of Oil (if found) (Millions of dollars)*
1.	Drill upto	Finding Oil	0.5	6	3.00
	2,000 feet	Dry	0.5	–4.00	–2.00
		(Refer to working note)			
					1.00
2.	Do not drill				NIL

Since the Expected P.V. of Oil (if found) on drilling upto 2,000 feet is 1.00 millions of dollars (positive), Big Oil should drill upto 2,000 feet.

Working Notes:

Let *x* be the event of not finding oil at 2,000 feets and y be the event of not finding oil at 4,000 feet and z be the event of not finding oil at 6,000 feets.

We know, that,

$P(x \cap y) = P(x) \times P(y/x)$

Where, $P(x \cap y)$ is the joint probability of not fiding oil at 2,000 feets and 4,000 feets, $P(x)$ is the probability of not finding oil at 2,000 feets and $P(y/x)$ is the probability of not fiding oil at 4,000 feets, if the event x has already occurred.

$P(x \cap y)$ = 1 – Cumulative probability of finding oil at 4,000 feet

= 1 – 0.6 = 0.4

$P(x)$ = 1 – Probability of finding oil at 2,000 feets

= 1 – 0.5 = 0.5

Hence, $P(y/x) = \frac{P(x \cap y)}{P(x)} = \frac{0.4}{0.5} = 0.8$

Therefore, probability of finding oil between 2,000 feets to 4,000 feets = 1 – 0.8 = 0.2 we know that

$P(x \cap y \cap z) = P(x) \times p(y/x) \times p(z/x \cap y)$

Where $P(x \cap y \cap z)$ is the joint probability of not finding oil at 2,000 feets, 4,000 feets and 6,000 feets, P(x) and P(y/x) are as explained earlier and $P(z/x \cap y)$ is the probability of not finding oil at 6,000 feets if the event x and y has already occurred.

$P(x \cap y \cap z)$ = 1 – Cumulative probability of finding oil at 6,000 feets

= 1- 0.7 = 0.3

$P(z/x \cap y) = \frac{P(x \cap y \cap z)}{P(x) \times P(y/x)} = \frac{0.3}{0.5 \times 0.8} = \frac{0.3}{0.4} = 0.75$

Therefore, probability of finding oil between 4,000 feets to 6,000 feets = 1 – 0.75 = 0.25

Question 35

Jumble Consultancy Group has determined relative utilities of cash flows of two forthcoming projects of its client company as follows :

Cash Flow in ₹	*-15000*	*-10000*	*-4000*	*0*	*15000*	*10000*	*5000*	*1000*
Utilities	*-100*	*-60*	*-3*	*0*	*40*	*30*	*20*	*10*

The distribution of cash flows of project A and Project B are as follows:

Project A

Cash Flow (₹)	*-15000*	*- 10000*	*15000*	*10000*	*5000*
Probability	*0.10*	*0.20*	*0.40*	*0.20*	*0.10*

Project B

Cash Flow (₹)	*- 10000*	*-4000*	*15000*	*5000*	*10000*
Probability	*0.10*	*0.15*	*0.40*	*0.25*	*0.10*

Which project should be selected and why ?

Answer

Evaluation of project utilizes of Project A and Project B

	Project A		
Cash flow (in ₹)	**Probability**	**Utility**	**Utility value**
-15,000	0.10	-100	-10
-10,000	0.20	-60	-12
15,000	0.40	40	16
10,000	0.20	30	6
5,000	0.10	20	2
			2

Cash flow (in ₹)	Project B		
	Probability	**Utility**	**Utility value**
-10,000	0.10	-60	-6
-4,000	0.15	-3	-0.45
15,000	0.40	40	16
5,000	0.25	20	5
10,000	0.10	30	3
			17.55

Project B should be selected as its expected utility is more

Question 36

You own an unused Gold mine that will cost ₹ 10,00,000 to reopen. If you open the mine, you expect to be able to extract 1,000 ounces of Gold a year for each of three years. After that the deposit will be exhausted. The Gold price is currently ₹ 5,000 an ounce, and each year the price is equally likely to rise or fall by ₹ 500 from its level at the start of year. The extraction cost is ₹4,600 an ounce and the discount rate is 10 per cent.

Required:

(a) Should you open the mine now or delay one year in the hope of a rise in the Gold price?

(b) What difference would it make to your decision if you could costlessly (but irreversibly) shut down the mine at any stage? Show the value of abandonment option.

Answer

(a) (i) Assume we open the mine now at t = 0. Taking into account the distribution of possible future price of gold over the next three years, we have

$$NPV = -\text{Rs.}10,00,000 + \frac{1,000 \times [(0.5 \times 5,500 + 0.5 \times 4,500) - 4,600]}{1.10}$$

$$+ \frac{1,000 \times [(0.5)^2 (6,000 + 5,000 + 5,000 + 4,000) - 4,600]}{(1.10)^2}$$

$$+ \frac{1,000 \times [(0.5)^3 (6,500 + 5,500 + 5,500 + 4,500 + 4,500 + 5,500 + 4,500 + 3,500) - 4,600]}{(1.10)^3}$$

$= -$ ₹ 5,260

Because the NPV is negative, we should not open the mine at t = 0. It does not make sense to open the mine at any price less than or equal to ₹ 5,000 per ounce.

(ii) Assume that we delay one year until t = 1, and open the mine if the price is ₹ 5,500.

At that point:

$$NPV = (-)\ ₹\ 10,00,000 + \frac{₹\,1000\left[\left(0.5 \times ₹\,6000 + 0.5 \times ₹\,5000\right) - ₹\,4600\right]}{1.10} +$$

$$\frac{1000\left[\left((0.5)^2 \times (₹\,6500 + ₹\,5500 + ₹\,5500 + ₹\,4500)\right) - ₹\,4600\right]}{(1.10)^2} +$$

$$\frac{1000\left[\left((0.5)^3 (₹\,7000 + ₹\,6000 + ₹\,6000 + ₹\,5000 + ₹\,5000 + ₹\,6000 + ₹\,5000 + ₹\,4000)\right) - ₹\,4600\right]}{(1.10)^3}$$

= ₹ 12,38,167

If the price at t_1 reaches ₹ 5,500, then expected price for all future periods is ₹ 5,500.

NPV at t_0 = ₹ 12,38,167/1.10 = ₹ 11,25,606

If the price rises to ₹ 5,500 at t = 1, we should open the mine at that time.

The expected NPV of this strategy is:

(0.50 × ₹ 11,25,606) + (0.50 × 0) = ₹ 5,62,803

As already stated mine should not be opened if the price is less than or equal to ₹ 5,000 per ounce.

If the price at t_1 reaches ₹ 4,500, then expected price for all future periods is ₹ 4,500. In that situation we should not open the mine.

(b) Suppose we open the mine at t = 0, when the price is ₹ 5,000. At t = 2, there is a 0.25 probability that the price will be ₹ 4,000. Then since the price at t = 3 cannot rise above the extraction cost, the mine should be closed. If we open the mine at t = 0, when the price was ₹5,000 with the closing option the NPV will be:

$$NPV = - \text{Rs.}10,00,000 + \sum_{t=1}^{2} \frac{(5,000 - 4,600) \times 1,000}{(1.10)^t}$$

$$+ \frac{0.125 \times [1,900 + 900 + 900 + 900 - 100 - 100) \times 1,000]}{(1.10)^3}$$

= ₹ 1,07,438

Therefore, the NPV with the abandonment option (i.e. savings) is ₹ 1,07,438.

The value of the abandonment option is:

$0.125 \times 1,000 \times (100+1100) / (1.10)^3$ = ₹ 1,12,697

The NPV of strategy (2), that to open the mine at t = 1, when price rises to ₹ 5,500 per ounce, even without abandonment option, is higher than option 1. Therefore, the strategy (2) is preferable.

Under strategy 2, the mine should be closed if the price reaches ₹ 4,500 at t = 3, because the expected profit is (₹ 4,500 – 4,600) × 1,000 = – ₹ 1,00,000.

The value of the abandonment option is:

$0.125 \times (1,00,000) / (1.10)^4$ = ₹ 8,538

Note: Students may also assume that the price of the gold remains at ₹ 5,000 to solve the question.

Question 37

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	*Maintenance (₹)*	*Salvage (₹)*
Present	*0*	*40,000*
1	*10,000*	*25,000*
2	*20,000*	*15,000*
3	*30,000*	*10,000*
4	*40,000*	*0*

The opportunity cost of capital for A & Co. is 15%.

Required:

When should the company replace the machine?

(Notes: Present value of an annuity of Re. 1 per period for 8 years at interest rate of 15% : 4.4873; present value of Re. 1 to be received after 8 years at interest rate of 15% : 0.3269).

Answer

A & Co.

Equivalent cost of (EAC) of new machine

		₹
(i)	Cost of new machine now	90,000
	Add: PV of annual repairs @ ₹ 10,000 per annum for 8 years (₹ 10,000 × 4.4873)	44,873
		1,34,873
	Less: PV of salvage value at the end of 8 years (₹20,000×0.3269)	6,538
		1,28,335
	Equivalent annual cost (EAC) (₹ 1,28,335/4.4873)	28,600

PV of cost of replacing the old machine in each of 4 years with new machine

Scenario	*Year*	*Cash Flow (₹)*	*PV @ 15%*	*PV (₹)*
Replace Immediately	0	(28,600)	1.00	(28,600)
		40,000	1.00	40,000
				11,400
Replace in one year	1	(28,600)	0.870	(24,882)

	1	(10,000)	0.870	(8,700)
	1	25,000	0.870	21,750
				(11,832)
Replace in two years	1	(10,000)	0.870	(8,700)
	2	(28,600)	0.756	(21,622)
	2	(20,000)	0.756	(15,120)
	2	15,000	0.756	11,340
				(34,102)
Replace in three years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(28,600)	0.658	(18,819)
	3	(30,000)	0.658	(19,740)
	3	10,000	0.658	6,580
				(55,799)
Replace in four years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(30,000)	0.658	(19,740)
	4	(28,600)	0.572	(16,359)
	4	(40,000)	0.572	(22,880)
				(82,799)

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

Alternatively, optimal replacement period can also be computed using the following table:

Scenario	Year	Cashflow	PV at 15%	PV
Replace immediately	0	(40,000)	1	(40,000)
	1 to 4	28,600	2.855	81,652
				41,652
Replace after 1 year	1	10,000	0.870	8,696
	1	(25,000)	0.870	(21,739)

	2 to 4	28,600	1.985	56,783
				43,739
Replace after 2 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	2	(15,000)	0.756	(11,342)
	3 and 4	28,600	1.229	35,157
				47,633
Replace after 3 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	3	(10,000)	0.658	(6,575)
	4	28,600	0.572	16,352
				53,321
Replace after 4 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	4	40,000	0.572	22,870
				66,414

Question 38

A company has an old machine having book value zero – which can be sold for ₹ 50,000. The company is thinking to choose one from following two alternatives:

(i) To incur additional cost of ₹ 10,00,000 to upgrade the old existing machine.

(ii) To replace old machine with a new machine costing ₹ 20,00,000 plus installation cost ₹ 50,000.

Both above proposals envisage useful life to be five years with salvage value to be nil.

The expected after tax profits for the above three alternatives are as under :

Year	*Old existing Machine (₹)*	*Upgraded Machine (₹)*	*New Machine (₹)*
1	*5,00,000*	*5,50,000*	*6,00,000*
2	*5,40,000*	*5,90,000*	*6,40,000*
3	*5,80,000*	*6,10,000*	*6,90,000*
4	*6,20,000*	*6,50,000*	*7,40,000*
5	*6,60,000*	*7,00,000*	*8,00,000*

The tax rate is 40 per cent.

The company follows straight line method of depreciation. Assume cost of capital to be 15 per cent.

P.V.F. of 15%, 5 = 0.870, 0.756, 0.658, 0.572 and 0.497. You are required to advise the company as to which alternative is to be adopted.

Answer

(A)	**Cash Outflow**		₹
	(i)	In case machine is upgraded:	
		Upgradation Cost	10,00,000
	(ii)	In case new machine installed:	
		Cost	20,00,000
		Add: Installation cost	50,000
		Total Cost	20,50,000
		Less: Disposal of old machine	
		₹ 50,000 – 40% tax	30,000
		Total Cash Outflow	20,20,000

Working Note:

(i) Depreciation – in case machine is upgraded

₹ 10,00,000 ÷ 5 = ₹ 2,00,000

(ii) Depreciation – in case new machine is installed

₹ 20,50,000 ÷ 5 = ₹ 4,10,000

(iii) Old existing machine – Book Value is zero. So no depreciation.

(B) Cash Inflows after Taxes (CFAT)

Year	Old Existing Machine	Upgraded Machine			
	(i) EAT/CFAT ₹	(ii) EAT ₹	(iii) DEP ₹	(iv) CFAT ₹	= (iv)-(i) Incremental CFAT ₹
1	5,00,000	5,50,000	2,00,000	7,50,000	2,50,000
2	5,40,000	5,90,000	2,00,000	7,90,000	2,50,000
3	5,80,000	6,10,000	2,00,000	8,10,000	2,30,000
4	6,20,000	6,50,000	2,00,000	8,50,000	2,30,000
5	6,60,000	7,00,000	2,00,000	9,00,000	2,40,000

Cash Inflow after Taxes (CFAT)

Year		New Machine		
	(vi) EAT ₹	(vii) DEP ₹	(viii) CFAT ₹	(ix) = (viii) – (i) Incremental CFAT (₹)
1	6,00,000	4,10,000	10,10,000	5,10,000
2	6,40,000	4,10,000	10,50,000	5,10,000
3	6,90,000	4,10,000	11,00,000	5,20,000
4	7,40,000	4,10,000	11,50,000	5,30,000
5	8,00,000	4,10,000	12,10,000	5,50,000

P.V. AT 15% - 5 Years – on Incremental CFAT

Year	Upgraded Machine			New Machine		
	Incremental CFAT ₹	PVF	Total P.V. ₹	Incremental CFAT	PVF	Total PV ₹
1	2,50,000	0.870	2,17,500	5,10,000	0.870	4,43,700
2	2,50,000	0.756	1,89,000	5,10,000	0.756	3,85,560
3	2,30,000	0.658	1,51,340	5,20,000	0.658	3,42,160
4	2,30,000	0.572	1,31,560	5,30,000	0.572	3,03,160
5.	2,40,000	0.497	1,19,280	5,50,000	0.497	2,73,350

Total P.V. of CFAT	8,08,680			17,47,930
Less: Cash Outflows	10,00,000			20,20,000*
N.P.V. =	-1,91,320			- 2,72,070

*Acquisition Cost (including installation cost) ₹ 20,50,000

Less: Salvage Value of existing machine net of Tax ₹ 30,000

₹ 20,20,000

As the NPV in both the new (alternative) proposals is negative, the company should continue with the existing old Machine.

Question 39

(a) Company X is forced to choose between two machines A and B. The two machines are designed differently, but have identical capacity and do exactly the same job. Machine A costs ₹ 1,50,000 and will last for 3 years. It costs ₹ 40,000 per year to run. Machine B is an 'economy' model costing only ₹ 1,00,000, but will last only for 2 years, and costs ₹ 60,000 per year to run. These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10 per cent. Which machine company X should buy?

(b) Company Y is operating an elderly machine that is expected to produce a net cash inflow of ₹ 40,000 in the coming year and ₹ 40,000 next year. Current salvage value is ₹ 80,000 and next year's value is ₹ 70,000. The machine can be replaced now with a new machine, which costs ₹ 1,50,000, but is much more efficient and will provide a cash inflow of ₹ 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 per cent. Advise with reasons.

Answer

(a) Statement showing the evaluation of two machines

Machines	A	B
Purchase cost (₹): (i)	1,50,000	1,00,000
Life of machines (years)	3	2
Running cost of machine per year (₹): (ii)	40,000	60,000
Cumulative present value factor for 1-3 years @ 10% (iii)	2.486	–
Cumulative present value factor for 1-2 years @ 10% (iv)	–	1.735
Present value of running cost of machines (₹): (v)	99,440	1,04,100
	[(ii) × (iii)]	[(ii) × (iv)]

Cash outflow of machines (₹): (vi) = (i) + (v)	2,49,440	2,04,100
Equivalent present value of annual cash outflow	1,00,338	1,17,637
	[(vi) ÷ (iii)]	[(vi) ÷ (iv)]

Decision: Company X should buy machine A since its equivalent cash outflow is less than machine B.

(b) Statement showing present value of cash inflow of new machine when it replaces elderly machine now

	₹	₹
Cash inflow of a new machine per year		80,000
Cumulative present value for 1-3 years @ 10%		2.486
Present value of cash inflow for 3 years (₹ 80,000 × 2.486)		1,98,880
Less: Purchase cost of new machine	1,50,000	
Add: Salvage value of old machine	80,000	70,000
N.P.V. of cash inflow for 3 years		1,28,880
Equivalent annual net present value of cash Inflow of new machine $\left(\frac{₹\ 1,28,880}{2.486}\right)$		51,842

Statement showing present value of cash inflow of new machine when it replaces elderly machine next year

		₹
Cash inflow of a new machine per year		80,000
Cumulative present value for 1-3 years @ 10%		2.486
Present value of cash inflow for 3 years (₹ 80,000 × 2.486)		1,98,880
	₹	
Less: Cash outflow		
Purchase cost of new machine	1,50,000	
Less: Salvage value of old machine	70,000	80,000
N.P.V. of cash inflow for 3 years		1,18,880
Equivalent annual net present value of cash Inflow $\left(\frac{₹\ 1,18,880}{2.486}\right)$		47,820

Present Value of NPV of Cash inflow $\frac{₹\ 47,820}{1.10}$ 43,473

Advise: Since the equivalent annual cash inflow of new machine now and next year is more than cash inflow (₹ 40,000) of an elderly machine the company Y is advised to replace the elderly machine now.

Company Y need not wait for the next year to replace the elderly machine since the equivalent annual cash inflow now is more than the next year's cash inflow.

Question 40

A machine used on a production line must be replaced at least every four years. Costs incurred to run the machine according to its age are:

Age of the Machine (years)					
	0	***1***	***2***	***3***	***4***
Purchase price (in ₹)	*60,000*				
Maintenance (in ₹)		*16,000*	*18,000*	*20,000*	*20,000*
Repair (in ₹)		*0*	*4,000*	*8,000*	*16,000*
Scrap Value (in ₹)		*32,000*	*24,000*	*16,000*	*8,000*

Future replacement will be with identical machine with same cost. Revenue is unaffected by the age of the machine. Ignoring inflation and tax, determine the optimum replacement cycle. PV factors of the cost of capital of 15% for the respective four years are 0.8696, 0.7561, 0.6575 and 0.5718.

Answer

Working Notes

First of all we shall calculate cash flows for each replacement cycle as follows:

One Year Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	32,000	16,000

Two Years Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	24,000	2,000

Three Years Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)

1	-	(16,000)	-	(16,000)
2	-	(22,000)	-	(22,000)
3	-	(28,000)	16,000	(12,000)

Four Years Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net cash Flow
0	(60,000)	-	-	(60,000)
1	-	(16,000)	-	(16,000)
2	-	(22,000)	-	(22,000)
3	-	(28,000)	-	(28,000)
4	-	(36,000)	8,000	(28,000)

Now we shall calculate NPV for each replacement cycles

		1 Year		2 Years		3 Years		4 Years	
Year	PVF@ 15%	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV
0	1	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000	-60,000
1	0.8696	16,000	13,914	-16,000	-13,914	-16,000	-13,914	-16,000	-13,914
2	0.7561	-	-	2,000	1,512	-22,000	-16,634	-22,000	-16,634
3	0.6575	-	-	-	0	-12,000	-7,890	-28,000	-18,410
4	0.5718	-	-	-	0		0	-28,000	-16,010
			-46,086		-72,402		-98,438		-1,24,968

Replacement Cycles		EAC (₹)
1 Year	$\frac{46,086}{0.8696}$	52,997
2 Years	$\frac{72,402}{1.6257}$	44,536
3 Years	$\frac{98,438}{2.2832}$	43,114
4 Years	$\frac{1,24,968}{2.855}$	43,772

Since EAC is least in case of replacement cycle of 3 years hence machine should be replaced after every three years.

Question 41

Trouble Free Solutions (TFS) is an authorized service center of a reputed domestic air conditioner manufacturing company. All complaints/ service related matters of Air conditioner are attended by this service center. The service center employs a large number of mechanics, each of whom is provided with a motor bike to attend the complaints. Each mechanic travels approximately 40000 kms per annuam. TFS decides to continue its present policy of always buying a new bike for its mechanics but wonders whether the present policy of replacing the bike every three year is optimal or not. It is of believe that as new models are entering into market on yearly basis, it wishes to consider whether a replacement of either one year or two years would be better option than present three year period. The fleet of bike is due for replacement shortly in near future.

The purchase price of latest model bike is ₹ 55,000. Resale value of used bike at current prices in market is as follows:

Period	₹
1 Year old	35,000
2 Year old	21,000
3 Year old	9,000

Running and Maintenance expenses (excluding depreciation) are as follows:

Year	Road Taxes Insurance etc. (₹)	Petrol Repair Maintenance etc. (₹)
1	3,000	30,000
2	3,000	35,000
3	3,000	43,000

Using opportunity cost of capital as 10% you are required to determine optimal replacement period of bike.

Answer

In this question the effect of increasing running cost and decreasing resale value have to be weighted upto against the purchase cost of bike. For this purpose we shall compute Equivalent Annual Cost (EAC) of replacement in different years shall be computed and compared.

Year	Road Taxes (₹)	Petrol etc. (₹)	Total (₹)	PVF @10%	PV (₹)	Cumulative PV (₹)	PV of Resale Price (₹)	Net Outflow (₹)
1	3,000	30,000	33,000	0.909	29,997	29,997	31,815	(1,818)

2	3,000	35,000	38,000	0.826	31,388	61,385	17,346	44,039
3	3,000	43,000	46,000	0.751	34,546	95,931	6,759	89,172

Computation of EACs

Year*	Purchase Price of Bike (₹)	Net Outflow (₹)	Total Outflow (₹)	PVAF @ 10%	EAC♣ (₹)
1	55,000	(1,818)	53,182	0.909	58,506
2	55,000	44,039	99,039	1.735	57,083
3	55,000	89,172	1,44,172	2.486	57,993

Thus, from above table it is clear that EAC is least in case of 2 years, hence bike should be replaced every two years.

Question 42

DEF Ltd has been regularly paying a dividend of ₹ 19,20,000 per annum for several years and it is expected that same dividend would continue at this level in near future. There are 12,00,000 equity shares of ₹ 10 each and the share is traded at par.

The company has an opportunity to invest ₹ 8,00,000 in one year's time as well as further ₹ 8,00,000 in two year's time in a project as it is estimated that the project will generate cash inflow of ₹ 3,60,000 per annum in three year's time which will continue for ever. This investment is possible if dividend is reduced for next two years.

Whether the company should accept the project? Also analyze the effect on the market price of the share, if the company decides to accept the project.

Answer

First we calculate cost of Equity (K_e)/PE Ratio

$$D_1 = \frac{19,20,000}{12,00,000} = 1.6$$

$$P_0 = 10$$

$$K_e = \frac{D}{P} = \frac{₹\ 1.6}{10} = 16\%$$

$$P/E = \frac{10}{1.6} = 6.25$$

Now we shall compute NPV of the project

* Assume these periods are the periods from which bike shall be kept in use.

♣ EAC is used to bring Cash Flows occurring for different periods at one point of Time.

$$NPV = \frac{-800000}{(1+0.16)} + \frac{-800000}{(1+0.16)^2} + \left[\frac{360000}{0.16} \times \frac{1}{(1+0.16)^2}\right]$$

= -6,89,655 – 5,94,530 + 16,72,117

= 3,87,932

As NPV of the project is positive, the value of the firm will increase by ₹ 3,87,932 and spread over the number of shares e.g. 12,00,000, the market price per share will increase by 32 paisa.

Question 43

Ramesh owns a plot of land on which he intends to construct apartment units for sale. No. of apartment units to be constructed may be either 10 or 15. Total construction costs for these alternatives are estimated to be ₹ 600 lakhs or ₹ 1025 lakhs respectively. Current market price for each apartment unit is ₹ 80 lakhs. The market price after a year for apartment units will depend upon the conditions of market. If the market is buoyant, each apartment unit will be sold for ₹ 91 lakhs, if it is sluggish, the sale price for the same will be ₹ 75 lakhs. Determine the current value of vacant plot of land. Should Ramesh start construction now or keep the land vacant? The yearly rental per apartment unit is ₹ 7 lakhs and the risk free interest rate is 10% p.a.

Assume that the construction cost will remain unchanged.

Answer

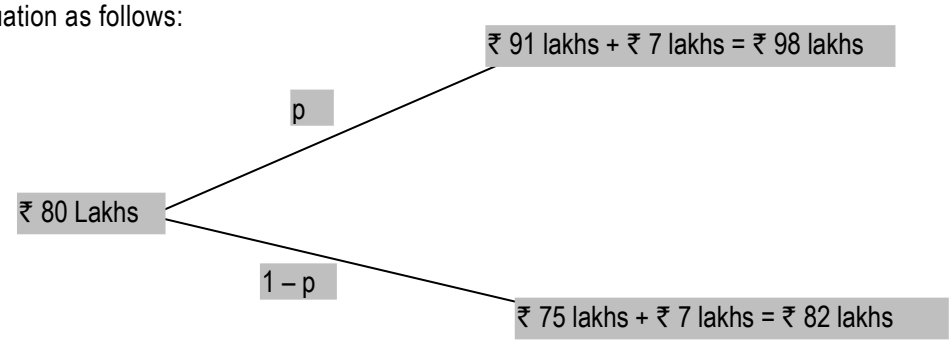
Presently 10 units apartments shall yield a profit of ₹ 200 lakh (₹ 800 lakhs – ₹ 600 lakhs) and 15 unit apartment will yield a profit of ₹ 175 lakh (₹ 1200 lakhs – ₹ 1025 lakhs). Thus 10 units apartment is the best alternative if Ramesh has to construct now.

However, Ramesh waits for 1 year his pay-off will be as follows:

	Market Conditions	
	Buoyant Market	*Sluggish Market*
10 units apartments	₹ 91 lakhs X 10 – ₹ 600 lakhs = ₹ 310 lakhs	₹ 75 lakhs X 10 – ₹ 600 lakhs = ₹ 150 lakhs
15 units apartments	₹ 91 lakhs X 15 – ₹ 1025 lakhs = ₹ 340 lakhs	₹ 75 lakhs X 15 – ₹ 1025 lakhs = ₹ 100 lakhs

Thus if market conditions turnout to be buoyant the best alternative is 15 units apartments and net pay-off will be ₹ 340 lakhs and if market turnout to be sluggish the best alternative is the 10 units apartments and net pay-off shall be ₹ 150 lakhs.

To determine the value of vacant plot we shall use Binomial Model (Risk Neutral Method) of option valuation as follows:



Alternatively student can calculate these values as follows (Sale Value + Rent):

If market is buoyant then possible outcome = ₹ 91 lakh + ₹ 7 lakh = ₹ 98 lakhs

If market is sluggish then possible outcome = ₹ 75 lakh + ₹ 7 lakh = ₹ 82 lakhs

Let p be the probability of buoyant condition then with the given risk-free rate of interest of 10% the following condition should be satisfied:

$$₹ 80 \text{ lakhs} = \frac{[(p \times ₹ 98 \text{lakhs}) + (1\text{-}p) \times ₹ 82 \text{lakhs}]}{1.10}$$

$$p = \frac{3}{8} \text{ i.e. } 0.375$$

Thus 1-p = 0.625

Expected cash flow next year

0.375 × ₹ 340 lakhs + 0.625 X ₹ 150 lakhs = ₹ 221.25 lakhs

Present Value of expected cash flow:

₹ 221.25 lakhs (0.909) = ₹ 201.12 lakhs

Thus the value of vacant plot is ₹ 201.12 lakhs

Alternatively,

Expected Cash Flow next year

= 0.375 x (340 + 105) lakhs + 0.625 x (150+70) lakhs

= 0.375 x 445 lakhs + 0.625 x 220 lakhs

= 166.875 lakhs + 137.50 lakhs = 304.375 lakhs

Since the current value of vacant land is more than profit from 10 units apartments now the land should be kept vacant.

3
Leasing Decisions

BASIC CONCEPTS AND FORMULAE

1. Introduction

Lease can be defined as a right to use an equipment or capital goods on payment of periodical amount. Two principal parties to any lease transaction are:

- *Lessor:* The actual owner of equipment permitting use to the other party on payment of periodical amount.
- *Lessee:* One who acquires the right to use the equipment on payment of periodical amount.

2. Types of Leasing

(a) Operating Lease: In this type of lease transaction, the primary lease period is short and the lessor would not be able to realize the full cost of the equipment and other incidental charges thereon during the initial lease period. Besides the cost of machinery, the lessor also bears insurance, maintenance and repair costs etc. Agreements of operating lease generally provide for an option to the lessee/lessor to terminate the lease after due notice.

(b) Financial Lease: It is a long-term arrangement, which is irrevocable during the primary lease period which is generally the full economic life of the leased asset. Under this arrangement lessor is assured to realize the cost of purchasing the leased asset, cost of financing it and other administrative expenses as well as his profit by way of lease rent during the initial (primary) period of leasing itself. Financial lease involves transferring almost all the risks incidental to ownership and benefits arising therefrom except the legal title to the lessee. The variants of financial lease are as follows:

- **Leveraged lease:** Though a type of financial lease, however, here the lessor may not be a single individual but a group of equity participants and the group borrows a large amount from financial institutions to purchase the leased asset.
- **Sales and Lease Back Leasing:** Under this arrangement an asset which already exists and is used by the lessee is first sold to the lessor for consideration in cash. The same asset is then acquired for use under financial

lease agreement from the lessor. The lessee continues to make economic use of asset against payment of lease rentals while ownership vests with the lessor.

- **Sales-Aid-Lease:** When the leasing company (lessor) enters into an arrangement with the seller, usually manufacturer of equipment, to market the latter's product through its own leasing operations, it is called a 'sales-aid-lease'. The leasing company usually gets a commission on such sales from the manufacturer and doubles its profit.

3. Financial Evaluation of Leasing Arrangement

Lessee Perspective

Calculation of NPV (L) / NAL:

Cost of Asset

Less: PV of Lease rentals (LR)

Add: PV of tax shield on LR

Less: PV of debt tax shield

Less: PV of interest tax shield on displaced debt

Less: PV of salvage value.

If NAL/NPV (L) is +, the leasing alternative to be used, otherwise borrowing alternative would be preferable.

- **Method I (Normal method)**

  Discount lease rentals at pre-tax rates and discount rest of cash flows at post tax rates.

- **Method II (Alternatively)**

  Discount all cash flows at post tax rates ignoring the cash flow on account of interest tax shield on displaced debt.

4. Evaluation of Lease Methods

(a) Present Value Analysis: In this method, the present value of the annual lease payments (tax adjusted) is compared with that of the annual loan repayments adjusted for tax shield on depreciation and interest, and the alternative which has the lesser cash outflow will be chosen.

(b) Internal Rate of Return Analysis: This method seeks to establish the rate at which the lease rentals, net of tax shield on depreciation are equal to the cost of leasing. In other words, the result of this analysis is the after tax cost of capital explicit in the lease compared with that of the other available sources of finance.

(c) Bower-Herringer-Williamson Method: This method segregates the financial and tax aspects of lease financing. The evaluation procedure under this method

is as follows:

- Compare the present value of debt with the discounted value of lease payments (gross), the rate of discount being the gross cost of debt capital. The net present value is the financial advantage (or disadvantage).
- Work out the comparative tax benefit during the period and discount it at an appropriate cost of capital. The present value is the operating advantage (or disadvantage) of leasing.
- If the net result is an advantage, select leasing.

5. Cross-Border Leasing

Cross-border leasing is a leasing arrangement where lessor and lessee are situated in different countries. This raises significant additional issues relating to tax avoidance and tax shelters.

Objectives of Cross-Border Leasing

- Reduce the overall cost of financing through utilization by the lessor of tax depreciation allowances to reduce its taxable income.
- The lessor is often able to utilize non-recourse debt to finance a substantial portion of the equipment cost. The debt is secured by among other things, a mortgage on the equipment and by an assignment of the right to receive payments under the lease.
- Also, depending on the structure, in some countries the lessor can utilize very favourable "leveraged lease" financial accounting treatment for the overall transaction.
- In some countries, it is easier for a lessor to repossess the leased equipment following a lessee default because the lessor is an owner and not a mere secured lender.
- Leasing provides the lessee with 100% financing.

6. Differences between Lease and Hire Purchase

In Hire-purchase transaction the person using the asset on hire-purchase basis is the owner of the asset and full title is transferred to him after he has paid the agreed installments. The asset will be shown in his balance sheet and he can claim depreciation and other allowances on the asset for computation of tax during the currency of hire-purchase agreement and thereafter.

Whereas, on the other hand, in a lease transaction, the ownership of the equipment always vests with the lessor and lessee only gets the right to use the asset. Depreciation and other allowances on the asset will be claimed by the lessor and the asset will also be shown in the balance sheet of the lessor. The lease money paid by the lessee can be charged to his Profit and Loss Account. However, the asset as such will not appear in the balance sheet of the lessee. Such asset for the lessee is, therefore, called off the balance sheet asset.

Question 1

What are the characteristic features of Financial and Operating Lease?

Answer

Salient features of Financial Lease

(i) It is an intermediate term to long-term arrangement.

(ii) During the primary lease period, the lease cannot be cancelled.

(iii) The lease is more or less fully amortized during the primary lease period.

(iv) The costs of maintenance, taxes, insurance etc., are to be incurred by the lessee unless the contract provides otherwise.

(v) The lessee is required to take the risk of obsolescence.

(vi) The lessor is only the Financier and is not interested in the asset.

Salient features of Operating Lease

(i) The lease term is significantly less than the economic life of the equipment.

(ii) It can be cancelled by the lessee prior to its expiration date.

(iii) The lease rental is generally not sufficient to fully amortize the cost of the asset.

(iv) The cost of maintenance, taxes, insurance are the responsibility of the lessor.

(v) The lessee is protected against the risk of obsolescence.

(vi) The lessor has the option to recover the cost of the asset from another party on cancellation of the lease by leasing out the asset.

Question 2

Write a short note on Cross border leasing.

Answer

Cross-border leasing is a leasing agreement where lessor and lessee are situated in different countries. This raises significant additional issues relating to tax avoidance and tax shelters. It has been widely used in some European countries, to arbitrage the difference in the tax laws of different countries.

Cross-border leasing have been in practice as a means of financing infrastructure development in emerging nations. Cross-border leasing may have significant applications in financing infrastructure development in emerging nations - such as rail and air transport equipment, telephone and telecommunications, equipment, and assets incorporated into power generation and distribution systems and other projects that have predictable revenue streams.

A major objective of cross-border leases is to reduce the overall cost of financing through utilization by the lessor of tax depreciation allowances to reduce its taxable income, The tax savings are passed through to the lessee as a lower cost of finance. The basic prerequisites are relatively high tax rates in the lessor's country, liberal depreciation rules and either very flexible or very formalistic rules governing tax ownership.

Question 3

Many companies calculate the internal rate of return of the incremental after-tax cash-flows from financial leases.

What problems do you think this may give rise to? To what rate should the internal rate of return be compared? Discuss.

Answer

Main problems faced in using Internal Rate of Return can be enumerated as under:

(1) The IRR method cannot be used to choose between alternative lease bases with different lives or payment patterns.

(2) If the firms do not pay tax or pay at constant rate, then IRR should be calculated from the lease cash-flows and compared to after-tax rate of interest. However, if the firm is in a temporary non-tax paying status, its cost of capital changes over time, and there is no simple standard of comparison.

(3) Another problem is that risk is not constant. For the lessee, the payments are fairly riskless and interest rate should reflect this. The salvage value for the asset, however, is probably much riskier. As such two discount rates are needed. IRR gives only one rate, and thus, each cash-flow is not implicitly discounted to reflect its risk.

(4) Multiple roots rarely occur in capital budgeting since the expected cashflow usually changes signs once. With leasing, this is not the case often. A lessee will have an immediate cash inflow, a series of outflows for a number of years, and then an inflow during the terminal year. With two changes of sign, there may be, in practice frequently two solutions for the IRR.

Question 4

M/s Gama & Co. is planning of installing a power saving machine and are considering buying or leasing alternative. The machine is subject to straight-line method of depreciation. Gama & Co. can raise debt at 14% payable in five equal annual instalments of ₹ 1,78,858 each, at the beginning of the year. In case of leasing, the company would be required to pay an annual end of year rent of 25% of the cost of machine for 5 years.

The Company is in 40% tax bracket. The salvage value is estimated at ₹ 24,998 at the end of 5 years.

Evaluate the two alternatives and advise the company by considering after tax cost of debt concept under both alternatives.

P.V. factors 0.9225, 0.8510, 0.7851, 0.7242, 0.6681 respectively for 1 to 5 years.

Answer

CALCULATION OF COST OF THE MACHINE

Beginning of Year	Cl. Balance at the beginning	Installment	Interest	Principal component
5	0	1,78,858	21,965	1,56,893
4	1,56,893	1,78,858	41,233	1,37,625
3	2,94,518	1,78,858	58,134	1,20,724
2	4,15,242	1,78,858	72,960	1,05,898
1	5,21,140	1,78,858	0	1,78,858
		Total		6,99,998

Cost of the machine is ₹ 6,99,998

Alternatively it can be computed as follows:

$$\text{Annual Payment} = \frac{\text{Cost of Machine}}{\text{PVAF}(14\%,0-4)}$$

$$1,78,858 = \frac{\text{Cost of Machine}}{3.91371}$$

Cost of Machine = 6,99,998

Year	Total Payment	Interest	Principal component	Principal Outstanding
0	1,78,858	0	1,78,857	5,21,139
1	1,78,858	72,959	1,05,899	4,15,240
2	1,78,858	58,134	1,20,725	2,94,516
3	1,78,858	41,232	1,37,626	1,56,890
4	1,78,858	21,964	1,56,894	0
Total			6,99,997	

Buying Option

$$\text{Depreciation p.a.} = \frac{₹\,6,99,998 - ₹\,24,998}{5} = \frac{₹\,6,75,000}{5}$$

Depreciation p.a. = ₹ 1,35,000

Tax Saving on interest & Depreciation

Year	Interest (₹)	Dep. (₹)	Total (₹)	Tax Saving (₹)
1	72,960	1,35,000	2,07,960	83,184
2	58,134	1,35,000	1,93,134	77,254
3	41,233	1,35,000	1,76,233	70,493
4	21,965	1,35,000	1,56,965	62,786
5	0	1,35,000	1,35,000	54,000

P.V. Out flow

Year	Installment (₹)	Tax Saving (₹)	Net outflow (₹)	PV @8.4%	P.V. (₹)
0	1,78,858	0	1,78,858	1.0000	1,78,858.00
1	1,78,858	83,184	95,674	0.9225	88,259.26
2	1,78,858	77,254	1,01,604	0.8510	86,465.36
3	1,78,858	70,493	1,08,365	0.7851	85,077.34
4	1,78,858	62,786	1,16,072	0.7242	84,059.40
5		54,000	-54,000	0.6681	-36,077.00
					4,86,641.47
	Salvage Value		24,998	0.6681	16,701.17
	P.V. of Outflow				4,69,940.30

Leasing Option

Lease Rent 25% of ₹ 6,99,998 i.e. ₹ 1,74,999.50 app. ₹ 1,75,000

Lease Rent payable at the end of the year

Year	Lease Rental (₹)	Tax Saving (₹)	Net outflow (₹)	PV @8.4%	P.V. (₹)
1-5	1,75,000	70,000	1,05,000	3.9509	4,14,844.50

Decision – The company is advised to opt for leasing as the total PV of cash outflow is lower by ₹ 55,095.80

Question 5

XYZ Ltd. requires an equipment costing ₹ 10,00,000; the same will be utilized over a period of 5 years. It has two financing options in this regard :

(i) Arrangement of a loan of ₹ 10,00,000 at an interest rate of 13 percent per annum; the loan being repayable in 5 equal year end installments; the equipment can be sold at the end of fifth year for ₹1,00,000.

(ii) Leasing the equipment for a period of five years at an early rental of ₹3,30,000 payable at the year end.

The rate of depreciation is 15 percent on Written Down Value (WDV) basis, income tax rate is 35 percent and discount rate is 12 percent.

Advise which of the financing options should XYZ Ltd. exercise and why?

Answer

Option A

The loan amount is repayable together with the interest at the rate of 13% on loan amount and is repayable in equal installments at the end of each year. The PVAF at the rate of 13% for 5 years is 3.5172, the amount payable will be

$$\text{Annual Payment} = \frac{₹\,10,00,000}{3.5172} = ₹\ 2,84,320 \text{ (rounded)}$$

Schedule of Debt Repayment

End of Year	Total Payment ₹	Interest ₹	Principal ₹	Principal Amount Outstanding ₹
1	2,84,320	1,30,000	1,54,320	8,45,680
2	2,84,320	1,09,938	1,74,382	6,71,298
3	2,84,320	87,269	1,97,051	4,74,247
4	2,84,320	61,652	2,22,668	2,51,579
5	2,84,320	32,741*	2,51,579	------

* Balancing Figure

Schedule of Cash Outflows: Debt Alternative

(Amount in ₹)

(1)	*(2)*	*(3)*	*(4)*	*(3) + (4)*	*(5)*	*(6)*	*(7)*	*(8)*
End of year	*Debt Payment*	*Interest*	*Dep*		*Tax Shield [(3)+(4)] 0.35*	*Cash outflows (2) – (5)*	*PV factors @ 12%*	*PV*
1	2,84,320	1,30,000	1,50,000	2,80,000	98,000	1,86,320	0.893	1,66,384
2	2,84,320	1,09,938	1,27,500	2,37,438	83,103	2,01,217	0.797	1,60,370

3	2,84,320	87,269	1,08,375	1,95,644	68,475	2,15,845	0.712	1,53,682
4	2,84,320	61,652	92,119	1,53,771	53,820	2,30,500	0.636	1,46,598
5	2,84,320	32,741	78,301	1,11,042	38,865	2,45,455	0.567	1,39,173
								7,66,207
Less: PV of Salvage Value								(56,700)
								7,09,507

Total present value of Outflows = ₹ 7,09,508

Option B

Lease Rent	330,000
Tax Shield	(115,500)
Outflow	2,14,500
	× 3.605
	₹ 7,73,273

Since PV of outflows is lower in the Borrowing option, XYZ Ltd. should avail of the loan and purchase the equipment.

Question 6

Sundaram Ltd. discounts its cash flows at 16% and is in the tax bracket of 35%. For the acquisition of a machinery worth ₹10,00,000, it has two options – either to acquire the asset by taking a bank loan @ 15% p.a. repayable in 5 yearly installments of ₹2,00,000 each plus interest or to lease the asset at yearly rentals of ₹3,34,000 for five (5) years. In both the cases, the instalment is payable at the end of the year. Depreciation is to be applied at the rate of 15% using 'written down value' (WDV) method. You are required to advise which of the financing options is to be exercised and why.

Year	*1*	*2*	*3*	*4*	*5*
P.V factor @16%	*0.862*	*0.743*	*0.641*	*0.552*	*0.476*

Answer

Alternative I: Acquiring the asset by taking bank loan:

Years		1	2	3	4	5
(a)	Interest (@15% p.a. on opening balance)	150,000	120,000	90,000	60,000	30,000
	Depreciation (@15%WDV)	150,000	127,500	108,375	92,119	78,301
		300,000	247,500	198,375	152,119	108,301
(b)	Tax shield (@35%)	105,000	86,625	69,431	53,242	37,905

	Interest less Tax shield (a)-(b)	45,000	33,375	20,569	6,758	(-)7,905
	Principal Repayment	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000
	Total cash outflow	2,45,000	2,33,375	2,20,569	2,06,758	1,92,095
	Discounting Factor @ 16%	0.862	0.743	0.641	0.552	0.476
	Present Value	2,11,190	1,73,398	1,41,385	1,14,130	91,437

Total P.V of cash outflow = ₹731,540

Alternative II: Acquire the asset on lease basis

Year	Lease Rentals ₹	Tax Shield @35%	Net Cash Outflow	Discount Factor	Present Value
1	3,34,000	1,16,900	2,17,100	0.862	1,87,140
2	3,34,000	1,16,900	2,17,100	0.743	1,61,305
3	3,34,000	1,16,900	2,17,100	0.641	1,39,161
4	3,34,000	1,16,900	2,17,100	0.552	1,19,839
5	3,34,000	1,16,900	2,17,100	0.476	1,03,340
				Present value of Total Cash out flow	7,10,785

Advice -By making Analysis of both the alternatives, it is observed that the present value of the cash outflow is lower in alternative II by ₹20,755 (i.e.₹731,540 – ₹7,10,785) Hence, it is suggested to acquire the asset on lease basis.

Question 7

ABC Ltd. is considering a proposal to acquire a machine costing ₹ 1,10,000 payable ₹ 10,000 down and balance payable in 10 annual equal instalments at the end of each year inclusive of interest chargeable at 15%. Another option before it is to acquire the asset on a lease rental of ₹ 15,000 per annum payable at the end of each year for 10 years. The following information is also available.

(i) Terminal Scrap value of ₹ 20,000 is realizable, if the asset is purchased.

(ii) The company provides 10% depreciation on straight line method on the original cost.

(iii) Income tax rate is 50%.

You are required to compute the analyse cash flows and to advise as to which option is better.

Answer

Option I: To buy the asset:

In this option the firm has to pay ₹ 10,000 down and the balance ₹ 1,00,000 together with interest @ 15% is payable in 10 annual equal instalments. The instalment amount may be calculated by dividing ₹ 1,00,000 by the PVAF for 10 years at 15% i.e.

Annual repayment = ₹ 1,00,000/5.0188 = ₹ 19,925

The cash flows of the borrowing and purchase option may be computed as follows:

Year	*Instalment*	*Interest*	*Repayment*	*Balance*
	₹	*₹*	*₹*	*₹*
1	19,925	15,000	4,925	95,075
2	19,925	14,261	5,664	89,411
3	19,925	13,412	6,513	82,898
4	19,925	12,435	7,490	75,408
5	19,925	11,311	8,614	66,794
6	19,925	10,019	9,906	56,888
7	19,925	8,533	11,392	45,496
8	19,925	6,824	13,101	32,395
9	19,925	4,859	15,066	17,329
10	19,925	2,596*	17,329	–

***** Difference between the outstanding balance and the last instalment (i.e. ₹ 19,925 – ₹ 17,329 = ₹ 2,596)

Year	*Installment*	*Interest*	*Depreciation*	*Tax Shield 50% (2 + 3)*	*Net CF (1-4)*	*PVF*	*PV*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
	₹	*₹*	*₹*	*₹*	*₹*		*₹*
0	10,000	–	–	–	–	1.000	10,000
1	19,925	15,000	11,000	13,000	6,925	.870	6,025
2	19,925	14,261	11,000	12,631	7,294	.756	5,514
3	19,925	13,412	11,000	12,206	7,719	.658	5,079
4	19,925	12,435	11,000	11,718	8,207	.572	4,694
5	19,925	11,311	11,000	11,156	8,769	.497	4,358
6	19,925	10,019	11,000	10,510	9,415	.432	4,067
7	19,925	8,533	11,000	9,767	10,158	.376	3,819
8	19,925	6,824	11,000	8,912	11,013	.327	3,601

9	19,925	4,859	11,000	7,930	11,995	.284	3,407
10	19,925	2,596	11,000	6,798	13,127	.247	3,242
	Present value of total outflows						–53,806
10	Salvage value (after tax)		10,000	–	–	.247	+2,470
	Net present value of outflows						–51,336

It may be noted that (i) depreciation of ₹ 11,000 has been provided for all the 10 years. This is 10% of the original cost of ₹ 1,10,000. (ii) The asset is fully depreciated during its life of 10 years, therefore, the book value at the end of 10th year would be zero. As the asset is having a salvage value of ₹ 20,000, this would be capital gain and presuming it to be taxable at the normal rate of 50%, the net cash inflow on account of salvage value would be ₹ 10,000 only. This is further discounted to find out the present value of this inflow.

Option II – Evaluation of Lease Option:

In case the asset is acquired on lease, there is a lease rent of ₹ 15,000 payable at the end of next 10 years. This lease rental is tax deductible, therefore, the net cash outflow would be only ₹ 7,500 (after tax). The PVAF for 10 years @ 15% is 5.0188. So, the present value of annuity of ₹ 7,500 is

Present value of annuity of outflow = ₹ 7,500 × 5.0188 = ₹ 37,641.

Advice: If the firm opts to buy the asset, the present value of outflow comes to ₹ 51,336; and in case of lease option, the present value of outflows comes to ₹ 37,641. Hence, the firm should opt for the lease option. In this way, the firm will be able to reduce its costs by ₹ 13,695 i.e. ₹ 51,336 – ₹ 37,641. This may also be referred to as Net Benefit of Leasing.

Note: Students may also discount cash flows under both alternatives at after tax cost i.e. 15% (1 – 0.5) = 7.5%. Discounting will not have any impact on this decision since any discount factor will lead to present value of lease to be less than that of present value of debt.

Question 8

Engineers Ltd. is in the business of manufacturing nut bolts. Some more product lines are being planned to be added to the existing system. The machinery required may be bought or may be taken on lease. The cost of machine is ₹ 20,00,000 having a useful life of 5 years with the salvage value of ₹ 4,00,000 (consider short term capital loss/gain for the Income tax). The full purchase value of machine can be financed by bank loan at the rate of 20% interest repayable in five equal instalments falling due at the end of each year. Alternatively, the machine can be procured on a 5 years lease, year-end lease rentals being ₹ 6,00,000 per annum. The Company follows the written down value method of depreciation at the rate of 25 per cent. Company's tax rate is 35 per cent and cost of capital is 14 per cent.

(i) Advise the company which option it should choose – lease or borrow.

(ii) Assess the proposal from the lessor's point of view examining whether leasing the machine is financially viable at 14 per cent cost of capital.

Detailed working notes should be given.

Answer

Discounting Factor:

Cost of finance 20% - Tax 35% = 13%.

(i) PV of cash outflows under leasing alternative

Year-end	*Lease rent after taxes P.A.*	*PVIFA at 13%*	*Total P.V.*
1 – 5	₹ 3,90,000	3.517	₹ 13,71,630

PV of cash outflows under buying alternative

Year end	*Loan Instalment*	*Tax advantage on Interest*	*Tax advantage on Depreciation*	*Net Cash Outflow*	*PVIF at 13%*	*Total PV*
1	6,68,673	1,40,000	1,75,000	3,53,673	0.885	3,13,001
2	6,68,673	1,21,193	1,31,250	4,16,230	0.783	3,25,908
3	6,68,673	98,624	98,438	4,71,611	0.693	3,26,826
4	6,68,673	71,542	73,828	5,23,303	0.613	3,20,785
5	6,68,673	38,819	55,371	5,74,483	0.543	3,11,944
		Total PV outflows				15,98,464
		Less: PV of Salvage Value (₹ 4,00,000 *0.543)				2,17,200
						13,81,264
		Less: PV of tax saving on short term capital loss (4,74,609 – 4,00,000) * 35% * .543				14,179
		NPV of Cash outflow				13,67,085

Working Notes:

(1) Schedule of Debt Payment

Year-end	*Opening balance*	*Interest @ 20%*	*Repayment*	*Closing Balance*	*Principal Amount*
1	20,00,000	4,00,000	6,68,673	17,31,327	2,68,673
2	17,31,327	3,46,265	6,68,673	14,08,919	3,22,408
3	14,08,919	2,81,784	6,68,673	10,22,030	3,86,889
4	10,22,030	2,04,406	6,68,673	5,57,763	4,64,267
5	5,57,763	1,10,910*	6,68,673	0	5,57,763

*Balancing Figure

(2) Schedule of Depreciation

Year	*Opening WDV*	*Depreciation*	*Closing WDV*
1	20,00,000	5,00,000	15,00,000
2	15,00,000	3,75,000	11,25,000
3	11,25,000	2,81,250	8,43,750
4	8,43,750	2,10,938	6,32,812
5	6,32,812	1,58,203	4,74,609

(3) EMI = ₹ 20,00,000 / Annuity for 5 years @ 20% = i.e. ₹ 20,00,000 / 2.991 = ₹ 6,68,673.

Advice: Company is advised to borrow and buy not to go for leasing as NPV of cash outflows is lower in case of buying alternative.

Note: Students may note that the cost of capital of the company given in the question is 14% at which cash flows may also be discounted.

(ii) **Evaluation from Lessor's Point of View**

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Lease Rent	6,00,000	6,00,000	6,00,000	6,00,000	6,00,000
Less: Depreciation	5,00,000	3,75,000	2,81,250	2,10,938	1,58,203
EBT	1,00,000	2,25,000	3,18,750	3,89,062	4,41,797
Less: Tax @ 35%	35,000	78,750	1,11,563	1,36,172	1,54,629
EAT	65,000	1,46,250	2,07,187	2,52,890	2,87,168
Add: Depreciation	5,00,000	3,75,000	2,81,250	2,10,938	1,58,203
Cash Inflows	5,65,000	5,21,250	4,88,437	4,63,828	4,45,371
PV factor @ 14%	0.877	0.769	0.675	0.592	0.519
PV of inflows	4,95,505	4,00,841	3,29,695	2,74,586	2,31,148

Evaluation:

Aggregate PV of cash inflows	17,31,775
Add: PV of salvage value (4,00,000 × 0.519)	2,07,600
Add: Tax shelter on short-term capital loss (4,74,609 – 4,00,000) × 0.35 × 0.519	13,553
PV of all cash inflows	19,52,928
Cost of the machine	20,00,000
NPV	–47,072

Hence, leasing at this rate is not feasible.

Question 9

ABC Ltd. is contemplating have an access to a machine for a period of 5 years. The company can have use of the machine for the stipulated period through leasing arrangement or the requisite amount can be borrowed to buy the machine. In case of leasing, the company received a proposal to pay annual end of year rent of ₹ 2.4 lakhs for a period of 5 years.

In case of purchase (which costs ₹10,00,000/-) the company would have a 12%, 5 years loan to be paid in equated installments, each installment becoming due to the beginning of each years. It is estimated that the machine can be sold for ₹2,00,000/- at the end of 5th year. The company uses straight line method of depreciation. Corporate tax rate is 30%. Post tax cost of capital of ABC Ltd. is 10%.

You are required to advice

(i) Whether the machine should be bought or taken on lease.

(ii) Analyse the financial viability from the point of view of the lessor assuming 12% post tax cost of capital.

	PV of ₹ 1@10% for 5 years	***PV of ₹ 1 @ 12% for 5 years***
1	*.909*	*.893*
2	*.826*	*.797*
3	*.751*	*.712*
4	*.683*	*.636*
5	*.621*	*.567*

Answer

(i) Calculation of loan installment:

₹10,00,000 / (1+ PVIFA 12%, 4)

₹10,00,000 / (1 + 3.038) = ₹ 2,47,647

Debt Alternative: Calculation of Present Value of Outflows

(Amount in ₹)

(1) End of year	*(2) Debt Payment*	*(3) Interest*	*(4) Dep.*	*(5) Tax Shield [(3)+(4)]x0.3*	*(6) Cash outflows (2) – (5)*	*(7) PV factors @ 10%*	*(8) PV*
0	2,47,647	0	0	0	2,47,647	1.000	2,47,647
1	2,47,647	90,282	1,60,000	75,085	1,72,562	0.909	1,56,859
2	2,47,647	71,398	1,60,000	69,419	1,78,228	0.826	1,47,216

3	2,47,647	50,249	1,60,000	63,075	1,84,572	0.751	1,38,614
4	2,47,647	26,305*	1,60,000	55,892	1,91,755	0.683	1,30,969
5	0	0	1,60,000	48,000	(48,000)	0.621	(29,808)
							7,91,497
Less: Salvage Value ₹ 2,00,000 x 0.621							1,24,200
Total Present Value of Outflow							6,67,297

*balancing figure

Leasing Decision: Calculation of Present Value of Outflows

Yrs. 1-5 ₹2,40,000 x (1 - 0.30) x 3.790 = ₹6,36,720

Decision: Leasing option is viable.

(ii) From Lessor's Point of View

		(₹)
Cost of Machine		(-) 10,00,000
PV of Post tax lease Rental (₹2,40,000 x 0.7 x 3.605)	6,05,640	
PV of Depreciation tax shield (₹1,60,000 x 0.3 x 3.605)	1,73,040	
PV of salvage value (₹2,00,000 x 0.567)	1,13,400	8,92,080
NPV		(-) 1,07,920

Decision – Leasing proposal is not viable.

Question 10

ABC Company has decided to acquire a ₹ 5,00,000 pulp control device that has a useful life of ten years. A subsidy of ₹ 50,000 is available at the time the device is acquired and placed into service. The device would be depreciated on straight-line basis and no salvage value is expected. The company is in the 50% tax bracket. If the acquisition is financed with a lease, lease payments of ₹ 55,000 would be required at the beginning of each year. The company can also borrow at 10% repayable in equal instalments. Debt payments would be due at the beginning of each year:

(i) What is the present value of cash outflow for each of these financing alternatives, using the after-tax cost of debt?

(ii) Which of the two alternatives is preferable?

Answer

Initial amount borrowed = ₹ 5,00,000 – ₹ 50,000 = ₹ 4,50,000

This amount of ₹4,50,000 is the amount which together with interest at the rate of 10% on outstanding amount is repayable in equal installments i.e., annuities in the beginning of each

of 10 years. The PVAF at the rate of 10% for 9 years is 5.759 and for the year 0 it is 1.000. So, the annuity amount may be ascertained by dividing ₹4,50,000 by (5.759 + 1.000).

So Annual payment = ₹4,50,000/6.759 = ₹66,578

Amount owed at time 0 = ₹4,50,000 – ₹ 66,578 = ₹3,83,422.

Schedule of Debt Payment

End of Year	Total Payment ₹	Interest ₹	Principal Amount Outstanding ₹
0	66,578	0	3,83,422
1	66,578	38,342	3,55,186
2	66,578	35,519	3,24,127
3	66,578	32,413	2,89,962
4	66,578	28,996	2,52,380
5	66,578	25,238	2,11,040
6	66,578	21,104	1,65,566
7	66,578	16,557	1,15,545
8	66,578	11,555	60,522
9	66,578	6,056*	NIL

* Balancing Figure

Schedule of Cash Outflows: Debt Alternative

(Amount in ₹)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
End of year	*Debt Payment*	*Interest*	*Dep*	*Tax Shield [(3)+(4)]0.5*	*Cash outflows (2) – (5)*	*PV factors @ 5%*	*PV*
0	66,578	0	0	0	66,578	1.000	66,578
1	66,578	38,342	50,000	44,171	22,407	0.952	21,331
2	66,578	35,519	50,000	42,759	23,819	0.907	21,604
3.	66,578	32,413	50,000	41,206	25,372	0.864	21,921
4	66,578	28,996	50,000	39,498	27,080	0.823	22,287
5	66,578	25,238	50,000	37,619	28,959	0.784	22,704
6	66,578	21,104	50,000	35,552	31,026	0.746	23,145
7	66,578	16,557	50,000	33,279	33,299	0.711	23,676

8	66,578	11,555	50,000	30,777	35,801	0.677	24,237
9	66,578	6,056	50,000	28,028	38,550	0.645	24,865
10	-	0	50,000	25,000	(-25,000)	0.614	(-15,350)
Total present value of Outflows							2,56,998

Schedule of Cash Outflows: Leasing Alternative

(Amount in ₹)

End of year	*Lease Payment*	*Tax Shield*	*Cash Outflow*	*PVIFA @ 5%*	*PV*
0	55,000	0	55,000	1.000	55,000
1-9	55,000	27,500	27,500	7.109	1,95,498
10	0	27,500	-27,500	0.614	(-16,885)
Total Present value of Outflows					2,33,613

The present values of cash outflow are ₹2,56,998 and ₹2,33,613 respectively under debt and lease alternatives. As under debt alternatives the cash outflow would be more, the lease is preferred.

Note: (i) The repayment of loan as well as payment of lease rental is made in the beginning of the years. So, at the end of year 10, there will not be any payment in either option, but the tax benefit of depreciation for the year 10 as well as of lease rentals paid in the beginning of year 10, will be available only at the end of year 10.

(ii) Students may also calculate depreciation after subtracting the amount of subsidy from original cost, however, even in this situation, lease alternative is preferable.

Question 11

Agrani Ltd. is in the business of manufacturing bearings. Some more product lines are being planned to be added to the existing system. The machinery required may be bought or may be taken on lease. The cost of machine is ₹ 40,00,000 having a useful life of 5 years with the salvage value of ₹ 8,00,000. The full purchase value of machine can be financed by 20% loan repayable in five equal instalments falling due at the end of each year. Alternatively, the machine can be procured on a 5 years lease, year-end lease rentals being ₹ 12,00,000 per annum. The Company follows the written down value method of depreciation at the rate of 25%. Company's tax rate is 35 per cent and cost of capital is 16 per cent:

(i) Advise the company which option it should choose – lease or borrow.

(ii) Assess the proposal from the lessor's point of view examining whether leasing the machine is financially viable at 14% cost of capital (Detailed working notes should be given. Calculations can be rounded off to ₹ lakhs).

Answer

(i) P.V. of Cash outflow under lease option

(in ₹)

Year	*Lease Rental after tax*	*PVIFA @ 13%*	*Total P.V.*
1 – 5	12,00,000 (I – T) = 7,80,000	20% (I – T) 3.517	27,43,260

Cash Outflow under borrowing option

5 equal instalments

₹ 40,00,000 ÷ 2.991 (PVIFA 20%) = 13,37,345

Tax Advantage

Year	*Loan Instalments*	*On Interest*	*On Depreciation*	*Net Cash Outflow*	*PVIF 13%*	*Total PV*
1	13,37,345	2,80,000	3,50,000	7,07,345	.885	6,26,000
2	13,37,345	2,48,386	2,62,500	8,26,459	.783	6,47,117
3	13,37,345	1,97,249	1,96,875	9,43,221	.693	6,53,652
4	13,37,345	1,43,085	1,47,656	10,46,604	.613	6,41,568
5	13,37,345	77,635	1,10,742	11,48,968	.543	6,23,890
						31,92,227
Total PV						31,92,227
Less: PV Salvage value adjusted for Tax savings on loss of sale of machinery (₹ 8,00,000 × .543 = ₹ 4,34,400) + (₹ 28,359) (See Working Note on Depreciation) 9,49,219 – 8,00,000 = 1,49,219 × .35 × .543 = 28,359						4,62,759
Total present value of cash outflow						27,29,468

Decision: PV of cash outflow of lease option is greater than borrow option and hence borrow option is recommended.

Working Notes:

1. Debt and Interest Payments

Year	*Loan Instalments*	*Loan at the beginning of the year*	*Interest*	*Principal*	*Balance at the end of year*
1	13,37,345	40,00,000	8,00,000	5,37,345	34,62,655

2	13,37,345	34,62,655	6,92,531	6,44,814	28,17,841
3	13,37,345	28,17,841	5,63,568	7,73,777	20,44,064
4	13,37,345	20,44,064	4,08,813	9,28,532	11,15,532
5	13,37,345	11,15,532	2,21,813*	11,15,532	-

* Balancing Figure

2.

Year		*Depreciation*
1	40,00,000 × .25	10,00,000
2	30,00,000 × .25	7,50,000
3	22,50,000 × .25	5,62,500
4	16,87,500 × .25	4,21,875
5	12,65,625 × .25	3,16,406

B.V. of machine = 12,65,625 – 3,16,406 = 9,49,219.

(ii) Proposal from the View Point of Lessor

Lessor's Cash Flow

	1	*2*	*3*	*4*	*5*
Lease Rentals	12,00,000	12,00,000	12,00,000	12,00,000	12,00,000
Less: Dep. (A)	10,00,000	7,50,000	5,62,500	4,21,875	Nil
EBT	2,00,000	4,50,000	6,37,500	7,78,125	12,00,000
Less: Tax @ 35%	70,000	1,57,500	2,23,125	2,72,344	4,20,000
EAT (B)	1,30,000	2,92,500	4,14,375	5,05,781	7,80,000
CFAT	11,30,000	10,42,500	9,76,875	9,27,656	7,80,000
PV factor @ 14%	.877	.769	.675	.592	.519
PV	9,91,010	8,01,683	6,59,391	5,49,172	4,04,820

PV of Lease Rent	34,06,076
Add: PV of Salvage Value	4,15,200
Add: PV of Tax Saving on loss of sale of asset	84,581
Total PV of cash inflow	39,05,857
Cost of Machine	40,00,000
NPV	(94,143)

Decision: Lease rate is not financially viable. Hence, not recommended.

Question 12

Your company is considering acquiring an additional computer to supplement its time-share computer services to its clients. It has two options:

(i) To purchase the computer for ₹ 22 lakhs.

(ii) To lease the computer for three years from a leasing company for ₹ 5 lakhs as annual lease rent plus 10% of gross time-share service revenue. The agreement also requires an additional payment of ₹ 6 lakhs at the end of the third year. Lease rents are payable at the year-end, and the computer reverts to the lessor after the contract period.

The company estimates that the computer under review will be worth ₹ 10 lakhs at the end of third year.

Forecast Revenues are:

Year	*1*	*2*	*3*
Amount (₹ in lakhs)	*22.5*	*25*	*27.5*

Annual operating costs excluding depreciation/lease rent of computer are estimated at ₹ 9 lakhs with an additional ₹ 1 lakh for start up and training costs at the beginning of the first year. These costs are to be borne by the lessee. Your company will borrow at 16% interest to finance the acquisition of the computer. Repayments are to be made according to the following schedule:

Year end	*1*	*2*	*3*
Principal (₹000)	*500*	*850*	*850*
Interest (₹000)	*352*	*272*	*136*

The company uses straight line method (SLM) to depreciate its assets and pays 50% tax on its income. The management approaches you to advice. Which alternative would be recommended and why?

Note: The PV factor at 8% and 16% rates of discount are:

Year	*1*	*2*	*3*
8%	*0.926*	*0.857*	*0.794*
16%	*0.862*	*0.743*	*0.641*

Answer

Working Notes:

(a) Depreciation: ₹ 22,00,000 – 10,00,000/3 = ₹ 4,00,000 p.a.

(b) Effective rate of interest after tax shield: .16 × (1 - .50) = .08 or 8%.

(c) Operating and training costs are common in both alternatives hence not considered while

calculating NPV of cash flows.

Calculation of NPV

1. Alternative I: Purchase of Computer

Particulars	*Year 1*	*Year 2*	*Year 3*
	₹	₹	₹
Instalment Payment			
Principal	5,00,000	8,50,000	8,50,000
Interest	3,52,000	2,72,000	1,36,000
Total (A)	8,52,000	11,22,000	9,86,000
Tax shield @ 50%;			
Interest payment	1,76,000	1,36,000	68,000
Depreciation	2,00,000	2,00,000	2,00,000
Total (B)	3,76,000	3,36,000	2,68,000
Net Cash outflows (A – B)	4,76,000	7,86,000	7,18,000
PV factor at 8%	0.926	0.857	0.794
PV of Cash outflows	4,40,776	6,73,602	5,70,092
Total PV of Cash outflows:			16,84,470
Less: PV of salvage value (₹ 10 lakhs × 0.794)			7,94,000
Net PV of cash outflows			8,90,470

2. Alternative II: Lease of the Computer

Particulars	*Year 1*	*Year 2*	*Year 3*
	₹	₹	₹
Lease rent	5,00,000	5,00,000	5,00,000
10% of gross revenue	2,25,000	2,50,000	2,75,000
Lump sum payment	–	–	6,00,000
Total Payment	7,25,000	7,50,000	13,75,000
Less: Tax shield @ 50%	3,62,500	3,75,000	6,87,500
Net Cash outflows	3,62,500	3,75,000	6,87,500
PV of Cash outflows @ 8%	3,35,675	3,21,375	5,45,875
Total PV of cash outflows			12,02,925

Recommendation: Since the Present Value (PV) of net cash outflow of Alternative I is lower, the company should purchase the computer.

Question 13

ABC Ltd. sells computer services to its clients. The company has recently completed a feasibility study and decided to acquire an additional computer, the details of which are as follows:

(1) The purchase price of the computer is ₹ 2,30,000; maintenance, property taxes and insurance will be ₹ 20,000 per year. The additional expenses to operate the computer are estimated at ₹ 80,000. If the computer is rented from the owner, the annual rent will be ₹ 85,000, plus 5% of annual billings. The rent is due on the last day of each year.

(2) Due to competitive conditions, the company feels that it will be necessary to replace the computer at the end of three years with a more advanced model. Its resale value is estimated at ₹ 1,10,000.

(3) The corporate income tax rate is 50% and the straight line method of depreciation is followed.

(4) The estimated annual billing for the services of the new computer will be ₹ 2,20,000 during the first year, and ₹ 2,60,000 during the subsequent two years.

(5) If the computer is purchased, the company will borrow to finance the purchase from a bank with interest at 16% per annum. The interest will be paid regularly, and the principal will be returned in one lump sum at the end of the year 3.

Should the company purchase the computer or lease it? Assume (i) straight line method of depreciation, (ii) salvage value of ₹ 1,10,000 and evaluate the proposal from the point of view of lessor if its cost of capital is also 12%.

Answer

Evaluation from the point of view of Lessee: The lessee has two alternatives: (i) To acquire the computer out of borrowed funds, and (ii) To acquire the computer on lease basis. The financial implications of these two options can be evaluated as follows:

Option I: To acquire computer out of borrowed funds. In this case, the company has to pay interest @ 16% annually and repayment of loan at the end of 3rd year. However, the salvage value of ₹1,10,000 will be available to it. The information can be presented as follows:

Year	*Interest*	*Depreciation*	*Expenses*	*Tax Shield (5)=50% of (2+3+4)*	*Cash outflows*	*PVF (8%)*	*PV (₹)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*6=(2+4-5)*		
1	₹36,800	₹40,000	₹20,000	₹48,400	₹8,400	.926	7,778
2	36,800	40,000	20,000	48,400	8,400	.857	7,199
3	36,800	40,000	20,000	48,400	8,400	.794	6,670
4	Repayment – Savage (2,30,000 –1,10,000)				₹1,20,000	.794	95,280
			Present Value of Outflows				1,16,927

Option II: To acquire the Computer on lease basis: In this case, the Company will be required to pay an annual lease rent of ₹85,000 + 5% of annual billing at the end of year. The financial implications can be evaluated as follows:

Year	*Rental*	*5% of Billing*	*Tax Shield*	*Cash Outflow*	*PV (8%)*	*(PV)*
	(1)	*(2)*	*(3)= (50% of 1+2)*	*(4)= (1+2+3)*		
1	₹85,000	₹11,000	₹48,000	₹48,000	.926	₹44,448
2	85,000	13,000	49,000	49,000	.857	41,993
3	85,000	13,000	49,000	49,000	.794	38,906
	Present Value of Outflows					1,25,347

As the PV of outflows is less in case of buying option, the Company should borrow funds to buyout the computer.

Note: It may be noted that the additional expenses of ₹80,000 to operate the computer have not been considered in the above calculation. These expenses are required in both the options and are considered to be irrelevant to decide between lease or buy.

Evaluation from the point of view of lessor:

	Year 1	*Year 2*	*Year 3*
Lease Rental	85,000	85,000	85,000
5% of Billing	11,000	13,000	13,000
Total Income	96,000	98,000	98,000
Less: Maintenance Expenses	20,000	20,000	20,000
Depreciation	40,000	40,000	40,000
Income before tax	36,000	38,000	38,000
Tax @ 50%	18,000	19,000	19,000
Net Income after Tax	18,000	19,000	19,000
Depreciation added back	40,000	40,000	40,000
Cash Inflow (Annual)	58,000	59,000	59,000
Scrap Value	-	-	1,10,000
	58,000	59,000	1,69,000
PVF (12%)	0.893	0.797	0.712
Present Value	51,794	47,023	1,20,328
Total Present Value			2,19,145
Less: Initial Cost			2,30,000
Net Present Value			-10,855
As the NPV for the lessor is negative, he may not accept the proposal.			

Question 14

A Company is planning to acquire a machine costing ₹ 5,00,000. Effective life of the machine is 5 years. The Company is considering two options. One is to purchase the machine by lease and the other is to borrow ₹ 5,00,000 from its bankers at 10% interest p.a. The Principal amount of loan will be paid in 5 equal instalments to be paid annually. The machine will be sold at ₹ 50,000 at the end of 5th year. Following further informations are given:

(a) Principal, interest, lease rentals are payable on the last day of each year.

(b) The machine will be fully depreciated over its effective life.

(c) Tax rate is 30% and after tax. Cost of Capital is 8%.

Compute the lease rentals payable which will make the firm indifferent to the loan option.

Answer

(a) Borrowing option:

Annual Instalment = ₹5,00,000/- / 5 = ₹1,00,000/-

Annual depreciation = ₹5,00,000/- / 5 = ₹1,00,000/-

Computation of net cash outflow:

Year	*Principal (₹)*	*Interest (₹)*	*Total (₹)*	*Tax Saving Depn. & Interest (₹)*	*Net cash Outflow (₹)*	*PV @ 8%†*	*Total PV (₹)*
1	1,00,000	50,000	1,50,000	45,000	1,05,000	0.926	97,230
2	1,00,000	40,000	1,40,000	42,000	98,000	0.857	83,986
3	1,00,000	30,000	1,30,000	39,000	91,000	0.794	72,254
4	1,00,000	20,000	1,20,000	36,000	84,000	0.735	61,740
5	1,00,000	10,000	1,10,000	33,000	77,000	0.681	52,437
							3,67,647
Less: Present value of Inflows at the end of 5th year (₹50,000/- x 0.7) or ₹35,000 x 0.681 =							23,835
PV of Net Cash outflows							3,43,812

Calculation of lease rentals:

Therefore, Required Annual after tax outflow = 3,43,812/3.993 = ₹86,104/-*

Therefore, Annual lease rental = 86,104/0.70 = ₹1,23,006/-

* If it is assumed that installment is payable in the beginning of the year then lease rent shall be computed as follows:

Required Annual after tax outflow = 3,43,812/4.312 = ₹79,734/-

Therefore, Annual lease rental = 79,734/0.70 = ₹1,13,906/-

Further, if it is assumed that the lease rent is payable in the beginning of the year and tax benefit accrue in arrears then lease rent shall be computed as follows:

Let 'R' be the lease rent

PV of Lease Rent = 4.312R

PV of Tax Benefits = 3.933 x 0.30R = 1.1979R

Accordingly

3,43,812 = 4.312R - 1.1979R

R = 1,10,405

Thus, lease rent at which lessor will be Break Even = ₹1,10,405

† Alternatively it can also be discounted at post tax cost of debt i.e. 8.00% (1 - 0.30) = 5.60%.

Question 15

The Finance manager of ABC Corporation is analyzing firms policy regarding computers which are now being leased on yearly basis on rental amounting to ₹ 1,00,000 per year. The computers can be bought for ₹ 5,00,000. The purchase would be financed by 16% and the loan is repayable in 4 equal annual installments.

On account of rapid technological progress in the computer industry, it is suggested that a 4-year economic life should be used instead of a 10-year physical life. It is estimated that the computers would be sold for ₹ 2,00,000 at the end of 4 years.

The company uses the straight line method of depreciation. Corporate tax rate is 35%.

(i) Whether the equipment be bought or be taken on lease?

(ii) Analyze the financial viability from the point of view of the lessor, assuming 14% cost of capital.

(iii) Determine the minimum lease rent at which lessor would break even.

Answer

(i) The loan amount is repayable together with the interest at the rate of 16% on loan amount and is repayable in equal installments at the end of each year. The PVAF at the rate of 16% for 4 years is 2.798, the amount payable will be

$$\text{Annual Payment} = \frac{₹\ 5,00,000}{2.798} = ₹\ 1,78,699 \text{ (rounded)}$$

Schedule of Debt Repayment

End of Year	Total Principal ₹	Interest ₹	Principal ₹	Principal Amount Outstanding ₹
1	5,00,000	80,000	98,699	4,01,301
2	4,01,301	64,208	1,14,491	2,86,810
3	2,86,810	45,890	1,32,809	1,54,001
4	1,54,001	24,698*	1,54,001	------

* Balancing Figure

Tax Benefit on Interest and Depreciation

Year	*Interest*	*Depreciation*	*Total*	*Tax Benefit*
1	80,000	75,000	1,55,000	54,250
2	64,208	75,000	1,39,208	48,723
3	45,890	75,000	1,20,890	42,312
4	24,698	75,000	99,698	34,894

Present Value of Cash Flows under Borrow and Buying proposal

Year	Installment ₹	Salvage Value (₹)	Tax Benefit (₹)	Net Flow (₹)	PVF @ 10.4%	PV (₹)
1	1,78,699		54,250	1,24,449	0.906	1,12,751
2	1,78,699		48,723	1,29,976	0.820	1,06,580
3	1,78,699		42,312	1,36,387	0.743	1,01,336
4	1,78,699	(2,00,000)	34,894	-56,195	0.673	-37,819
					3.142	2,82,848

Present Value of Cash Flows under Leasing Option

₹ 1,00,000 (1- 0.35) x 3.142 = ₹ 2,04,230

Hence leasing should be preferred as cash flow is least in this option.

(ii) Analyzing financial viability from Lessor's point of view

(a) Determination of Cash Flow after Tax

	₹
Annual Rent	1,00,000
Less: Depreciation	75,000
EBT	25,000
Less: Tax @ 35%	8,750

Profit after Tax	16,250
Add: Depreciation	75,000
	91,250

(b) Computation of Net Present Value

	₹
Present Value of Cash inflow (₹ 91,250 x 2.914)	2,65,903
Add: PV of Salvage Value (₹ 2,00,000 x 0.592)	1,18,400
	3,84,303
Purchase Price	(5,00,000)
NPV	(1,15,697)

Thus proposal is not financially viable from lessor's point of view.

(iii) Break Even Lease Rent

	₹
Cost of Computer	5,00,000
Less: PV of Salvage Value (₹ 2,00,000 x 0.592)	1,18,400
	3,81,600
PVIAF (14%,4)	2.914
CFAT Desired	1,30,954
Less: Depreciation	75,000
EAT	55,954
Add: Taxes	30,129
EBT	86,083
Add: Depreciation	75,000
Lease Rental (Desired)	1,61,083

Question 16

Armada Leasing Company is considering a proposal to lease out a school bus. The bus can be purchased for ₹ 5,00,000 and, in turn, be leased out at ₹ 1,25,000 per year for 8 years with payments occurring at the end of each year:

(i) Estimate the internal rate of return for the company assuming tax is ignored.

(ii) What should be the yearly lease payment charged by the company in order to earn 20 per cent annual compounded rate of return before expenses and taxes?

(iii) Calculate the annual lease rent to be charged so as to amount to 20% after tax annual compound rate of return, based on the following assumptions:

(i) Tax rate is 40%;

(ii) Straight line depreciation;

(iii) Annual expenses of ₹ 50,000; and

(iv) Resale value ₹ 1,00,000 after the turn.

Answer

(i) Payback period = $\frac{5,00,000}{1,25,000} = 4.00$

PV factor closest to 4.00 in 8 years is 4.078 at 18%

Thus IRR = 18%

Note: Students may also arrive at the answer of 18.63% instead of 18% if exact calculation are made as follows:-

PV factor in 8 years at 19% is 3.9544

Interpolating for 4.00

$$IRR = 18\% + \frac{4.0776 - 4.000}{4.0776 - 3.9544} = 18.63\%$$

(ii) Desired lease rent to earn 20% IRR before expenses and taxes:

$$\text{Lease Rent} = \frac{5,00,000}{\text{PVIFA } 8\,\text{yr}, 20\%} = \frac{5,00,000}{3.837} = ₹\ 1,30,310.14 \text{ p.a.}$$

(iii) Revised lease rental on school bus to earn 20% return based on the given conditions.

PV factor [(X – E – D) (1 – T) + D] + (PV factor × S.V.) = Co

3.837 [(x – 50,000 – 50,000) (1 – .4) + 50,000] + (.233 × 1,00,000*) = 5,00,000

3.837 [.6x – 60,000 + 50,000)] + 23,300 = 5,00,000

2.3022x = 5,15,070

x = 2,23,729.47

This may be confirmed as lease rental	2,23,729.47
Less: Expenses + Depreciation	1,00,000.00
EBT	1,23,729.47
Less tax 40%	49,491.79
PAT	74,237.68

Add: Depreciation	50,000.00
CFAT	1,24,237.68

$$\frac{\text{Co - PV of SV}}{\text{CFAT}} = \frac{5,00,000 - 23,300}{1,24,237.68} = 3.837 \text{ or } 20\%$$

*** Note:** Alternatively STCG can also be considered as net of tax.

Question 17

ABC Leasing Ltd. has been approached by a client to write a five years lease on an asset costing ₹10,00,000 and having estimated salvage value of ₹1,00,000 thereafter. The company has a after tax required rate of return of 10% and its tax rate is 50%. It provides depreciation @33 ⅓ % on written down value of the asset. What lease rental will provide the company its after tax required rate of return?

Answer

In order to find out the annual lease rent, the cash flows from the asset must be evaluated as follows:

Year	*Depreciation (₹)*	*Tax Shield (₹)*	*Cash flow (₹)*	*PVF(10%)*	*PV (₹)*
1	3,33,333	1,66,667	1,66,666	.909	1,51,500
2	2,22,222	1,11,111	1,11,111	.826	91,778
3	1,48,148	74,074	74,074	.751	55,630
4	98,766	49,383	49,383	.683	33,728
5	65,844	32,922	32,922	.621	20,444
5	31,687*	15,843	15,843	.621	9,838
5	Salvage Value		1,00,000	.621	62,100
				Present Value of Inflows	4,25,018
				Outflow	10,00,000
				Net Present value	5,74,982

* Short Term Capital Loss

The firm therefore, should have total recovery of ₹5,74,982 through the lease rentals. The annual lease rental after tax may be calculated as follows:

Lease rental (after tax) = Total recovery required ÷ $PVAF_{(10\%n)}$

= ₹5,74,982 ÷ 3.791 = ₹1,51,670

Now, the lease rental before tax = ₹1,51,670 ÷ 0.5

= ₹3,03,340

Therefore, the firm should charge a lease rental of ₹3,03,340 in order to earn a required rate of return of 10% after tax.

Question 18

Fair finance, a leasing company, has been approached by a prospective customer intending to acquire a machine whose Cash Down price is ₹ 3 crores. The customer, in order to leverage his tax position, has requested a quote for a three year lease with rentals payable at the end of each year but in a diminishing manner such that they are in the ratio of 3 : 2 : 1.

Depreciation can be assumed to be on straight line basis and Fair Finance's marginal tax rate is 35%. The target rate of return for Fair Finance on the transaction is 10%.

Required:

Calculate the lease rents to be quoted for the lease for three years.

Answer

Capital sum to be placed under Lease

		₹ in lakhs
Cash Down price of machine		300.00
Less: Present value of depreciation		
Tax Shield		
$100 \times .35 \times \frac{1}{(1.10)}$	31.82	
$100 \times .35 \times \frac{1}{(1.10)^2}$	28.93	
$100 \times .35 \times \frac{1}{(1.10)^3}$	26.30	87.05
		212.95

If the normal annual lease rent per annum is *x*, then cash flow will be:

Year	*Post-tax cash flow*	*P.V. of post-tax cash flow*
1	$3x \times (1 - .35) = 1.95x$	$1.95x \times (1/1.10) = 1.7727x$
2	$2x \times (1 - .35) = 1.3x$	$1.30x \times [(1/(1.10)^2] = 1.0743x$

3	$x \times (1 - .35) = 0.65x$	$0.65\ x\ [1/(1.10)^3] = 0.4884x$ $= 3.3354x$

Therefore 3.3354 x = 212.95 or x = ₹ 63.8454 lakhs

Year-wise lease rentals:

₹ in lakhs

Year 1	3 × 63.8454 lakhs	= 191.54
2	2 × 63.8454 lakhs	= 127.69
3	1 × 63.8454 lakhs	= 63.85

Question 19

Classic Finance, a Leasing Company, has been approached by a prospective customer intending to acquire a machine whose cash down price is ₹ 6 crores. The customer, in order to leverage his tax position, has requested a quote for a three year lease with rentals payable at the end of each year but in a diminishing manner such that they are in the ratio of 3 : 2 : 1. Depreciation can be assumed to be on WDV basis at 25% and Classic Finance's marginal tax rate is 35%. The target rate of return for Classic Finance on the transaction is 10%. You are required to calculate the lease rents to be quoted for the lease for three years.

Answer

Calculation of depreciation tax shield

(₹ Lakhs)

Year	Cost / WDV	Dep. @ 25 %	Tax shield @ 0.35	PVF	PV of dep. tax shield
1	600.00	150.00	52.50	0.909	47.72
2	450.00	112.50	39.38	0.826	32.53
3	337.50	84.38	29.53	0.751	22.18
					102.43

Capital sum to be placed on lease (₹ Lakhs)

Cash down price	600.00
Less: PV of depreciation tax shield	102.43
To be placed on lease	**497.57**

Let the normal annual lease rent were to be "x" then

Year	Post tax	PVF	PV of cash flow
1	3 x (1-0.35) or 1.95 x	0.909	1.773 x

2	2x (1-0.35) or 1.30*x*	0.826	1.074*x*
3	1x (1-0.35) or 0.65*x*	0.751	0.488*x*
			3.335 *x*

Value of *x* = ₹ 497.57 lakhs / 3.335 i.e ₹ 149.196 lakhs

Year wise lease rental will be

		₹lakhs
Year 1	3 × 149.196	447.59
Year 2	2 × 149.196	298.39
Year 3	1 × 149.196	149.20

Question 20

M/s ABC Ltd. is to acquire a personal computer with modem and a printer. Its price is ₹ 60,000. ABC Ltd. can borrow ₹ 60,000 from a commercial bank at 12% interest per annum to finance the purchase. The principal sum is to be repaid in 5 equal year-end instalments.

ABC Ltd. can also have the computer on lease for 5 years.

The firm seeks your advise to know the maximum lease rent payable at each year end. Consider the following additional information:

(i) Interest on bank loan is payable at each year end.

(ii) The full cost of the computer will be written off over the effective life of computer on a straight-line basis. This is allowed for tax purposes.

(iii) At the end of year 5, the computer may be sold for ₹ 1,500 through a second -hand dealer, who will charge 8% commission on the sale proceeds.

(iv) The company's effective tax rate is 30%.

(v) The cost of capital is 11%.

Suggest the maximum annual lease rental for ABC Ltd. :

PV Factor at 11%

Year	PVF
1	0.901
2	0.812
3	0.731
4	0.659
5	0.593

Answer

Workings

(i)	Annual loan repayment: ₹ $\frac{60,000}{5}$	₹ 12,000
(ii)	Residual sale value at year 5	₹ 1,500
	(-) Commission at 8%	120
	Profit on sale	1380
	(-) Tax @ 30%	414
	Net cash flow (₹ 1,380 - ₹ 414)	₹966

(iii) Net cash outflow under loan option –

Year	1 (₹)	2 (₹)	3 (₹)	4 (₹)	5 (₹)	Total (₹)
Principal repayment	12,000	12,000	12,000	12,000	12,000	60,000
Payment of Interest	7,200	5,760	4,320	2,880	1,440	21,600
(-) Tax Savings @ 30% on depreciation	(3,600)	(3,600)	(3,600)	(3,600)	(3,600)	(18,000)
Tax savings on Interest	(2,160)	(1,728)	(1,296)	(864)	(432)	(6,480)
Net out flow	13,440	12,432	11,424	10,416	9,408	57,120
Discount factor at 11%	0.901	0.812	0.731	0.659	0.593	3.696
PV of cash outflow	12,109	10,095	8,351	6,864	5,579	42,998
Less: PV of Post tax inflow at the end of year 5 (₹ 966×0.593)						(573)
					PV of net Cash outflows in 5 years	42,425

Computation of Annual Lease Rentals:

PV of post tax Annual Lease Rentals in 5 years should not exceed ₹ 42,425.

Or say, PV of Post-tax Lease Rental for one year. Should not exceed

₹ $\frac{42,425}{3.696}$ = ₹11,479

₹11479 post-tax = [₹ 11,479/(1-t)] pretax

= ₹ 11,479/(1 - 0.30) = ₹16,398

Therefore, maximum pre-tax annual rental should be ₹16,398

Question 21

P Ltd. has decided to acquire a machine costing ₹ 50 lakhs through leasing. Quotations from 2 leasing companies have been obtained which are summarised below:

	Quote A	*Quote B*
Lease term	*3 years*	*4 years*
Initial lease rent (₹ lakhs)	*5.00*	*1.00*
Annual lease rent (payable in arrears) (₹ lakhs)	*21.06*	*19.66*

P Ltd. evaluates investment proposals at 10% cost of capital and its effective tax rate is 30%. Terminal payment in both cases is negligible and may be ignored.

Make calculations and show which quote is beneficial to P Ltd. Present value factors at 10% rate for years 1-4 are respectively 0.91, 0.83, 0.75 and 0.68. Calculations may be rounded off to 2 decimals in lakhs.

Answer

(in lakhs)

	Quote A	*Quote B*
Calculation of Present Value (PV) of cash payments:		
Initial lease rent (PV)	5.00	1.00
Less: PV of tax benefit on initial payment of lease rent		
₹ 5.00 lakh x 0.30 x 0.91	(1.365)	-
₹ 1.00 lakh x 0.30 x 0.91	-	(0.273)
PV of Annual lease rents		
₹ 21.06 lakh x 0.7 x 2.49	36.71	-
₹ 19.66 lakh x 0.7 x 3.17	-	43.63
Total payments in PV	**40.345**	**44.357**
Capital Recovery Factor (reciprocal of Annuity Factor)		
1/2.49	0.402	-
1/3.17	-	0.315
Equated Annual Payment or cash outflow (₹ lakhs)	**16.20**	**13.979**

Conclusion: Since Quote B implies lesser equated annual cash outflow, it is better.

Question 22

X Ltd. had only one water pollution control machine in this type of block of asset with no book value under the provisions of the Income Tax Act, 1961 as it was subject to rate of depreciation of 100% in the very first year of installation.

Due to funds crunch, X Ltd. decided to sell the machine which can be sold in the market to anyone for ₹ 5,00,000 easily.

Understanding this from a reliable source, Y Ltd. came forward to buy the machine for ₹ 5,00,000 and lease it to X Ltd. for lease rental of ₹ 90,000 p.a. for 5 years. X Ltd. decided to invest the net sale proceed in a risk free deposit, fetching yearly interest of 8.75% to generate some cash flow. It also decided to relook the entire issue afresh after the said period of 5 years.

Another company, Z Ltd. also approached X Ltd. proposing to sell a similar machine for ₹ 4,00,000 to the latter and undertook to buy it back at the end of 5 years for ₹ 1,00,000 provided the maintenance were entrusted to Z Ltd. for yearly charge of ₹ 15,000. X Ltd. would utilise the net sale proceeds of the old machine to fund this machine also should it accept this offer.

The marginal rate of tax of X Ltd. is 34% and its weighted average cost of capital is 12%.

Which Alternative would you recommend?

Discounting Factors @ 12%

Year	*1*	*2*	*3*	*4*	*5*
	0.893	*0.797*	*0.712*	*0.636*	*0.567*

Answer

First Option

	₹
Sale Proceeds	5,00,000
Tax @ 34%	1,70,000
Net Proceed	3,30,000
Interest @ 8.75% p.a.	= ₹ 28,875

NPV of this Option

	Year					
	0	**1**	**2**	**3**	**4**	**5**
Int. on Net Proceeds (₹)		28,875	28,875	28,875	28,875	28,875
Tax @ 34% (₹)		-9,818	-9,818	-9,818	-9,818	-9,818
Lease Rent (₹)		-90,000	-90,000	-90,000	-90,000	-90,000
Tax @34%(₹)		30,600	30,600	30,600	30,600	30,600

Terminal Cash Flow (₹)						3,30,000
Cash flow (₹)		-40,343	-40,343	-40,343	-40,343	2,89,657
PV Factor		0.893	0.797	0.712	0.636	0.567
PV of Cash Flows (₹)		-36,026	-32,153	-28,724	-25,658	1,64,236

NPV = ₹ 41,675

Second Option

	₹
Cost of New Machine	4,00,000
Net sale proceeds of old machine	3,30,000
Investment in Cash	70,000

NPV of this Option

	Year					
	0	**1**	**2**	**3**	**4**	**5**
Payment for new Machine (₹)	-70,000					
Tax saving ₹ 4,00,000 x 34%		1,36,000				
Maintenance (₹)		-15,000	-15,000	-15,000	-15,000	-15,000
Tax saving on above @ 34% (₹)		5,100	5,100	5,100	5,100	5,100
Terminal Cash Flow (₹)						1,00,000
Tax on above @ 34% (₹)						-34,000
Cash Flow (₹)	-70,000	1,26,100	-9,900	-9,900	-9,900	56,100
PV Factor	1	0.893	0.797	0.712	0.636	0.567
PV of Cash Flows (₹)	-70,000	1,12,607	-7,890	-7,049	-6,296	31,809

NPV = ₹ 53,181

The second alternative is recommended.

Question 23

Alfa Ltd. desires to acquire a diesel generating set costing ₹ 20 lakh which will be used for a period of 5 years. It is considering two alternatives (i) taking the generating set on lease or (ii) purchasing the asset outright by raising a loan. The company has been offered a lease contract with a lease payment of ₹ 5.2 lakh per annum for five years payable in advance. Company's banker requires the loan to be repaid @ 12% p.a. in 5 equal annual instalments, each installment being due at the beginning of the each year. Tax relevant depreciation of the generator is 20% as per WDV method. At the end of 5th year the generator can be sold at ₹ 2,00,000. Marginal Tax rate of Alfa Ltd. is 30% and its post tax cost of capital is 10%.

Determine:

(a) The Net Advantage of Leasing to Alfa Ltd. and recommend whether leasing is financially viable.

(b) Break Even Lease Rental.

Answer

Workings:

(1) Calculation of annual installment

₹ 20 lakh/ 4.038 = ₹ 4.95 lakh

3.038* + 1 = 4.038

* PVIAF @ 12% for 4 years

(2) Calculation of Present Value (PV) of tax shield or tax benefit on interest on debt : -

Yr.	Installment (₹ lakh)	Opening value (₹ lakh)	Principal payment (₹ lakh)	Interest 12% (₹ lakh)	Tax shield (₹ lakh)	PVF (12%)	PV (₹ lakh)
0	4.95	20.00	4.95	-	-	-	-
1	4.95	15.05	3.15	1.80	0.54	0.893	0.482
2	4.95	11.90	3.52	1.43	0.43	0.797	0.343
3	4.95	8.38	3.95	1.00	0.30	0.712	0.214
4	4.95	4.43	4.43	0.52	0.16	0.635	0.102
							1.141

(3) Calculation of Present Value (PV) of tax shield or tax benefit on depreciation: -

Year	Opening value (₹ lakh)	Depreciation Tax allowance (₹ lakh)	Tax Saving @ 30% (₹ lakh)	PVF (12%)	PV (₹ lakh)
1	20	4.00	1.20	0.893	1.072
2	16	3.20	0.96	0.797	0.765
3	12.80	2.56	0.77	0.712	0.548
4	10.24	2.05	0.62	0.635	0.394
5	8.19	1.64	0.49	0.567	0.278
					3.057

(4) Calculation of Present Value (PV) of lease decision : -

Particulars	Years	Amount (₹ lakh)	PVF @ 12%	PV (₹ lakh)
Lease Rent	0 -4	5.2	4.037	(-) 20.99

Tax relief on lease	1 -5	1.56	3.604	5.62
				(-) 15.37

(5) Calculation of Present Value (PV) of buying decision: -

	(₹ lakh)
Purchase price	- 20.00
Present Value of Tax saving on Interest	1.141
Present Value of tax saving on Depreciation	3.057
Salvage (₹ 2 lakh x 0.567)	1.134
Present Value of buying decision	(-) 14.668

(a) Calculation of Net Advantage of Leasing (NAL):

Particulars	(₹ lakh)
Present Value of lease decision	- 15.37
Less: Present Value of buying decision	- 14.668
Net Advantage of Leasing	- 0.702

Recommendation: Since Net Advantage of Leasing is negative the lease is financially not viable.

(b) Computation of Break Even Lease Rental (BELR)

Benefits from leasing : -

Let us assume the lease rental be L

Cost of the generator ₹ 20 lakh

PV of Tax shield on rentals 3.604 X 0.3 X L= 1.0812 L

Cost of leasing: -

Present Value of lease rentals	4.037 L
Present Value of Tax shield on interest on debt	1.141
Present Value of Tax shield on depreciation	3.057
Present Value of salvage	1.134*
	4.037 L + 5.332

Benefits from leasing = Cost of leasing

20 + 1.0812 L = 4.037 L + 5.332

Thus, L = 14.668/2.9565 = ₹ 4.961 lakh (BELR)

* Short Term Capital Loss on Salvage Value can also be considered.

Alternative Solution

Students may also discount cash flows under both alternatives at after tax cost of debt i.e. 12% (1-0.3) = 8.4%. In such situation the alternative solution will be as follows:

Workings:

(1) Calculation of annual installment

₹ 20 lakh/ 4.038 = ₹ 4.95 lakh

3.038* + 1 = 4.038

* PVIAF @ 12% for 4 years

(2) Calculation of Present Value (PV) of tax shield or tax benefit on interest on debt : -

Yr.	Installment (₹ lakh)	Opening value (₹ lakh)	Principal payment (₹ lakh)	Interest 12% (₹ lakh)	Tax shield (₹ lakh)	PVF (8.4%)	PV (₹ lakh)
0	4.95	20.00	4.95	-	-	-	-
1	4.95	15.05	3.15	1.80	0.54	0.922	0.498
2	4.95	11.90	3.52	1.43	0.43	0.851	0.366
3	4.95	8.38	3.95	1.00	0.30	0.785	0.236
4	4.95	4.43	4.43	0.52	0.16	0.724	0.116
							1.216

(3) Calculation of Present Value (PV) of tax shield or tax benefit on depreciation: -

Year	Opening value (₹ lakh)	Depreciation Tax allowance (₹ lakh)	Tax Saving @ 30% (₹ lakh)	PVF (8.4%)	PV (₹ lakh)
1	20	4.00	1.20	0.922	1.106
2	16	3.20	0.96	0.851	0.817
3	12.80	2.56	0.77	0.785	0.604
4	10.24	2.05	0.62	0.724	0.449
5	8.19	1.64	0.49	0.668	0.327
					3.303

(4) Calculation of Present Value (PV) of lease decision : -

Particulars	Years	Amount (₹ lakh)	PVF @ 8.4%	PV (₹ lakh)
Lease Rent	0 -4	5.2	4.283	(-) 22.27
Tax relief on lease	1 -5	1.56	3.95	6.16
				(-) 16.11

(5) Calculation of Present Value (PV) of buying decision : -

	(₹ lakh)
Purchase price	- 20.00
Present Value of Tax saving on Interest	1.216
Present Value of tax benefit on depreciation	3.303
Salvage (₹ 2 lakh x 0.668)	1.336
Present Value of buying decision	(-) 14.145

(a) Calculation of Net Advantage of Leasing (NAL):

Particulars	(₹ lakh)
Present Value of lease decision	- 16.110
Less: Present Value of buying decision	- 14.145
Net Advantage of Leasing	- 1.965

Recommendation: Since Net Advantage of Leasing is negative the lease is financially not viable.

(b) Computation of Break Even Lease Rental (BELR)

Benefits from leasing : -

Let us assume the lease rental be L

Cost of the generator ₹ 20 lakh

PV of Tax shield on rentals 3.95 X 0.3 X L= 1.185 L

Cost of leasing: -

Present Value of lease rentals	4.283 L
Present Value of Tax shield on interest on debt	1.216
Present Value of Tax shield on depreciation	3.303
Present Value of salvage	1.336*
	4.283 L + 5.855

Benefits from leasing = Cost of leasing

20 + 1.185 L = 4.283 L + 5.855

Thus, L = 14.145/3.098 = ₹ 4.566 lakh (BELR)

* Short Term Capital Loss on Salvage Value can also be considered.

Question 24

R Ltd., requires a machine for 5 years. There are two alternatives either to take it on lease or buy. The company is reluctant to invest initial amount for the project and approaches their bankers. Bankers are ready to finance 100% of its initial required amount at 15% rate of interest for any of the alternatives.

Under lease option, upfront Security deposit of ₹ 5,00,000/- is payable to lessor which is equal to cost of machine. Out of which, 40% shall be adjusted equally against annual lease rent. At the end of life of the machine, expected scrap value will be at book value after providing, depreciation @ 20% on written down value basis.

Under buying option, loan repayment is in equal annual installments of principal amount, which is equal to annual lease rent charges. However in case of bank finance for lease option, repayment of principal amount equal to lease rent is adjusted every year, and the balance at the end of 5th year.

Assume Income tax rate is 30%, interest is payable at the end of every year and discount rate is @ 15% p.a. The following discounting factors are given:

Year	*1*	*2*	*3*	*4*	*5*
Factor	*0.8696*	*0.7562*	*0.6576*	*0.5718*	*0.4972*

Which option would you suggest on the basis of net present values?

Answer

Cash outflow under borrow and buy option

Working Notes:

1. Calculation of Interest Amount

Year	Repayment of Principal (₹)	Principal Outstanding (₹)	Interest (₹)	Closing Balance (₹)
1	1,00,000	5,00,000	75,000	4,00,000
2	1,00,000	4,00,000	60,000	3,00,000
3	1,00,000	3,00,000	45,000	2,00,000
4	1,00,000	2,00,000	30,000	1,00,000
5	1,00,000	1,00,000	15,000	-

2. Depreciation Schedule

Year	Opening Balance (₹)	Depreciation (₹)	Closing Balance (₹)
1	5,00,000	1,00,000	4,00,000

2	4,00,000	80,000	3,20,000
3	3,20,000	64,000	2,56,000
4	2,56,000	51,200	2,04,800
5	2,04,800	40,960	1,63,840

3. Tax Benefit on Depreciation and Interest

Year	Interest (₹)	Depreciation (₹)	Total (₹)	Tax Benefit @ 30% (₹)
1	75,000	1,00,000	1,75,000	52,500
2	60,000	80,000	1,40,000	42,000
3	45,000	64,000	1,09,000	32,700
4	30,000	51,200	81,200	24,360
5	15,000	40,960	55,960	16,788

PV of Cash Outflow in Borrow and Buying Option

Year	Cash outflow (₹)	Tax Benefit (₹)	Net Cash Outflow (₹)	PVF@15%	PV (₹)
1	1,75,000	52,500	1,22,500	0.8696	1,06,526
2	1,60,000	42,000	1,18,000	0.7562	89,232
3	1,45,000	32,700	1,12,300	0.6576	73,848
4	1,30,000	24,360	1,05,640	0.5718	60,405
5	1,15,000	16,788	98,212	0.4972	48,831
5	(1,63,840)		(1,63,840)	0.4972	(81,461)
					2,97,381

Cash outflow under borrow and lease option

Cash payment to Lessor/ Tax Benefits on Lease Payment (Annual Lease Rent = ₹ 1,00,000)

Year	Net Lease Rent (₹)	Security Deposit (₹)	Tax Benefit on Gross Lease Rent (₹)	Net Cash Outflow (₹)
1	60,000*		30,000	30,000
2	60,000		30,000	30,000
3	60,000		30,000	30,000
4	60,000		30,000	30,000
5	60,000	(3,00,000)	30,000	(2,70,000)

* ₹ 1,00,000 – ₹ 40,000 = ₹ 60,000

Cash payment to Bank/ Tax Benefits on Interest Payment

Year	Principal Payment (₹)	Interest (₹)	Total (₹)	Tax Benefit on Interest (₹)	Net Outflow (₹)
1	40,000	75,000	1,15,000	22,500	92,500
2	40,000	69,000	1,09,000	20,700	88,300
3	40,000	63,000	1,03,000	18,900	84,100
4	40,000	57,000	97,000	17,100	79,900
5	3,40,000	51,000	3,91,000	15,300	3,75,700

PV of Cash Outflow in Borrow and Leasing Option

Year	Cash outflow to Bank (₹)	Cash Outflow under Lease (₹)	Total (₹)	PVF@15%	PV (₹)
1	92,500	30,000	1,22,500	0.8696	1,06,526
2	88,300	30,000	1,18,300	0.7562	89,458
3	84,100	30,000	1,14,100	0.6576	75,032
4	79,900	30,000	1,09,900	0.5718	62,841
5	3,75,700	(2,70,000)	1,05,700	0.4972	52,554
					3,86,411

Since PV of cash outflow is least in case of borrow and buying option it should be opted for.

4

Dividend Decisions

BASIC CONCEPTS AND FORMULAE

1. Introduction

Dividend refers to that portion of profit (after tax) which is distributed among the owners/shareholders of the firm and the profit which is not distributed is known as retained earnings. The dividend policy of the company should aim at achieving the objective of the company to maximise shareholder's wealth.

2. Practical Considerations in Dividend Policy

The practical considerations in dividend policy of a company are as below:

(a) Financial Needs of the Company;

(b) Constraints on Paying Dividends- Such as legal, liquidity, access to capital market and investment opportunities;

(c) Desire of Shareholders; and

(d) Stability of Dividends.

3. Forms of Dividend

Dividends can be divided into the following forms:

(i) Cash Dividend; and

(ii) Stock Dividend.

4. Theories on Dividend Policies

(a) Traditional Position: Expounded by Graham and Dodd, the stock market places considerably more weight on dividends than on retained earnings. Expressed quantitatively in the following valuation model:

$P = m (D + E/3)$

If E is replaced by (D+R) then,

$P = m (4D/3) + m (R/3)$

(b) Walter Approach: Given by Prof. James E. Walter, the approach focuses on how dividends can be used to maximise the wealth position of equity holders.

The relationship between dividend and share price on the basis of Walter's formula is shown below:

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

Where,

Vc = Market value of the ordinary shares of the company

Ra = Return on internal retention, i.e., the rate company earns on retained profits

Rc = Cost of Capital

E = Earnings per share

D = Dividend per share.

(c) Gordon Growth Model: This theory also contends that dividends are relevant. This model explicitly relates the market value of the firm to dividend policy. The relationship between dividend and share price on the basis of Gordon's formula is shown as:

$$V_E = \left[\frac{d_o\ (1+g)}{k_e - g}\right]$$

Where,

V_E = Market price per share (ex-dividend)

d_o = Current year dividend

g = Constant annual growth rate of dividends

K_e = Cost of equity capital (expected rate of return)

(d) Modigliani and Miller (MM) Hypothesis: This hypothesis states that under conditions of perfect capital markets, rational investors, absence of tax discrimination between dividend income and capital appreciation, given the firm's investment policy, its dividend policy may have no influence on the market price of shares. MM Hypothesis is primarily based on the arbitrage argument. Market price of a share after dividend declared on the basis of MM model is shown below:

$$P_o = \frac{P_1 + D_1}{1 + K_e}$$

Where,

P_o = The prevailing market price of a share

K_e = The cost of equity capital

D_1 = Dividend to be received at the end of period one

P_1 = Market price of a share at the end of period one.

If the firm were to finance all investment proposals, the total amount raised through new shares will be ascertained with the help of the following formula:

$$\Delta N = \frac{I - (E - nD_1)}{P_1}$$

Question 1

Write short note on effect of a Government imposed freeze on dividends on stock prices and the volume of capital investment in the background of Miller-Modigliani (MM) theory on dividend policy.

Answer

Effect of a Government Imposed Freeze on Dividends on Stock Prices and the Volume of Capital Investment in the Background of (Miller-Modigliani) (MM) Theory on Dividend Policy

According to MM theory, under a perfect market situation, the dividend of a firm is irrelevant as it does not affect the value of firm. Thus under MM's theory the government imposed freeze on dividend should make no difference on stock prices. Firms if do not pay dividends will have higher retained earnings and will either reduce the volume of new stock issues, repurchase more stock from market or simply invest extra cash in marketable securities. In all the above cases, the loss by investors of cash dividends will be made up in the form of capital gains. Whether the Government imposed freeze on dividends have effect on volume of capital investment in the background of MM theory on dividend policy have two arguments. One argument is that if the firms keep their investment decision separate from their dividend and financing decision then the freeze on dividend by the Government will have no effect on volume of capital investment. If the freeze restricts dividends the firm can repurchase shares or invest excess cash in marketable securities e.g. in shares of other companies. Other argument is that the firms do not separate their investment decision from dividend and financing decisions. They prefer to make investment from internal funds. In this case, the freeze of dividend by government could lead to increased real investment.

Question 2

Write short note on factors determining the dividend policy of a company.

Answer

Factors Determining the Dividend Policy of a Company

(i) Liquidity: In order to pay dividends, a company will require access to cash. Even very profitable companies might sometimes have difficulty in paying dividends if resources are tied up in other forms of assets.

(ii) Repayment of debt: Dividend payout may be made difficult if debt is scheduled for repayment.

(iii) Stability of Profits: Other things being equal, a company with stable profits is more likely to pay out a higher percentage of earnings than a company with fluctuating profits.

(iv) Control: The use of retained earnings to finance new projects preserves the company's ownership and control. This can be advantageous in firms where the present disposition of shareholding is of importance.

(v) Legal consideration: The legal provisions lay down boundaries within which a company can declare dividends.

(vi) Likely effect of the declaration and quantum of dividend on market prices.

(vii) Tax considerations and

(viii) Others such as dividend policies adopted by units similarly placed in the industry, management attitude on dilution of existing control over the shares, fear of being branded as incompetent or inefficient, conservative policy Vs non-aggressive one.

(ix) Inflation: Inflation must be taken into account when a firm establishes its dividend policy.

Question 3

What are the determinants of Dividend Policy?

Answer

Determinants of dividend policy

Many factors determine the dividend policy of a company. Some of the factors determining the dividend policy are:

(i) **Dividend Payout ratio:** A certain share of earnings to be distributed as dividend has to be worked out. This involves the decision to pay out or to retain. The payment of dividends results in the reduction of cash and, therefore, depletion of assets. In order to maintain the desired level of assets as well as to finance the investment opportunities, the company has to decide upon the payout ratio. D/P ratio should be determined with two bold objectives – maximising the wealth of the firms' owners and providing sufficient funds to finance growth.

(ii) **Stability of Dividends:** Generally investors favour a stable dividend policy. The policy should be consistent and there should be a certain minimum dividend that should be paid

regularly. The liability can take any form, namely, constant dividend per share; stable D/P ratio and constant dividend per share plus something extra. Because this entails – the investor's desire for current income, it contains the information content about the profitability or efficient working of the company; creating interest for institutional investor's etc.

(iii) **Legal, Contractual and Internal Constraints and Restriction:** Legal and Contractual requirements have to be followed. All requirements of Companies Act, SEBI guidelines, capital impairment guidelines, net profit and insolvency etc., have to be kept in mind while declaring dividend. For example, insolvent firm is prohibited from paying dividends; before paying dividend accumulated losses have to be set off, however, the dividends can be paid out of current or previous years' profit. Also there may be some contractual requirements which are to be honoured. Maintenance of certain debt equity ratio may be such requirements. In addition, there may be certain internal constraints which are unique to the firm concerned. There may be growth prospects, financial requirements, availability of funds, earning stability and control etc.

(iv) **Owner's Considerations:** This may include the tax status of shareholders, their opportunities for investment dilution of ownership etc.

(v) **Capital Market Conditions and Inflation:** Capital market conditions and rate of inflation also play a dominant role in determining the dividend policy. The extent to which a firm has access to capital market, also affects the dividend policy. A firm having easy access to capital market will follow a liberal dividend policy as compared to the firm having limited access. Sometime dividends are paid to keep the firms 'eligible' for certain things in the capital market. In inflation, rising prices eat into the value of money of investors which they are receiving as dividends. Good companies will try to compensate for rate of inflation by paying higher dividends. Replacement decision of the companies also affects the dividend policy.

Question 4

How tax considerations are relevant in the context of a dividend decision of a company?

Answer

Dividend Decision and Tax Considerations

Traditional theories might have said that distribution of dividend being from after-tax profits, tax considerations do not matter in the hands of the payer-company. However, with the arrival of Corporate Dividend Tax on the scene in India, the position has changed. Since there is a clear levy of such tax with related surcharges, companies have a consequential cash outflow due to their dividend decisions which has to be dealt with as and when the decision is taken.

In the hands of the investors too, the position has changed with total exemption from tax being made available to the receiving-investors. In fact, it can be said that such exemption from tax

has made the equity investment and the investment in Mutual Fund Schemes very attractive in the market.

Broadly speaking Tax consideration has the following impacts on the dividend decision of a company:

Before Introduction of Dividend Tax: Earlier, the dividend was taxable in the hands of investor. In this case the shareholders of the company are corporates or individuals who are in higher tax slab; it is preferable to distribute lower dividend or no dividend. Because dividend will be taxable in the hands of the shareholder @ 30% plus surcharges while long term capital gain is taxable @ 10%. On the other hand, if most of the shareholders are the people who are in no tax zone, then it is preferable to distribute more dividends.

We can conclude that before distributing dividend, company should look at the shareholding pattern.

After Introduction of Dividend Tax: Dividend tax is payable @ 12.5% - surcharge + education cess, which is effectively near to 14%. Now if the company were to distribute dividend, shareholder will indirectly bear a tax burden of 14% on their income. On the other hand, if the company were to provide return to shareholder in the form of appreciation in market price – by way of Bonus shares – then shareholder will have a reduced tax burden. For securities on which STT is payable, short term capital gain is taxable @ 10% while long term capital gain is totally exempt from tax.

Therefore, we can conclude that if the company pays more and more dividend (while it still have reinvestment opportunities) then to get same after tax return shareholders will expect more before tax return and this will result in lower market price per share.

Question 5

According to the position taken by Miller and Modigliani, dividend decision does not influence value. Please state briefly any two reasons, why companies should declare dividend and not ignore it.

Answer

The position taken by M & M regarding dividend does not take into account certain practical realities is the market place. Companies are compelled to declare annual cash dividends for reasons cited below:-

(i) Shareholders expect annual reward for their investment as they require cash for meeting needs of personal consumption.

(ii) Tax considerations sometimes may be relevant. For example, dividend might be tax free receipt, whereas some part of capital gains may be taxable.

(iii) Other forms of investment such as bank deposits, bonds etc, fetch cash returns periodically, investors will shun companies which do not pay appropriate dividend.

(iv) In certain situations, there could be penalties for non-declaration of dividend, e.g. tax on undistributed profits of certain companies.

Question 6

Write a short note on assumptions of Modigliani & Miller Hypothesis.

Answer

The Modigliani & Miller hypothesis is based on the following assumptions:

(i) The firm operates in perfect capital markets in which all investors are rational and information is freely available to all.

(ii) There are no taxes. Alternatively, there are no differences in the tax rates applicable to capital gains and dividends.

(iii) The firm has a fixed investment policy.

(iv) There are no floatation or transaction costs.

(v) Risk of uncertainty does not exist. Investors are able to forecast future prices and dividends with certainty, and

(vi) one discount rate is appropriate for all securities and all time periods. Thus, $r = k = k_t$ for all t.

Question 7

Write a short note on Traditional & Walter Approach to Dividend Policy

Answer

According to the traditional position expounded by Graham and Dodd, the stock market places considerably more weight on dividends than on retained earnings. For them, the stock market is overwhelmingly in favour of liberal dividends as against niggardly dividends. Their view is expressed quantitatively in the following valuation model:

$$P = m (D + E/3)$$

Where,

P = Market Price per share

D = Dividend per share

E = Earnings per share

m = a Multiplier.

As per this model, in the valuation of shares the weight attached to dividends is equal to four times the weight attached to retained earnings. In the model prescribed, E is replaced by (D+R) so that

$$P = m \{D + (D+R)/3\}$$

$$= m (4D/3) + m (R/3)$$

The weights provided by Graham and Dodd are based on their subjective judgments and not

derived from objective empirical analysis. Notwithstanding the subjectivity of these weights, the major contention of the traditional position is that a liberal payout policy has a favourable impact on stock prices.

The formula given by Prof. James E. Walter shows how dividend can be used to maximise the wealth position of equity holders. He argues that in the long run, share prices reflect only the present value of expected dividends. Retentions influence stock prices only through their effect on further dividends. It can envisage different possible market prices in different situations and considers internal rate of return, market capitalisation rate and dividend payout ratio in the determination of market value of shares.

Walter Model focuses on two factors which influences Market Price

(i) Dividend Per Share.

(ii) Relationship between Internal Rate of Return (IRR) on retained earnings and market expectations (cost of capital).

If IRR > Cost of Capital, Share price can be even higher in spite of low dividend. The relationship between dividend and share price on the basis of Walter's formula is shown below:

$$Vc = \frac{D + \frac{R_a}{R_c}(E-D)}{R_c}$$

Where,

V_c = Market value of the ordinary shares of the company

R_a = Return on internal retention, i.e., the rate company earns on retained profits

R_c = Cost of Capital

E = Earnings per share

D = Dividend per share.

Question 8

Sahu & Co. earns ₹ 6 per share having capitalisation rate of 10 per cent and has a return on investment at the rate of 20 per cent. According to Walter's model, what should be the price per share at 30 per cent dividend payout ratio? Is this the optimum payout ratio as per Walter?

Answer

Walter Model is $V_c = \frac{D + \frac{R_a}{R_c}(E-D)}{R_c}$

Where:

V_c = Market value of the share

R_a = Return on Retained earnings

R_c = Capitalisation Rate

E = Earning per share

D = Dividend per share

Hence, if Walter model is applied

Market Value of the Share $= \frac{1.80 + \frac{.20}{.10}(6 - 1.80)}{0.10}$ $P = \frac{1.80 + \frac{.20}{.10}(4.20)}{0.10}$

$$P = \frac{1.80 + 8.40}{0.10} \quad P = ₹\ 102$$

This is not the optimum payout ratio because $R_a > R_c$ and therefore V_c can further go up if payout ratio is reduced.

Question 9

The following figures are collected from the annual report of XYZ Ltd.:

	₹
Net Profit	*30 lakhs*
Outstanding 12% preference shares	*100 lakhs*
No. of equity shares	*3 lakhs*
Return on Investment	*20%*

What should be the approximate dividend pay-out ratio so as to keep the share price at ₹ 42 by using Walter model?

Answer

	₹ *in lakhs*
Net Profit	*30*
Less: Preference dividend	*12*
Earning for equity shareholders	*18*
Therefore earning per share	*₹ 18 lakhs / 3 lakhs = ₹ 6.00*

Cost of capital i.e. (k_e)

(Assumed) 16%*

Let, the dividend payout ratio be X and so the share price will be:

$$P = \frac{D}{K_e} + \frac{\frac{r(E-D)}{K_e}}{K_e}$$

Here D = 6x; E = ₹ 6; r = 0.20 and K_e = 0.16 and P = ₹ 42

$$\text{Hence } ₹\ 42 = \frac{6x}{0.16} + \frac{0.2(6-6x)}{0.16 \times 0.16}$$

Or, ₹ 42 = 37.50X + 46.875 (1 –x)

= 9.375x = 4.875

x = 0.52

So, the required dividend payout ratio will be = 52%

*Students can assume any percentage other than 16%.

Question 10

Goldi locks Ltd. was started a year back with equity capital of ₹ 40 lakhs. The other details are as under:

Earnings of the company	*₹ 4,00,000*
Price Earnings ratio	*12.5*
Dividend paid	*₹ 3,20,000*
Number of Shares	*40,000*

Find the current market price of the share. Use Walter's Model.

Find whether the company's D/ P ratio is optimal, use Walter's formula.

Answer

Goldilocks Ltd.

(i) Walter's model is given by

$$P = \frac{D + (E-D)(r/K_e)}{K_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹ 10

D = Dividend per share = ₹ 8

r = Return earned on investment = 10%

K_e = Cost of equity capital = 1/12.5 = 8%

$$P = \frac{8+(10-8)\times\frac{0.10}{0.08}}{0.08} = \frac{8+2\times\frac{0.10}{0.08}}{0.08}$$

= ₹ 131.25

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$\frac{0+(10-0)\frac{0.10}{0.08}}{0.08} = ₹156.25$$

Question 11

The following information pertains to M/s XY Ltd.

Earnings of the Company	*₹ 5,00,000*
Dividend Payout ratio	*60%*
No. of shares outstanding	*1,00,000*
Equity capitalization rate	*12%*
Rate of return on investment	*15%*

(i) What would be the market value per share as per Walter's model?

(ii) What is the optimum dividend payout ratio according to Walter's model and the market value of Company's share at that payout ratio?

Answer

(a) M/s XY Ltd.

(i) Walter's model is given by

$$P = \frac{D+(E-D)(r/k_e)}{K_e}$$

Where,

P = Market price per share.

E = Earnings per share = ₹5

D = Dividend per share = ₹3

r = Return earned on investment = 15%

K_e = Cost of equity capital = 12%

$$P = \frac{3+(5-3)\times\frac{0.15}{0.12}}{0.12} = \frac{3+2\times\frac{0.15}{0.12}}{0.12}$$

= ₹45.83

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is nil.

So, at a pay-out ratio of zero, the market value of the company's share will be:

$$\frac{0+(5-0)\frac{0.15}{0.12}}{0.12} = \text{Rs.}52.08$$

Question 12

The following information is supplied to you:

	₹
Total Earnings	*2,00,000*
No. of equity shares (of ₹100 each)	*20,000*
Dividend paid	*1,50,000*
Price/Earning ratio	*12.5*

(i) Ascertain whether the company is the following an optimal dividend policy.

(ii) Find out what should be the P/E ratio at which the dividend policy will have no effect on the value of the share.

(iii) Will your decision change, if the P/E ratio is 8 instead of 12.5?

Answer

(i) The EPS of the firm is ₹ 10 (i.e., ₹ 2,00,000/20,000). The P/E Ratio is given at 12.5 and the cost of capital, k_e, may be taken at the inverse of P/E ratio. Therefore, k_e is 8 (i.e., 1/12.5). The firm is distributing total dividends of ₹1,50,000 among 20,000 shares, giving a dividend per share of ₹7.50. the value of the share as per Walter's model may be found as follows:

$$P = \frac{D}{K_e} + \frac{(r/K_e)(E-D)}{K_e}$$

$$= \frac{7.50}{.08} + \frac{(.10/.08)(10-7.5)}{.08}$$

= ₹132.81

The firm has a dividend payout of 75% (i.e., ₹ 1,50,000) out of total earnings of ₹ 2,00,000. since, the rate of return of the firm, r, is 10% and it is more than the k_e of 8%, therefore, by distributing 75% of earnings, the firm is not following an optimal dividend policy. The optimal dividend policy for the firm would be to pay zero dividend and in such a situation, the market price would be

$$P = \frac{D}{k_e} + \frac{(r/K_e)(E-D)}{K_e}$$

$$= \frac{0}{.08} + \frac{(.10/.80)(10-0)}{.08}$$

= ₹156.25

So, theoretically the market price of the share can be increased by adopting a zero payout.

(ii) The P/E ratio at which the dividend policy will have no effect on the value of the share is such at which the k_e would be equal to the rate of return, r, of the firm. The K_e would be 10% (=r) at the P/E ratio of 10. Therefore, at the P/E ratio of 10, the dividend policy would have no effect on the value of the share.

(iii) If the P/E is 8 instead of 12.5, then the ke which is the inverse of P/E ratio, would be 12.5 and in such a situation k_e > r and the market price, as per Walter's model would be

$$P = \frac{D}{K_e} + \frac{(r/K_e)(E-D)}{K_e}$$

$$= \frac{7.50}{.125} + \frac{(.1/.125)(10-7.5)}{.125}$$

= ₹ 76

The optimal dividend policy for the firm would be to pay 100% dividend and market price of share in such case would be

$$P = \frac{10.0}{0.125} + \frac{(0.1/0.125)(10-10)}{0.125}$$

= ₹ 80

Question 13

The following information relates to Maya Ltd:

Earnings of the company	*₹ 10,00,000*
Dividend payout ratio	*60%*
No. of Shares outstanding	*2,00,000*
Rate of return on investment	*15%*
Equity capitalization rate	*12%*

(i) What would be the market value per share as per Walter's model ?

(ii) What is the optimum dividend payout ratio according to Walter's model and the market value of company's share at that payout ratio?

Answer

MAYA Ltd.

(i) Walter's model is given by –

$$p = \frac{D + (E - D)(\gamma / k_e)}{k_e}$$

Where, p = Market price per share,

E = Earning per share – ₹ 5

D = Dividend per share – ₹ 3

γ = Return earned on investment – 15%

k_e = Cost of equity capital – 12%

$$\therefore p = \frac{3 + (5-3) \times \frac{0.15}{0.12}}{0.12} = \frac{3 + 2 \times \frac{.15}{.12}}{.12} = ₹\ 45.83$$

(ii) According to Walter's model when the return on investment is more than the cost of equity capital, the price per share increases as the dividend pay-out ratio decreases. Hence, the optimum dividend pay-out ratio in this case is Nil. So, at a payout ratio of zero, the market value of the company's share will be:-

$$\frac{0 + (5-0) \times \frac{.15}{.12}}{0.12} = ₹\ 52.08$$

Question 14

Subhash & Co. earns ₹ 8 per share having capitalisation rate of 10 per cent and has a return on investment at the rate of 20 per cent. According to Walter's model, what should be the price per share at 25 per cent dividend payout ratio? Is this the optimum payout ratio as per Walter's Model?

Answer

Walter Model is as follows:-

$$V_e = \frac{D + \frac{R_a}{R_c}(E-D)}{R_c}$$

V_c = Market value of the share
R_a = Return on retained earnings
R_e = Capitalisation rate
E = Earnings per share
D = Dividend per share

Hence, if Walter model is applied-

Market value of the share $V_C = \frac{₹\,2.00 + \frac{0.20}{0.10}(₹\,8.00 - ₹\,2.00)}{0.10}$

or

$$V_C = \frac{₹\,2.00 + \frac{0.20}{0.10}(₹\,6.00)}{0.10}$$

or

$$V_C = \frac{₹\,2.00 + ₹\,2.00}{0.10} = \frac{₹14.00}{0.10} = ₹140$$

This is not the optimum payout ratio because $R_a > R_c$ and therefore V_e can further group if payout ratio is reduced.

Question 15

The earnings per share of a company is ₹ 10 and the rate of capitalisation applicable to it is 10 per cent. The company has three options of paying dividend i.e.(i) 50%,(ii)75% and (iii)100%. Calculate the market price of the share as per Walter's model if it can earn a return of (a) 15, (b) 10 and (c) 5 per cent on its retained earnings.

Answer

$$P = \frac{D + \frac{r}{ke}(E - D)}{ke}$$

Where

P= Price of Share

R= Rate of Earning

Ke = Rate of Capitalisation or Cost of Equity

		(i)	(ii)	(iii)
		DP ratio 50%	DP ratio 75%	DP ratio 100%
(a)	Price of Share if r =15%	$\frac{5+\left(\frac{.15}{.10}\right)(10-5)}{.10}$	$\frac{7.5+\left(\frac{.15}{.10}\right)(10-7.5)}{.10}$	$\frac{10+\left(\frac{.15}{.10}\right)(10-10)}{.10}$
		$\frac{12.5}{.10}$	$\frac{11.25}{.10}$	$\frac{10}{.10}$
		₹ 125	₹ 112.5	₹ 100
(b)	Price of Share if r = 10%	$\frac{5+\left(\frac{.10}{.10}\right)(10-5)}{.10}$	$\frac{7.5+\left(\frac{.10}{.10}\right)(10-7.5)}{.10}$	$\frac{10+\left(\frac{.10}{.10}\right)(10-10)}{.10}$
		$\frac{10}{.10} =$ ₹ 100	$\frac{10}{.1} = 100$	$\frac{10}{.1} =$ ₹ 100
(c)	Price of Share if r = 5%	$\frac{5+\left(\frac{.05}{.10}\right)(10-5)}{.10}$	$\frac{7.5+\left(\frac{.05}{.10}\right)(10-7.5)}{.10}$	$\frac{10+\left(\frac{.05}{.10}\right)(10-10)}{.10}$
		$\frac{7.5}{.10} =$ ₹ 75	$\frac{8.75}{.10} = 87.5$	$\frac{10}{.1} =$ ₹ 100

Question 16

X Ltd has an internal rate of return @ 20%. It has declared dividend @ 18% on its equity shares, having face value of ₹ 10 each. The payout ratio is 36% and Price Earning Ratio is

7.25. Find the cost of equity according to Walter's Model and hence determine the limiting value of its shares in case the payout ratio is varied as per the said model.

Answer

Internal Rate of Return (r) = 0.20

Dividend (D) = 1.80

Earnings Per share (E) = $\frac{1.80}{0.36} = 5$

Price of share (P) = 5 x 7.25 = 36.25

$$P = \frac{D + \frac{r}{k_e}(E - D)}{K_e}$$

$$36.25 = \frac{1.80 + \frac{0.20(5 - 1.80)}{ke}}{k_e}$$

$$36.25\ K_e = 1.80 + \frac{0.20(3.20)}{K_e}$$

$$36.25\ K_e = 1.80 + \frac{0.64}{K_e}$$

$$36.25\ K_e^2 = 1.80\ K_e + 0.64$$

$$K_e = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-1.80 \pm \sqrt{(1.80)^2 - 4 \times (-36.25) \times 0.64}}{2 \times (-36.25)}$$

$$= \frac{-1.80 \pm \sqrt{3.24 + 92.80}}{-72.50}$$

$$K_e = 16\%$$

Alternatively, it can also be calculated as follows:

$36.25\ K_e^2 - 1.80\ K_e - 0.64 = 0$

Taking 36.25 common

$K_e^2 - 0.05\ K_e - 0.0176 = 0$

$K_e^2 - 0.16\ K_e + 0.11\ K_e - 0.0176 = 0$

$K_e\ (K_e - 0.16) + 0.11\ (K_e - 0.16) = 0$

$(K_e + 0.11)\ (K_e - 0.16) = 0$

Since $K_e = -0.11$ is not possible, the possible answer shall be $K_e = 0.16$ i.e. 16%.

Since the firm is a growing firm, then 100% payout ratio will give limiting value of share

$$P = \frac{5.00 + \frac{0.20(5-5)}{0.16}}{0.16}$$

$$= \frac{5.00}{0.16}$$

= ₹ 31.25

Thus limiting value is ₹ 31.25

Alternatively, 0% payout ratio gives limiting value of shares as follows:

$$P = \frac{0 + \frac{0.20(5-0)}{0.16}}{0.16}$$

$$= \frac{1}{(0.16)^2}$$

= ₹ 39.06

Thus, limiting value is ₹ 39.06

Question 17

The following information is collected from the annual reports of J Ltd:

Profit before tax	*₹ 2.50 crore*
Tax rate	*40 percent*
Retention ratio	*40 percent*
Number of outstanding shares	*50,00,000*
Equity capitalization rate	*12 percent*
Rate of return on investment	*15 percent*

What should be the market price per share according to Gordon's model of dividend policy?

Answer

Gordon's Formula

$P_0 = \frac{E(1-b)}{K-br}$

P_0 = Market price per share

E = Earnings per share (₹ 1.50crore/ 50,00,000) = ₹ 3

K = Cost of Capital = 12%

b = Retention Ratio (%) = 40%

r = IRR = 15%

br = Growth Rate (0.40X15%) = 6%

$P_0 = \frac{3(1-0.40)}{0.12-0.06}$

$= \frac{1.80}{0.12-0.06} = \frac{₹1.80}{0.06}$

= ₹ 30.00

Question 18

Mr. A is contemplating purchase of 1,000 equity shares of a Company. His expectation of return is 10% before tax by way of dividend with an annual growth of 5%. The Company's last dividend was ₹ 2 per share. Even as he is contemplating, Mr. A suddenly finds, due to a Budget announcement Dividends have been exempted from Tax in the hands of the recipients. But the imposition of Dividend Distribution Tax on the Company is likely to lead to a fall in dividend of 20 paise per share. A's marginal tax rate is 30%.

Required:

Calculate what should be Mr. A's estimates of the price per share before and after the Budget announcement?

Answer

The formula for determining value of a share based on expected dividend is:

$P_0 = \frac{D_0 (1+g)}{(k-g)}$

Where

P_0 = Price (or value) per share

D_0 = Dividend per share

g = Growth rate expected in dividend

k = Expected rate of return

Hence,

Price estimate before budget announcement:

$$P_0 = \frac{2 \times (1 + 0.05)}{(0.10 - 0.05)} = ₹ 42.00$$

Price estimate after budget announcement:

$$P_0 = \frac{1.80 \times (1.05)}{(0.07 - 0.05)} = ₹ 94.50 \text{ or } P_0 = \frac{2.00 \times 1.05 - 0.20}{(0.07 - 0.05)} = ₹ 95.00$$

Question 19

A firm had been paid dividend at ₹2 per share last year. The estimated growth of the dividends from the company is estimated to be 5% p.a. Determine the estimated market price of the equity share if the estimated growth rate of dividends (i) rises to 8%, and (ii) falls to 3%. Also find out the present market price of the share, given that the required rate of return of the equity investors is 15.5%.

Answer

In this case the company has paid dividend of ₹2 per share during the last year. The growth rate (g) is 5%. Then, the current year dividend (D_1) with the expected growth rate of 5% will be ₹ 2.10

The share price is = $P_o = \frac{D_1}{K_e - g}$

$$= \frac{₹ 2.10}{0.155 - 0.05}$$

$$= ₹ 20$$

In case the growth rate rises to 8% then the dividend for the current year. (D_1) would be ₹ 2.16 and market price would be-

$$= \frac{₹ 2.16}{0.155 - 0.08}$$

$$= ₹ 28.80$$

In case growth rate falls to 3% then the dividend for the current year (D_1) would be ₹ 2.06 and market price would be-

$$= \frac{₹ 2.06}{0.155 - 0.03}$$

= ₹16.48

So, the market price of the share is expected to vary in response to change in expected growth rate is dividends.

Question 20

The following information is given for QB Ltd.

Earning per share	*₹ 12*
Dividend per share	*₹ 3*
Cost of capital	*18%*
Internal Rate of Return on investment	*22%*
Retention Ratio	*40%*

Calculate the market price per share using

(i) Gordon's formula

(ii) Walter's formula

Answer

(i) Gordon's Formula

$$P_0 = \frac{E(1-b)}{K-br}$$

P_0 = Present value of Market price per share

E = Earnings per share

K = Cost of Capital

b = Retention Ratio (%)

r = IRR

br = Growth Rate

$$P_0 = \frac{₹12(1-0.40)}{0.18-(0.40\times 0.22)}$$

$$= \frac{₹\,7.20}{0.18-0.088} = \frac{₹\ 7.20}{0.092}$$

= ₹ 78.26

(ii) Walter's Formula

$$V_c = \frac{D+\frac{R_a}{R_c}(E-D)}{R_c}$$

V_c = Market Price

D = Dividend per share

R_a = IRR

R_c = Cost of Capital

E = Earnings per share

$$= \frac{₹3 + \frac{0.22}{0.18}(₹12 - ₹3)}{0.18}$$

$$= \frac{₹3 + ₹11}{0.18}$$

$$= ₹ 77.77$$

Alternative Solution- As per the data provided in the question the retention ratio comes out to be 75% (as computed below) though mentioned in the question as 40%

(i) Gordon's Formula

$$\text{Retention Ratio} = \frac{\text{EPS} - \text{Dividend Per Share}}{\text{EPS}} = \frac{₹12 - ₹3}{₹12} = 0.75 \text{ i.e. } 75\%$$

With the retention ratio of 75% market price per share using the Gordons Formula shall be as follows

$$P_0 = \frac{E(1-b)}{K - br}$$

P_0 = Present value of Market price per share

E = Earnings per share

K = Cost of Capital

b = Retention Ratio (%)

r = IRR

br = Growth Rate

$$P_0 = \frac{12(1 - 0.75)}{0.18 - (0.75 \times 0.22)}$$

$$= \frac{3}{0.18 - 0.165} = ₹ 200$$

(ii) Walter's Formula

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

V_c = Market Price

D = Dividend per share

R_a = IRR

R_c = Cost of Capital

E = Earnings per share

$$= \frac{₹3 + \frac{0.22}{0.18}(₹12 - ₹3)}{0.18}$$

$$= \frac{₹3 + ₹11}{0.18} = ₹77.77$$

Question 21

X Ltd., has 8 lakhs equity shares outstanding at the beginning of the year. The current market price per share is ₹ 120. The Board of Directors of the company is contemplating ₹ 6.4 per share as dividend. The rate of capitalisation, appropriate to the risk-class to which the company belongs, is 9.6%:

(i) Based on M-M Approach, calculate the market price of the share of the company, when the dividend is – (a) declared; and (b) not declared.

(ii) How many new shares are to be issued by the company, if the company desires to fund an investment budget of ₹ 3.20 crores by the end of the year assuming net income for the year will be ₹ 1.60 crores?

Answer

Modigliani and Miller (M-M) – Dividend Irrelevancy Model:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

Where,

P_o = Existing market price per share i.e. ₹ 120

P_1 = Market price of share at the year-end (to be determined)

D_1 = Contemplated dividend per share i.e. ₹ 6.4

K_e = Capitalisation rate i.e. 9.6%.

(i) (a) Calculation of share price when dividend is declared:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$120 = \frac{P_1 + 6.4}{1 + 0.096}$$

$120 \times 1.096 = P_1 + 6.4$

$P_1 = 120 \times 1.096 - 6.4$

$= 125.12$

(b) Calculation of share price when dividend is not declared:

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

$$120 = \frac{P_1 + 0}{1 + 0.096}$$

$120 \times 1.096 = P_1 + 0$

$P_1 = 131.52$

(ii) Calculation of No. of shares to be issued:

(₹ in lakhs)

Particulars	*If dividend declared*	*If dividend not declared*
Net Income	160	160
Less: Dividend paid	51.20	------
Retained earnings	108.80	160
Investment budget	320	320
Amount to be raised by issue of new shares (i)	211.20	160
Market price per share (ii)	125.12	131.52
No. of new shares to be issued (ii)	1,68,797.95	1,21,654.50
Or say	1,68,798	1,21,655

Question 22

ABC Ltd. has 50,000 outstanding shares. The current market price per share is ₹ 100 each. It hopes to make a net income of ₹ 5,00,000 at the end of current year. The Company's Board is considering a dividend of ₹ 5 per share at the end of current financial year. The company needs to raise ₹ 10,00,000 for an approved investment expenditure. The company belongs to a risk class for which the capitalization rate is 10%. Show, how the M-M approach affects the value of firm if the dividends are paid or not paid.

Answer

A When dividend is paid

(a) Price per share at the end of year 1

$$100 = \frac{1}{1.10}(₹ 5 + P_1)$$

$110 = ₹ 5 + P_1$

$P_1 = 105$

(b) Amount required to be raised from issue of new shares

₹ 10,00,000 – (₹ 5,00,000 – ₹ 2,50,000)

₹ 10,00,000 – ₹ 2,50,000 = ₹ 7,50,000

(c) Number of additional shares to be issued

$\frac{7,50,000}{105} = \frac{1,50,000}{21}$ shares or say 7143 shares

(d) Value of ABC Ltd.

(Number of shares × Expected Price per share)

i.e., (50,000 + 7,143) × ₹ 105 = ₹ 60,00,015

B When dividend is not paid

(a) Price per share at the end of year 1

$$100 = \frac{P_1}{1.10}$$

$P_1 = 110$

(b) Amount required to be raised from issue of new shares

₹ 10,00,000 – ₹ 5,00,000 = ₹ 5,00,000

(c) Number of additional shares to be issued

$\frac{5,00,000}{110} = \frac{50,000}{11}$ shares or say 4545 shares.

(d) Value of ABC Ltd.,

(50,000 + 4,545) × ₹110

= ₹ 59,99,950

Thus, as per M.M. approach the value of firm in both situations will be the same.

Question 23

M Ltd. belongs to a risk class for which the capitalization rate is 10%. It has 25,000 outstanding shares and the current market price is ₹ 100. It expects a net profit of ₹ 2,50,000 for the year and the Board is considering dividend of ₹ 5 per share.

M Ltd. requires to raise ₹ 5,00,000 for an approved investment expenditure. Show, how the MM approach affects the value of M Ltd. if dividends are paid or not paid.

Answer

A When dividend is paid

(a) Price per share at the end of year 1

$$100 = \frac{1}{1.10}(₹ 5 + P_1)$$

$110 = ₹ 5 + P_1$

$P_1 = 105$

(b) Amount required to be raised from issue of new shares

₹ 5,00,000 – (₹ 2,50,000 – ₹ 1,25,000)

₹ 5,00,000 – ₹ 1,25,000 = ₹ 3,75,000

(c) Number of additional shares to be issued

$\frac{3,75,000}{105} = \frac{75,000}{21}$ shares or say 3572 shares

(d) Value of M Ltd.

(Number of shares × Expected Price per share)

i.e., (25,000 + 3,572) × ₹ 105 = ₹ 30,00,060

B When dividend is not paid

(a) Price per share at the end of year 1

$$100 = \frac{P_1}{1.10}$$

$P_1 = 110$

(b) Amount required to be raised from issue of new shares

₹5,00,000 – 2,50,000 = 2,50,000

(c) Number of additional shares to be issued

$\frac{2,50,000}{110} = \frac{25,000}{11}$ shares or say 2273 shares.

(d) Value of M Ltd.,

(25,000 + 2273) × ₹110

= ₹ 30,00,030

Whether dividend is paid or not, the value remains the same.

Question 24

RST Ltd. has a capital of ₹ 10,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of ₹ 10 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 12%. What will be the market price of the share at the end of the year, if

(i) a dividend is not declared ?

(ii) a dividend is declared ?

(iii) assuming that the company pays the dividend and has net profits of ₹5,00,000 and makes new investments of ₹10,00,000 during the period, how many new shares must be issued? Use the MM model.

Answer

As per MM model, the current market price of equity share is:

$$P_0 = \frac{1}{1+k_e} \times (D_1 + P_1)$$

(i) If the dividend is not declared:

$$100 = \frac{1}{1+0.12}(0 + P_1)$$

$$100 = \frac{P_1}{1.12}$$

P_1 = ₹112

The Market price of the equity share at the end of the year would be ₹112.

(ii) If the dividend is declared:

$$100 = \frac{1}{1+0.12} \times (10 + P_1)$$

$$100 = \frac{10 + P_1}{1.12}$$

$112 = 10 + P_1$

$P1 = 112 – 10 = ₹102$

The market price of the equity share at the end of the year would be ₹102.

(iii) In case the firm pays dividend of ₹10 per share out of total profits of ₹ 5,00,000 and plans to make new investment of ₹ 10,00,000, the number of shares to be issued may be found as follows:

Total Earnings	₹5,00,000
- Dividends paid	1,00,000
Retained earnings	4,00,000
Total funds required	10,00,000
Fresh funds to be raised	6,00,000
Market price of the share	102
Number of shares to be issued (₹6,00,000 / 102)	5,882.35

or, the firm would issue 5,883 shares at the rate of ₹102

Question 25

In December, 2011 AB Co.'s share was sold for ₹ 146 per share. A long term earnings growth rate of 7.5% is anticipated. AB Co. is expected to pay dividend of ₹ 3.36 per share.

(i) What rate of return an investor can expect to earn assuming that dividends are expected to grow along with earnings at 7.5% per year in perpetuity?

(ii) It is expected that AB Co. will earn about 10% on book Equity and shall retain 60% of earnings. In this case, whether, there would be any change in growth rate and cost of Equity?

Answer

(i) According to Dividend Discount Model approach the firm's expected or required return on equity is computed as follows:

$$= \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity share capital

D_1 = Expected dividend at the end of year 1

P_0 = Current market price of the share.

g = Expected growth rate of dividend.

$$\text{Therefore, } K_e = \frac{3.36}{146} + 7.5\%$$

= 0.0230 +0.075 = 0.098

Or, K_e = 9.80%

(ii) With rate of return on retained earnings (r) 10% and retention ratio (b) 60%, new growth rate will be as follows:

g= br i.e.

= 0.10 X 0.60 = 0.06

Accordingly dividend will also get changed and to calculate this, first we shall calculate previous retention ratio (b_1) and then EPS assuming that rate of return on retained earnings (r) is same.

With previous Growth Rate of 7.5% and r =10% the retention ratio comes out to be:

0.075 =b_1 X 0.10

b_1 = 0.75 and payout ratio = 0.25

With 0.25 payout ratio the EPS will be as follows:

$$\frac{3.36}{0.25} = 13.44$$

With new 0.40 (1 – 0.60) payout ratio the new dividend will be

D_1 = 13.44 X 0.40 = 5.376

Accordingly new K_e will be

$$K_e = \frac{5.376}{146} + 6.0\%$$

or, K_e = 9.68%

Alternatively

EPS with 6% growth rate instead of 7.5%.

$$13.44 \times \frac{1.06}{1.075} = 13.25$$

With new 0.40 (1 – 0.60) payout ratio the new dividend will be

D_1 = 13.25 X 0.40 = 5.30

Accordingly new K_e will be

$$K_e = \frac{5.30}{146} + 6.0\%$$

or, K_e = 9.63%

Question 26

X Ltd. is a Shoes manufacturing company. It is all equity financed and has a paid-tip Capital of ₹10,00,000 (₹10 per share)

X Ltd. has hired Swastika consultants to analyse the future earnings. The report of Swastika consultants states as follows:

(i) The earnings and dividend will grow at 25% for the next two years.

(ii) Earnings are likely to grow at the rate of 10% from 3rd year and onwards.

(iii) Further, if there is reduction in earnings growth, dividend payout ratio will increase to 50%.

The other data related to the company are as follows:

Year	*EPS (₹)*	*Net Dividend per share (₹)*	*Share Price (₹)*
2010	*6.30*	*2.52*	*63.00*
2011	*7.00*	*2.80*	*46.00*
2012	*7.70*	*3.08*	*63.75*
2013	*8.40*	*3.36*	*68.75*
2014	*9.60*	*3.84*	*93.00*

You may assume that the tax rate is 30% (not expected to change in future) and post tax cost of capital is 15%.

By using the Dividend Valuation Model, calculate

(i) Expected Market Price per share

(ii) P/E Ratio.

Answer

The formula for the Dividend valuation Model is

$$P_0 = \frac{D_1}{K_e - g}$$

K_e = Cost of Capital

g = Growth rate

D_1= Dividend at the end of year 1

On the basis of the information given, the following projection can be made:

Year	*EPS (₹)*	*DPS (₹)*	*PVF @15%*	*PV of DPS (₹)*
2015	12.00 (9.60 x 125%)	4.80 (3.84 x 125%)	0.870	4.176
2016	15.00 (12.00 x 125%)	6.00 (4.80 x 125%)	0.756	4.536
2017	16.50 (15.00 x 110%)	8.25* (50% of `16.50)	0.658	5.429
				14.141

*Payout Ratio changed to 50%.

After 2017, the perpetuity value assuming 10% constant annual growth is:

D_1= ₹ 8.25 × 110% = ₹ 9.075

Therefore P_o from the end of 2017

$$\frac{₹\ 9.075}{0.15-0.10} = ₹\ 181.50$$

This must be discounted back to the present value, using the 3 year discount factor after 15%.

	₹
Present Value of P_0 (` 181.50 × 0.658)	119.43
Add: PV of Dividends 2015 to 2017	14.14
Expected Market Price of Share	133.57

5
Indian Capital Market

BASIC CONCEPTS

1. Introduction

Indian financial market consists of capital market, money market and the debt market.

2. Capital Markets/Securities Market

The capital markets are relatively for long-term (greater than one year maturity) financial instruments (e.g. bonds and stocks).

- **Primary Market:** A market where new securities are bought and sold for the first time is called the New Issues market or the IPO market.
- **Secondary Market:** A market in which an investor purchases a security from another investor rather than the issuer, subsequent to the original issuance in the primary market.

There are many similarities and differences between Primary Market and Capital Market

3. Stock Exchange and Its Operations

Stock exchange is a place where the securities issued by the Government, public bodies and Joint Stock Companies are traded.

4. Leading Stock Exchanges in India

(a) Bombay Stock Exchange Limited (BSE): It is the oldest stock exchange in Asia. It's index is *SENSEX.* The Exchange has a nation-wide reach with a presence in 417 cities and towns of India. The BSE's On-Line Trading System (BOLT) is a proprietary system of the Exchange and is BS 7799-2-2002 certified. The surveillance and clearing and settlement functions of the Exchange are ISO 9001:2000 certified.

(b) National Stock Exchange (NSE): It was promoted by leading Financial Institutions at the behest of the Government of India and was incorporated in November 1992. It uses satellite communication technology to energize participation from around 320 cities spread all over the country. NSE can handle up to 6 million trades per day in Capital Market segment. NSE is one of the largest interactive VSAT based stock exchanges in the world. Today it supports more than 3000 VSATs.

5. Leading Stock Exchanges Abroad

(a) ***New York Stock Exchange (NYSE):*** was established in 1792. Each day on the

NYSE trading floor an auction takes place. Open bid and offers are managed on The Trading Floor by Exchange members acting on behalf of institutions and individual investors Buy and sell orders for each listed security meet directly on the trading floor in assigned locations. Prices are determined through supply and demand. Stocks buy and sell orders funnel through a single location, ensuring that the investor, no matter how big or small, is exposed to a wide range of buyers and sellers.

(b) ***Nasdaq:*** It is known for its growth, liquidity, depth of market and the world's most powerful, forward-looking technologies. Nasdaq National Market companies include some of the largest, best known companies in the world.

(c) ***London Stock Exchange*****:** Established in 1760. Dealing in shares is conducted via an off-market trading facility operated by Cazenovia and Company. It provides a range of services for companies as well as for investors and also regulates the markets to give protection to investors and companies to maintain its reputation for high standards and integrity.

6. Functions of Stock Exchanges

(a) Liquidity and Marketability of Securities;

(b) Fair Price Determination;

(c) Source for Long term Funds;

(d) Helps in Capital Formation; and

(e) Reflects the General State of Economy.

7. Stock Market Index

(a) Features

- Representative of entire Stock Market.
- Replacement of one company's share with other company's share.
- Flagship Indices- BSE Sensex and NSE Nifty

(b) Computation of Index

$$\text{Index Value} = \text{Index on Previous Day} \times \frac{\text{Total market capitalisation for current day}}{\text{Total capitalisation of the previous day}}$$

8. Settlement and Settlement Cycle

SEBI introduced a new settlement cycle known as the 'rolling settlement cycle'. This cycle starts and ends on the same day and settlement take place on the 'T+X' days where X is 2 days, which is the business days from the date of the transactions. NSE and BSE follow this cycle.

9. Clearing Houses

Charged with the function of ensuring (guaranteeing) the financial integrity of each trade.

The role of Clearing House is as under:

- It ensures adherence to the system and procedures for smooth trading.
- It minimises credit risks by being a counter party to all trades.
- It involves daily accounting of all gains or losses.
- It ensures delivery of payment for assets on the maturity dates for all outstanding contracts.
- It monitors the maintenance of speculation margins.

10. E-IPO

In addition to other requirements for public issue as given in SEBI guidelines wherever applicable, a company proposing to issue capital to public through the on-line system of the stock exchange for offer of securities has to comply with additional requirements in this regard.

For E-IPO, the company should enter into agreement with the stock exchange(s) and the stock exchange would appoint SEBI registered stock brokers of the stock exchange to accept applications.

11. Capital Market Instruments

- **Equity Shares**: It is a share in the ownership of a company. Stock represents a claim on the company's assets and earnings. It entitles the owner to vote at shareholders' meetings and to receive dividends.
- **Preference Shares**: These shares form part of the share capital of the company which carry a preferential right to be paid in case a company goes bankrupt or is liquidated. They do not have voting rights but have a higher claim on the assets and earnings of the company.
- **Debentures/ Bonds**: A bond is a long-term debt security. It represents "debt" in that the bond buyer actually lends the face amount to the bond issuer.

$$YTM = \frac{\text{Coupon Rate} + \text{Prorated Discount}}{(\text{Face Value} + \text{Purchase Price})/2}$$

- **American Depository Receipts (ADRs)**: An American Depository Receipt (ADR) is a negotiable receipt which represents one or more depository shares held by a US custodian bank, which in turn represent underlying shares of non-issuer held by a custodian in the home country.
- **Global Depository Receipts (GDRs)**: They are negotiable certificates with publicly traded equity of the issuer as underlying security. An issue of depository receipts would involve the issuer, issuing agent to a foreign depository. The depository, in turn, issues GDRs to investors evidencing their rights as shareholders Depository receipts are denominated in foreign currency and are listed on an international exchange such as London or Luxembourg. GDRs enable investors to trade a dollar

denominated instrument on an international stock exchange and yet have rights in foreign shares.

12. **Derivatives:** It is a financial instrument which derives its value from some other financial price. This 'other financial price' is called the underlying.

Types of Derivative Risks

(a) **Credit risk:** Credit risk is the risk of loss due to counterparty's failure to perform on an obligation to the institution.

(b) **Market risk:** Market risk is the risk of loss due to adverse changes in the market value (the price) of an instrument or portfolio of instruments.

(c) **Liquidity risk:** Liquidity risk is the risk of loss due to failure of an institution to meet its funding requirements or to execute a transaction at a reasonable price.

(d) **Operational risk:** Operational risk is the risk of loss occurring as a result of inadequate systems and control, deficiencies in information systems, human error, or management failure.

(e) **Legal risk:** Legal risk is the risk of loss arising from contracts which are not legally enforceable (e.g. the counterparty does not have the power or authority to enter into a particular type of derivatives transaction) or documented correctly.

(f) **Regulatory risk:** Regulatory risk is the risk of loss arising from failure to comply with regulatory or legal requirements.

(g) **Reputation risk:** Reputation risk is the risk of loss arising from adverse public opinion and damage to reputation.

13. **Types of Financial Derivatives**

- **Future Contract:** It is an agreement between two parties that commits one party to buy an underlying financial instrument (bond, stock or currency) or commodity (gold, soybean or natural gas) and one party to sell a financial instrument or commodity at a specific price at a future date.
- **Stock Options:** A privilege, sold by one party to another, that gives the buyer right not an obligation, to buy (call) or sell (put) a stock at an agreed upon price within a certain period on or a specific date regardless of changes in its market price during that period.
- **Stock Index Futures:** Stock index futures may be used to either speculate on the equity market's general performance or to hedge a stock portfolio against a decline in value.
- **Stock Index Option:** A call or put option on a financial index. Investors trading index options are essentially betting on the overall movement of the stock market as represented by a basket of stocks.

14. **Option Valuation Techniques**

(a) **Binomial Model:** The Binomial Model breaks down the time to expiration into

potentially a very large number of time intervals, or steps. With the binomial model it is possible to check at every point in an option's life (i.e. at every step of the binomial tree) for the possibility of early exercise (e.g. where, due to e.g. a dividend, or a put being deeply in the money the option price at that point is less than its intrinsic value).

(b) Risk Neutral Method: The basic argument in this approach is that since the valuation of options is based on arbitrage and is therefore independent of risk preferences and assuming any set of risk we should get the same answer as by using Binomial Model.

(c) Black-Scholes Model: The Black-Scholes model is used to calculate a theoretical price (ignoring dividends paid during the life of the option) using the five key determinants of an option's price: stock price, strike price, volatility, time to expiration, and short-term (risk free) interest rate.

$$OP = SN(d_1) - Xe^{-rt}N(d_2)$$

Where:

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$$

$$d_2 = d_1 - v\sqrt{t}$$

The variables are:

S = current stock price

X = strike price of the option

t = time remaining until expiration, expressed as a percent of a year

r = current continuously compounded risk-free interest rate

v = annual volatility of stock price (the standard deviation of the short-term returns over one year).

ln = natural logarithm

N(x) = standard normal cumulative distribution function

e = the exponential function

(d) Greeks: The Greeks are a collection of statistical values (expressed as percentages) that give the investor a better overall view of how a stock has been performing :

(i) ***Delta:*** It is the degree to which an option price will move given a small change in the underlying stock price. A deeply out-of-the-money call will have a delta very close to zero; a deeply in-the-money call will have a delta very close to 1.

The formula for a delta of a European call on a non-dividend paying stock is:

Delta = N (d_1) (see Black-Scholes formula for d_1)

(ii) ***Gamma:*** It measures how fast the delta changes for small changes in the underlying stock price. It is the delta of the delta.

(iii) ***Theta:*** The change in option price given a one day decrease in time to expiration. It is a measure of time decay.

(iv) ***Rho:*** The change in option price given a one percentage point change in the risk-free interest rate.

(v) ***Vega:*** Sensitivity of option value to change in volatility.

(e) Pricing Future Contract

Cost-of-Carry Model: It is an arbitrage-free pricing model. Its central theme is that futures contract is so priced as to preclude arbitrage profit.

Futures price = Spot Price + Carry Cost – Carry Return

15. Embedded Derivatives

It is a derivative instrument that is embedded in another contract - the host contract. The host contract might be a debt or equity instrument, a lease, an insurance contract or a sale or purchase contract.

16. Commodity Derivatives

Trading in derivatives first started to protect farmers from the risk of the value of their crop going below the cost price of their produce. Derivative contracts were offered on various agricultural products like cotton, rice, coffee, wheat, pepper, etc. Commodity futures and swaps are also available.

There are 25 commodity derivative exchanges in India as of now and derivative contracts on nearly 100 commodities are available for trade.

17. Commodity Exchanges in India

(a) National Commodity & Derivatives Exchange Limited (NCDEX): NCDEX is a public limited company incorporated on April 23, 2003 under the Companies Act, 1956. It is the only commodity exchange in the country promoted by national level institutions. NCDEX is regulated by Forward Market Commission in respect of futures trading in commodities.

(b) Multi Commodity Exchange (MCX): MCX is an independent and de-mutualised multi commodity exchange. It has permanent recognition from the Government of India for facilitating online trading, clearing and settlement operations for commodities futures market across the country.

(c) Indian Commodity Exchange (ICEX): It is a screen based on-line derivatives exchange for commodities. It has robust assaying and warehousing facilities in order to facilitate deliveries.

(d) National Multi-Commodity Exchange of India (NMCE): It is the first de-mutualised Electronic Multi-Commodity Exchange of India being granted the

National status on a permanent basis by the Government of India and operational since 26th November 2002.

18. OTC Derivatives

It is a derivative contract which is privately negotiated. OTC trades have no anonymity, and they generally do not go through a clearing corporation.

- **OTC Interest Rate Derivatives:** Over-the-counter (OTC) interest rate derivatives include instruments such as forward rate agreements (FRAs), interest rate swaps, caps, floors, and collars
- **FRA:** It is a forward contract that sets terms for the exchange of cash payments based on changes in the London Interbank Offered Rate (LIBOR).
- Final settlement of the amounts owed by the parties to an FRA is determined by the formula
- Payment

$$\frac{(N)(RR - FR)(dtm/DY)}{[1 + RR(dtm/DY)]}$$

Where,

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date;

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360or 365 days.

- **Interest rate swaps:** They provide for the exchange of payments based on differences between two different interest rates;
- **Interest rate caps, floors, and collars:** They are option-like agreements that require one party to make payments to the other when a stipulated interest rate, most often a specified maturity of LIBOR, moves outside of some predetermined range.

Question 1

Write a note about the functions of merchant banker.

Answer

Functions of Merchant Bankers: The basic function of merchant banker or investment banker is marketing of corporate and other securities. In the process, he performs a number of

services concerning various aspects of marketing, viz., origination, underwriting, and distribution, of securities. During the regime of erstwhile Controller of Capital Issues in India, when new issues were priced at a significant discount to their market prices, the merchant banker's job was limited to ensuring press coverage and dispatching subscription forms to every corner of the country. Now, merchant bankers are designing innovative instruments and perform a number of other services both for the issuing companies as well as the investors The activities or services performed by merchant bankers, in India, today include:

(a) Project promotion services.

(b) Project finance.

(c) Management and marketing of new issues.

(d) Underwriting of new issues.

(e) Syndication of credit.

(f) Leasing services.

(g) Corporate advisory services.

(h) Providing venture capital.

(i) Operating mutual funds and off shore funds.

(j) Investment management or portfolio management services.

(k) Bought out deals.

(l) Providing assistance for technical and financial collaborations and joint ventures.

(m) Management of and dealing in commercial paper.

(n) Investment services for non-resident Indians.

Question 2

Write short note on Asset Securitisation.

Answer

Asset Securitisation: Securitisation is a process of transformation of illiquid asset into security which may be traded later in the open market. It is the process of transformation of the assets of a lending institution into negotiable instruments. The term 'securitisation' refers to both switching away from bank intermediation to direct financing via capital market and/or money market, and the transformation of a previously illiquid asset like automobile loans, mortgage loans, trade receivables, etc. into marketable instruments.

This is a method of recycling of funds. It is beneficial to financial intermediaries, as it helps in enhancing lending funds. Future receivables, EMIs and annuities are pooled together and transferred to an special purpose vehicle (SPV). These receivables of the future are shifted to

mutual funds and bigger financial institutions. This process is similar to that of commercial banks seeking refinance with NABARD, IDBI, etc.

Question 3

Write a note on buy-back of shares by companies.

Answer

Buyback of shares: Till 1998, buyback of equity shares was not permitted in India. But now they are permitted after suitably amending the Companies Act, 1956. However, the buyback of shares in India are permitted under certain guidelines issued by the Government as well as by the SEBI. Several companies have opted for such buyback including Reliance, Bajaj, and Ashok Leyland to name a few. In India, the corporate sector generally chooses to buyback by the tender method or the open market purchase method. The company, under the tender method, offers to buy back shares at a specific price during a specified period which is usually one month. Under the open market purchase method, a company buys shares from the secondary market over a period of one year subject to a maximum price fixed by the management. Companies seem to now have a distinct preference for the open market purchase method as it gives them greater flexibility regarding time and price.

As impact of buyback, the P/E ratio may change as a consequence of buyback operation. The P/E ratio may rise if investors view buyback positively or it may fall if the investors regard buyback negatively.

Rationale of buyback: Range from various considerations. Some of them may be:

(i) For efficient allocation of resources.

(ii) For ensuring price stability in share prices.

(iii) For taking tax advantages.

(iv) For exercising control over the company.

(v) For saving from hostile takeover.

(vi) To provide capital appreciation to investors this may otherwise be not available.

This, however, has some disadvantages also like, manipulation of share prices by its promoters, speculation, collusive trading etc.

Question 4

(a) Briefly explain 'Buy Back of Securities' and give the management objectives of buying Back Securities.

(b) Explain the term 'Insider Trading' and why Insider Trading is punishable.

Answer

(a) Buy Back of Securities: Companies are allowed to buy back equity shares or any other

security specified by the Union Government. In India Companies are required to extinguish shares bought back within seven days. In USA Companies are allowed to hold bought back shares as treasury stock, which may be reissued. A company buying back shares makes an offer to purchase shares at a specified price. Shareholders accept the offer and surrender their shares.

The following are the management objectives of buying back securities:

(i) To return excess cash to shareholders, in absence of appropriate investment opportunities.

(ii) To give a signal to the market that shares are undervalued.

(iii) To increase promoters holding, as a percentage of total outstanding shares, without additional investment. Thus, buy back is often used as a defence mechanism against potential takeover.

(iv) To change the capital structure.

(b) Insider Trading: The insider is any person who accesses the price sensitive information of a company before it is published to the general public. Insider includes corporate officers, directors, owners of firm etc. who have substantial interest in the company. Even, persons who have access to non-public information due to their relationship with the company such as internal or statutory auditor, agent, advisor, analyst consultant etc. who have knowledge of material, 'inside' information not available to general public. Insider trading practice is the act of buying or selling or dealing in securities by as a person having unpublished inside information with the intention of making abnormal profit's and avoiding losses. This inside information includes dividend declaration, issue or buy back of securities, amalgamation, mergers or take over, major expansion plans etc.

The word insider has wide connotation. An outsider may be held to be an insider by virtue of his engaging himself in this practice on the strength of inside information.

Insider trading practices are lawfully prohibited. The regulatory bodies in general are imposing different fines and penalties for those who indulge in such practices. Based on the recommendation of Sachar Committee and Patel Committee, SEBI has framed various regulations and implemented the same to prevent the insider trading practices. Recently SEBI has made several changes to strengthen the existing insider Trading Regulation, 1992 and new Regulation as SEBI (Prohibition of Insider Trading) Regulations, 2002 has been introduced. Insider trading which is an unethical practice resorted by those in power in corporates has manifested not only in India but elsewhere in the world causing huge losses to common investors thus driving them away from capital market. Therefore, it is punishable.

Question 5

Write short note on Stock Lending Scheme.

Answer

Stock Lending: In 'stock lending', the legal title of a security is temporarily transferred from a lender to a borrower. The lender retains all the benefits of ownership, other than the voting rights. The borrower is entitled to utilize the securities as required but is liable to the lender for all benefits.

A securities lending programme is used by the lenders to maximize yields on their portfolio. Borrowers use the securities lending programme to avoid settlement failures.

Securities lending provide income opportunities for security-holders and creates liquidity to facilitate trading strategies for borrowers It is particularly attractive for large institutional shareholders as it is an easy way of generating income to offset custody fees and requires little involvement of time. It facilitates timely settlement, increases the settlements, reduces market volatility and improves liquidity.

The borrower deposits collateral securities with the approved, intermediary. In case the borrower fails to return the securities, he will be declared a defaulter and the approved intermediary will liquidate the collateral deposited with it. In the event of default, the approved intermediary is liable for making good the loss caused to the lender. The borrower cannot discharge his liabilities of returning the equivalent securities through payment in cash or kind.

Current Status in India: National Securities Clearing Corporation Ltd. launched its stock lending operations (christened Automated Lending & Borrowing Mechanism – ALBM) on February 10, 1999. This was the beginning of the first real stock lending operation in the country. Stock Holding Corporation of India, Deutsche Bank and Reliance are the other three stock lending intermediaries registered with SEBI.

Under NSCCL system only dematerialized stocks are eligible. The NSCCL'S stock lending system is screen based, thus instantly opening up participation from across the country wherever there is an NSE trading terminal. The transactions are guaranteed by NSCCL and the participating members are the clearing members of NSCCL. The main features of NSCCL system are:

(i) The session will be conducted every Wednesday on NSE screen where borrowers and lenders enter their requirements either as a purchase order indicating an intention to borrow or as sale, indicating intention to lend.

(ii) Previous day's closing price of a security will be taken as the lending price of the security.

(iii) The fee or interest that a lender gets will be market determined and will be the difference between the lending price and the price arrived at the ALBM session.

(iv) Corresponding to a normal market segment, there will be an ALBM session.

(v) Funds towards each borrowing will have to be paid in on the securities lending day.

(vi) A participant will be required to pay-in-funds equal to the total value of the securities

borrowed.

(vii) The same amount of securities has to be returned at the end of the ALBM settlement on the day of the pay-out of the ALBM settlement.

(viii) The previous day's closing price is called the lending price and the rate at which the lending takes place is called the lending fee. This lending fee alone is determined in the course of ALBM session.

(ix) Fee adjustment shall be made for any lender not making full delivery of a security. The lender's account shall be debited for the quantity not delivered.

(x) The borrower account shall be debited to the extent of the securities not lend on account of funds shortage.

Question 6

Write a short note on 'Book building'.

Answer

Book Building: Book building is a technique used for marketing a public offer of equity shares of a company. It is a way of raising more funds from the market. After accepting the free pricing mechanism by the SEBI, the book building process has acquired too much significance and has opened a new lead in development of capital market.

A company can use the process of book building to fine tune its price of issue. When a company employs book building mechanism, it does not pre-determine the issue price (in case of equity shares) or interest rate (in case of debentures) and invite subscription to the issue. Instead it starts with an indicative price band (or interest band) which is determined through consultative process with its merchant banker and asks its merchant banker to invite bids from prospective investors at different prices (or different rates). Those who bid are required to pay the full amount. Based on the response received from investors the final price is selected. The merchant banker (called in this case Book Runner) has to manage the entire book building process. Investors who have bid a price equal to or more than the final price selected are given allotment at the final price selected. Those who have bid for a lower price will get their money refunded.

In India, there are two options for book building process. One, 25 per cent of the issue has to be sold at fixed price and 75 per cent is through book building. The other option is to split 25 per cent of offer to the public (small investors) into a fixed price portion of 10 per cent and a reservation in the book built portion amounting to 15 per cent of the issue size. The rest of the book-built portion is open to any investor.

The greatest advantage of the book building process is that this allows for price and demand discovery. Secondly, the cost of issue is much less than the other traditional methods of raising capital. In book building, the demand for shares is known before the issue closes. In

fact, if there is not much demand the issue may be deferred and can be rescheduled after having realised the temper of the market.

Question 7

Explain the term "Offer for Sale".

Answer

Offer for sale is also known as bought out deal (BOD). It is a new method of offering equity shares, debentures etc., to the public. In this method, instead of dealing directly with the public, a company offers the shares/debentures through a sponsor. The sponsor may be a commercial bank, merchant banker, an institution or an individual. It is a type of wholesale of equities by a company. A company allots shares to a sponsor at an agreed price between the company and sponsor. The sponsor then passes the consideration money to the company and in turn gets the shares duly transferred to him. After a specified period as agreed between the company and sponsor, the shares are issued to the public by the sponsor with a premium. After the public offering, the sponsor gets the shares listed in one or more stock exchanges. The holding cost of such shares by the sponsor may be reimbursed by the company or the sponsor may get the profit by issue of shares to the public at premium.

Thus, it enables the company to raise the funds easily and immediately. As per SEBI guidelines, no listed company can go for BOD. A privately held company or an unlisted company can only go for BOD. A small or medium size company which needs money urgently chooses to BOD. It is a low cost method of raising funds. The cost of public issue is around 8% in India. But this method lacks transparency. There will be scope for misuse also. Besides this, it is expensive like the public issue method. One of the most serious short coming of this method is that the securities are sold to the investing public usually at a premium. The margin thus between the amount received by the company and the price paid by the public does not become additional funds of the company, but it is pocketed by the issuing houses or the existing shareholde₹

Question 8

Explain the terms ESOS and ESPS with reference to the SEBI guidelines for The Employees Stock Option Plans (ESOPs).

Answer

ESOS and ESPS

	ESOS	ESPS
1.	**Meaning**	
	Employee Stock Option Scheme means a scheme under which the company grants option to employees.	Employee Stock Purchase Scheme means a scheme under which the company offers shares to employees as a part of public issue.

2.	**Auditors' Certificate**	
	Auditors' Certificate to be placed at each AGM stating that the scheme has been implemented as per the guidelines and in accordance with the special resolution passed.	No such Certificate is required.
3.	**Transferability**	
	It is not transferable.	It is transferable after lock in period.
4.	**Consequences of failure**	
	The amount payable may be forfeited. If the option is not vested due to non-fulfillment of condition relating to vesting of option then the amount may be refunded to the employees.	Not applicable.
5.	**Lock in period**	
	Minimum period of 1 year shall be there between the grant and vesting of options. Company is free to specify the lock in period for the shares issued pursuant to exercise of option.	One year from the date of allotment. If the ESPS is part of public issue and the shares are issued to employees at the same price as in the public issue, the shares issued to employees pursuant to ESPS shall not be subject to any lock in.

Question 9

What is the procedure for the book building process? Explain the recent changes made in the allotment process.

Answer

The modern and more popular method of share pricing these days is the **BOOK BUILDING** route. After appointing a merchant banker as a book runner, the company planning the IPO, specifies the number of shares it wishes to sell and also mentions a price band. Investors place their orders in Book Building process that is similar to bidding at an auction. The willing investors submit their bids above the floor price indicated by the company in the price band to the book runner. Once the book building period ends, the book runner evaluates the bids on the basis of the prices received, investor quality and timing of bids. Then the book runner and the company conclude the final price at which the issuing company is willing to issue the stock and allocate securities. Traditionally, the number of shares is fixed and the issue size gets determined on the basis of price per share discovered through the book building process.

Public issues these days are targeted at various segments of the investing fraternity. Companies now allot certain portions of the offering to different segments so that everyone gets a chance to participate. The segments are traditionally three - qualified institutional

bidders (Q1Bs), high net worth individuals (HNIs) and retail investors (general public). Indian companies now have to offer about 50% of the offer to Q1Bs, about 15% to high net worth individuals and the remaining 35% to retail investors Earlier retail and high net worth individuals had 25% each. Also the Q1Bs are allotted shares on a pro-rata basis as compared to the earlier norm when it was at the discretion of the company management and the investment bankers. These investors (Q1B) also have to pay 10% margin on application. This is also a new requirement. Once the offer is completed, the company gets listed and investors and shareholders can trade the shares of the company in the stock exchange.

Question 10

Explain briefly the advantages of holding securities in 'demat' form rather than in physical form.

Answer

Advantages of Holding Securities in 'Demat' Form: The Depositories Act, 1996 provides the framework for the establishment and working of depositories enabling transactions in securities in scripless (or demat) form. With the arrival of depositories on the scene, many of the problems previously encountered in the market due to physical handling of securities have been to a great extent minimized. In a broad sense, therefore, it can be said that 'dematting' has helped to broaden the market and make it smoother and more efficient.

From an individual investor point of view, the following are important advantages of holding securities in demat form:

- It is speedier and avoids delay in transfer
- It avoids lot of paper work.
- It saves on stamp duty.

From the issuer-company point of view also, there are significant advantages due to dematting, some of which are:

- Savings in printing certificates, postage expenses.
- Stamp duty waiver.
- Easy monitoring of buying/selling patterns in securities, increasing ability to spot takeover attempts and attempts at price rigging.

Question 11

Write short notes on the Stock Lending Scheme – its meaning, advantages and risk involved.

Answer

Stock Lending Scheme: Stock lending means transfer of security. The legal title is temporarily transferred from a lender to a borrower. The lender retains all the benefits of ownership, except voting power/rights. The borrower is entitled to utilize the securities as

required but is liable to the lender for all benefits such as dividends, rights etc. The basic purpose of stock borrower is to cover the short sales i.e. selling the shares without possessing them. SEBI has introduced scheme for securities lending and borrowing in 1997.

Advantages:

(1) Lenders to get return (as lending charges) from it, instead of keeping it idle.

(2) Borrower uses it to avoid settlement failure and loss due to auction.

(3) From the view-point of market this facilitates timely settlement, increase in settlement, reduce market volatility and improves liquidity.

(4) This prohibits fictitious Bull Run.

The borrower has to deposit the collateral securities, which could be cash, bank guarantees, government securities or certificates of deposits or other securities, with the approved intermediary. In case, the borrower fails to return the securities, he will be declared a defaulter and the approved intermediary will liquidate the collateral deposited with it.

In the event of default, the approved intermediary is liable for making good the loss caused to the lender.

The borrower cannot discharge his liabilities of returning the equivalent securities through payment in cash or kind.

National Securities Clearing Corporation Ltd. (NSCCL), Stock Holding Corporation of India (SHCIL), Deutsche Bank, and Reliance Capital etc. are the registered and approved intermediaries for the purpose of stock lending scheme. NSCCL proposes to offer a number of schemes, including the Automated Lending and Borrowing Mechanism (ALBM), automatic borrowing for settlement failures and case by case borrowing.

Question 12

How is a stock market index calculated? Indicate any two important stock market indices.

Answer

1. A base year is set alongwith a basket of base shares.
2. The changes in the market price of these shares is calculated on a daily basis.
3. The shares included in the index are those shares which are traded regularly in high volume.
4. In case the trading in any share stops or comes down then it gets excluded and another company's shares replace it.
5. Following steps are involved in calculation of index on a particular date:
   - Calculate market capitalization of each individual company comprising the index.
   - Calculate the total market capitalization by adding the individual market capitalization of all companies in the index.

- Computing index of next day requires the index value and the total market capitalization of the previous day and is computed as follows:
- $$\text{Index Value} = \text{Index on Previous Day} \times \frac{\text{Total market capitalisation for current day}}{\text{Total capitalisation of the previous day}}$$
- It should also be noted that Indices may also be calculated using the price weighted method. Here the share the share price of the constituent companies form the weights. However, almost all equity indices world-wide are calculated using the market capitalization weighted method.

Each stock exchange has a flagship index like in India Sensex of BSE and Nifty of NSE and outside India is Dow Jones, FTSE etc.

Question 13

What is a depository? Who are the major players of a depository system? What advantages does the depository system offer to the clearing member?

Answer

(i) A depository is an organization where the securities of a shareholder are held in the form of electronic accounts in the same way as a bank holds money. The depository holds electronic custody of securities and also arranges for transfer of ownership of securities on the settlement dates.

(ii) Players of the depository system are:

- Depository
- Issuers or Company
- Depository participants
- Clearing members
- Corporation
- Stock brokers
- Clearing Corporation
- Investors
- Banks

(iii) Advantages to Clearing Member

- Enhanced liquidity, safety, and turnover on stock market.
- Opportunity for development of retail brokerage business.
- Ability to arrange pledges without movement of physical scrip and further increase of trading activity, liquidity and profits.

- Improved protection of shareholder's rights resulting from more timely communications from the issuer.
- Reduced transaction costs.
- Elimination of forgery and counterfeit instruments with attendant reduction in settlement risk from bad deliveries.
- Provide automation to post-trading processing.
- Standardisation of procedures.

Question 14

Write a short note on depository participant.

Answer

Under this system, the securities (shares, debentures, bonds, Government Securities, MF units etc.) are held in electronic form just like cash in a bank account. To speed up the transfer mechanism of securities from sale, purchase, transmission, SEBI introduced Depository Services also known as Dematerialization of listed securities. It is the process by which certificates held by investors in physical form are converted to an equivalent number of securities in electronic form. The securities are credited to the investor's account maintained through an intermediary called Depository Participant (DP). Shares/Securities once dematerialized lose their independent identities. Separate numbers are allotted for such dematerialized securities. Organization holding securities of investors in electronic form and which renders services related to transactions in securities is called a Depository. A depository holds securities in an account, transfers securities from one account holder to another without the investors having to handle these in their physical form. The depository is a safe keeper of securities for and on behalf of the investors. All corporate benefits such as Dividends, Bonus, Rights etc. are issued to security holders as were used to be issued in case of physical form.

Question 15

Write short note on Advantages of a depository system.

Answer

Advantages of a Depository System

The different stake-holders have advantages flowing out of the depository system. They are:-

(I) **For the Capital Market:**

(i) It eliminates bad delivery;

(ii) It helps to eliminate voluminous paper work;

(iii) It helps in the quick settlement of dues and also reduces the settlement time;

(iv) It helps to eliminate the problems concerning odd lots;

(v) It facilitates stock-lending and thus deepens the market.

(II) **For the Investor:**

(i) It reduces the risks associated with the loss or theft of documents and securities and eliminates forgery;

(ii) It ensures liquidity by speedy settlement of transactions;

(iii) It makes investors free from the physical holding of shares;

(iv) It reduces transaction costs; and

(v) It assists investors in securing loans against the securities.

(III) **For the Corporate Sector or Issuers of Securities:**

(i) It provides upto date information on shareholders' names and addresses;

(ii) It enhances the image of the company;

(iii) It reduces the costs of the secretarial department;

(iv) It increases the efficiency of registrars and transfer agents; and

(v) It provides better facilities of communication with members.

Question 16

Write short note on Green shoe option.

Answer

Green Shoe Option: It is an option that allows the underwriting of an IPO to sell additional shares if the demand is high. It can be understood as an option that allows the underwriter for a new issue to buy and resell additional shares upto a certain pre-determined quantity.

Looking to the exceptional interest of investors in terms of over-subscription of the issue, certain provisions are made to issue additional shares or bonds to underwriters for distribution. The issuer authorises for additional shares or bonds. In common parlance, it is the retention of over-subscription to a certain extent. It is a special feature of euro-issues. In euro-issues the international practices are followed.

In the Indian context, green shoe option has a limited connotation. SEBI guidelines governing public issues contain appropriate provisions for accepting over-subscriptions, subject to a ceiling, say, 15 per cent of the offer made to public. In certain situations, the green-shoe option can even be more than 15 per cent.

Examples:

- IDBI had come–up earlier with their Flexi bonds (Series 4 and 5). This is a debt-instrument. Each of the series was initially floated for ₹ 750 crores. SEBI had permitted IDBI to retain an excess of an equal amount of ₹ 750 crores.
- ICICI had launched their first tranche of safety bonds through unsecured redeemable

debentures of ₹ 200 crores, with a green shoe option for an identical amount.

More recently, Infosys Technologies has exercised the green shoe option to purchase upto 7,82,000 additional ADSs representing 3,91,000 equity shares. This offer initially involved 5.22 million depository shares, representing 2.61 million domestic equity shares.

Question 17

(i) What are derivatives?

(ii) Who are the users and what are the purposes of use?

(iii) Enumerate the basic differences between cash and derivatives market.

Answer

(i) Derivative is a product whose value is to be derived from the value of one or more basic variables called bases (underlying assets, index or reference rate). The underlying assets can be Equity, Forex, and Commodity.

(ii)

	Users	Purpose
(a)	Corporation	To hedge currency risk and inventory risk
(b)	Individual Investors	For speculation, hedging and yield enhancement.
(c)	Institutional Investor	For hedging asset allocation, yield enhancement and to avail arbitrage opportunities.
(d)	Dealers	For hedging position taking, exploiting inefficiencies and earning dealer spreads.

(iii) The basic differences between Cash and the Derivative market are enumerated below:-

In cash market tangible assets are traded whereas in derivate markets contracts based on tangible or intangibles assets likes index or rates are traded.

(a) In cash market tangible assets are traded whereas in derivative market contracts based on tangible or intangibles assets like index or rates are traded.

(b) In cash market, we can purchase even one share whereas in Futures and Options minimum lots are fixed.

(c) Cash market is more risky than Futures and Options segment because in "Futures and Options" risk is limited upto 20%.

(d) Cash assets may be meant for consumption or investment. Derivate contracts are for hedging, arbitrage or speculation.

(e) The value of derivative contract is always based on and linked to the underlying security. However, this linkage may not be on point-to-point basis.

(f) In the cash market, a customer must open securities trading account with a securities depository whereas to trade futures a customer must open a future trading account with a derivative broker.

(g) Buying securities in cash market involves putting up all the money upfront whereas buying futures simply involves putting up the margin money.

(h) With the purchase of shares of the company in cash market, the holder becomes part owner of the company. While in future it does not happen.

Question 18

What is the significance of an underlying in relation to a derivative instrument?

Answer

The underlying may be a share, a commodity or any other asset which has a marketable value which is subject to market risks. The importance of underlying in derivative instruments is as follows:

- All derivative instruments are dependent on an underlying to have value.
- The change in value in a forward contract is broadly equal to the change in value in the underlying.
- In the absence of a valuable underlying asset the derivative instrument will have no value.
- On maturity, the position of profit/loss is determined by the price of underlying instruments. If the price of the underlying is higher than the contract price the buyer makes a profit. If the price is lower, the buyer suffers a loss.

Question 19

Distinguish between:

(i) Forward and Futures contracts.

(ii) Intrinsic value and Time value of an option.

Answer

(i) Forward and Future Contracts:

S.No.	Features	Forward	Futures
1.	Trading	Forward contracts are traded on personal basis or on telephone or otherwise.	Futures Contracts are traded in a competitive arena.
2.	Size of Contract	Forward contracts are individually tailored and have no standardized size	Futures contracts are standardized in terms of quantity or amount as the case may be

3.	Organized exchanges	Forward contracts are traded in an over the counter market.	Futures contracts are traded on organized exchanges with a designated physical location.
4.	Settlement	Forward contracts settlement takes place on the date agreed upon between the parties.	Futures contracts settlements are made daily via. Exchange's clearing house.
5.	Delivery date	Forward contracts may be delivered on the dates agreed upon and in terms of actual delivery.	Futures contracts delivery dates are fixed on cyclical basis and hardly takes place. However, it does not mean that there is no actual delivery.
6.	Transaction costs	Cost of forward contracts is based on bid – ask spread.	Futures contracts entail brokerage fees for buy and sell orde₹
7.	Marking to market	Forward contracts are not subject to marking to market	Futures contracts are subject to marking to market in which the loss on profit is debited or credited in the margin account on daily basis due to change in price.
8.	Margins	Margins are not required in forward contract.	In futures contracts every participants is subject to maintain margin as decided by the exchange authorities
9.	Credit risk	In forward contract, credit risk is born by each party and, therefore, every party has to bother for the creditworthiness.	In futures contracts the transaction is a two way transaction, hence the parties need not to bother for the risk.

(ii) Intrinsic value and the time value of an Option: Intrinsic value of an option and the time value of an option are primary determinants of an option's price. By being familiar with these terms and knowing how to use them, one will find himself in a much better position to choose the option contract that best suits the particular investment requirements.

Intrinsic value is the value that any given option would have if it were exercised today. This is defined as the difference between the option's strike price (x) and the stock actual current price (c.p). In the case of a call option, one can calculate the intrinsic value by taking CP-X. If the result is greater than Zero (In other words, if the stock's current price is greater than the option's strike price), then the amount left over after subtracting CP-X is the option's intrinsic value. If the strike price is greater than the current stock price, then the intrinsic value of the option is zero – it would not be worth anything if it were to

be exercised today. An option's intrinsic value can never be below zero. To determine the intrinsic value of a put option, simply reverse the calculation to X - CP

Example: Let us assume Wipro Stock is priced at ₹105/-. In this case, a Wipro 100 call option would have an intrinsic value of (₹105 – ₹100 = ₹5). However, a Wipro 100 put option would have an intrinsic value of zero (₹100 – ₹105 = -₹5). Since this figure is less than zero, the intrinsic value is zero. Also, intrinsic value can never be negative. On the other hand, if we are to look at a Wipro put option with a strike price of ₹120. Then this particular option would have an intrinsic value of ₹15 (₹120 – ₹105 = ₹15).

Time Value: This is the second component of an option's price. It is defined as any value of an option other than the intrinsic value. From the above example, if Wipro is trading at ₹105 and the Wipro 100 call option is trading at ₹7, then we would conclude that this option has ₹2 of time value (₹7 option price – ₹5 intrinsic value = ₹ 2 time value). Options that have zero intrinsic value are comprised entirely of time value.

Time value is basically the risk premium that the seller requires to provide the option buyer with the right to buy/sell the stock upto the expiration date. This component may be regarded as the Insurance premium of the option. This is also known as "Extrinsic value." Time value decays over time. In other words, the time value of an option is directly related to how much time an option has until expiration. The more time an option has until expiration, greater the chances of option ending up in the money.

Question 20

(i) What are Stock futures?

(ii) What are the opportunities offered by Stock futures?

(iii) How are Stock futures settled?

Answer

(i) Stock future is a financial derivative product where the underlying asset is an individual stock. It is also called equity future. This derivative product enables one to buy or sell the underlying Stock on a future date at a price decided by the market forces today.

(ii) Stock futures offer a variety of usage to the investors Some of the key usages are mentioned below:

Investors can take long-term view on the underlying stock using stock futures.

(a) Stock futures offer high leverage. This means that one can take large position with less capital. For example, paying 20% initial margin one can take position for 100%, i.e., 5 times the cash outflow.

(b) Futures may look over-priced or under-priced compared to the spot price and can offer opportunities to arbitrage and earn riskless profit.

(c) When used efficiently, single-stock futures can be effective risk management tool. For instance, an investor with position in cash segment can minimize either market risk or price risk of the underlying stock by taking reverse position in an appropriate futures contract.

(iii) Up to March 31, 2002, stock futures were settled in cash. The final settlement price is the closing price of the underlying stock. From April 2002, stock futures are settled by delivery, i.e., by merging derivatives position into cash segment.

Question 21

What is a "derivative"? Briefly explain the recommendations of the L.C. Gupta Committee on derivatives.

Answer

The derivatives are most modern financial instruments in hedging risk. The individuals and firms who wish to avoid or reduce risk can deal with the others who are willing to accept the risk for a price. A common place where such transactions take place is called the 'derivative market'.

Derivatives are those assets whose value is determined from the value of some underlying assets. The underlying asset may be equity, commodity or currency.

Based on the report of Dr. L.C. Gupta Committee the following recommendations are accepted by SEBI on Derivatives:

- Phased introduction of derivative products, with the stock index futures as starting point for equity derivative in India.
- Expanded definition of securities under the Securities Contracts (Regulation) Act (SCRA) by declaring derivative contracts based on index of prices of securities and other derivatives contracts as securities.
- Permission to existing stock exchange to trade derivatives provided they meet the eligibility conditions including adequate infrastructural facilities, on-line trading and surveillance system and minimum of 50 members opting for derivative trading etc.
- Initial margin requirements related to the risk of loss on the position and capital adequacy norms shall be prescribed.
- Annual inspection of all the members operating in the derivative segment by the Stock Exchange.
- Dissemination of information by the exchange about the trades, quantities and quotes in real time over at least two information vending networks.
- The clearing corporation/house to settle derivatives trades. This should meet certain specified eligibility conditions and the clearing corporation/house must interpose itself between both legs of every trade, becoming the legal counter party to both or

alternatively provide an unconditional guarantee for settlement of all trades.

- Two tier membership: The trading member and clearing member, and the entry norms for the clearing member would be more stringent.
- The clearing member should have a minimum networth of ₹ 3 crores and shall make a deposit of ₹ 50 lakhs with the exchange/clearing corporation in the form of liquid assets.
- Prescription of a model Risk Disclosure Document and monitoring broker-dealer/client relationship by the Stock Exchange and the requirement that the sales personnel working in the broker-dealer office should pass a certification programme.
- Corporate clients/financial institutions/mutual funds should be allowed to trade derivatives only if and to the extent authorised by their Board of Directors/Trustees.
- Mutual Funds would be required to make necessary disclosures in their offer documents if they opt to trade derivatives. For the existing schemes, they would require the approval of their unit holde₹ The minimum contract value would be ₹ 1 lakh, which would also apply in the case of individuals.

Question 22

Write short note on Marking to market.

Answer

Marking to market: It implies the process of recording the investments in traded securities (shares, debt-instruments, etc.) at a value, which reflects the market value of securities on the reporting date. In the context of derivatives trading, the futures contracts are marked to market on periodic (or daily) basis. Marking to market essentially means that at the end of a trading session, all outstanding contracts are repriced at the settlement price of that session. Unlike the forward contracts, the future contracts are repriced every day. Any loss or profit resulting from repricing would be debited or credited to the margin account of the broker. It, therefore, provides an opportunity to calculate the extent of liability on the basis of repricing. Thus, the futures contracts provide better risk management measure as compared to forward contracts.

Suppose on 1st day we take a long position, say at a price of ₹ 100 to be matured on 7th day. Now on 2nd day if the price goes up to ₹ 105, the contract will be repriced at ₹ 105 at the end of the trading session and profit of ₹ 5 will be credited to the account of the buyer. This profit of ₹ 5 may be drawn and thus cash flow also increases. This marking to market will result in three things – one, you will get a cash profit of ₹ 5; second, the existing contract at a price of ₹ 100 would stand cancelled; and third you will receive a new futures contract at ₹ 105. In essence, the marking to market feature implies that the value of the futures contract is set to zero at the end of each trading day.

Question 23

What are the reasons for stock index futures becoming more popular financial derivatives over stock futures segment in India?

Answer

Stock index futures is most popular financial derivatives over stock futures due to following reasons:

1. It adds flexibility to one's investment portfolio. Institutional investors and other large equity holders prefer the most this instrument in terms of portfolio hedging purpose. The stock systems do not provide this flexibility and hedging.
2. It creates the possibility of speculative gains using leverage. Because a relatively small amount of margin money controls a large amount of capital represented in a stock index contract, a small change in the index level might produce a profitable return on one's investment if one is right about the direction of the market. Speculative gains in stock futures are limited but liabilities are greater.
3. Stock index futures are the most cost efficient hedging device whereas hedging through individual stock futures is costlier.
4. Stock index futures cannot be easily manipulated whereas individual stock price can be exploited more easily.
5. Since, stock index futures consists of many securities, so being an average stock, is much less volatile than individual stock price. Further, it implies much lower capital adequacy and margin requirements in comparison of individual stock futures. Risk diversification is possible under stock index future than in stock futures.
6. One can sell contracts as readily as one buys them and the amount of margin required is the same.
7. In case of individual stocks the outstanding positions are settled normally against physical delivery of shares. In case of stock index futures they are settled in cash all over the world on the premise that index value is safely accepted as the settlement price.
8. It is also seen that regulatory complexity is much less in the case of stock index futures in comparison to stock futures.
9. It provides hedging or insurance protection for a stock portfolio in a falling market.

Question 24

Write short note on Options.

Answer

Options: An option is a claim without any liability. It is a claim contingent upon the occurrence of certain conditions and, therefore, option is a contingent claim. More specifically, an option is contract that gives the holder a right, without any obligation, to buy or sell an asset at an agreed price on or before a specified period of time. The option to buy an asset is known as a call option and the option to sell an asset is called put option. The price at which option can be exercised is called as exercise price or strike price. Based on exercising the option it can be classified into two categories:

(i) **European Option:** When an option is allowed to be exercised only on the maturity date.

(ii) **American Option:** When an option is exercised any time before its maturity date.

When an option holder exercises his right to buy or sell it may have three possibilities.

(a) An option is said to be in the money when it is advantageous to exercise it.

(b) When exercise is not advantageous it is called out of the money.

(c) When option holder does not gain or lose it is called at the money.

The holder of an option has to pay a price for obtaining call/put option. This price is known as option premium. This price has to be paid whether the option is exercised or not.

Question 25

What are the features of Futures Contract?

Answer

Future contracts can be characterized by:-

(a) These are traded on organized exchanges.

(b) Standardised contract terms like the underlying assets, the time of maturity and the manner of maturity etc.

(c) Associated with clearing house to ensure smooth functioning of the market.

(d) Margin requirements and daily settlement to act as further safeguard i.e., marked to market.

(e) Existence of regulatory authority.

(f) Every day the transactions are marked to market till they are re-wound or matured.

Future contracts being traded on organizatised exchanges, impart liquidity to a transaction. The clearing house being the counter party to both sides or a transaction, provides a mechanism that guarantees the honouring of the contract and ensuring very low level of default.

Question 26

State any four assumptions of Black Scholes Model

Answer

The model is based on a normal distribution of underlying asset returns. The following assumptions accompany the model:

1. European Options are considered,
2. No transaction costs,
3. Short term interest rates are known and are constant,

4. Stocks do not pay dividend,
5. Stock price movement is similar to a random walk,
6. Stock returns are normally distributed over a period of time, and
7. The variance of the return is constant over the life of an Option.

Question 27

Give the meaning of 'Caps, Floors and Collars' options.

Answer

Cap: It is a series of call options on interest rate covering a medium-to-long term floating rate liability. Purchase of a Cap enables the a borrowers to fix in advance a maximum borrowing rate for a specified amount and for a specified duration, while allowing him to avail benefit of a fall in rates. The buyer of Cap pays a premium to the seller of Cap.

Floor: It is a put option on interest rate. Purchase of a Floor enables a lender to fix in advance, a minimal rate for placing a specified amount for a specified duration, while allowing him to avail benefit of a rise in rates. The buyer of the floor pays the premium to the seller.

Collars: It is a combination of a Cap and Floor. The purchaser of a Collar buys a Cap and simultaneously sells a Floor. A Collar has the effect of locking its purchases into a floating rate of interest that is bounded on both high side and the low side.

Question 28

What do you know about swaptions and their uses?

Answer

(i) Swaptions are combination of the features of two derivative instruments, i.e., option and swap.

(ii) A swaption is an option on an interest rate swap. It gives the buyer of the swaption the right but not obligation to enter into an interest rate swap of specified parameters (maturity of the option, notional principal, strike rate, and period of swap). Swaptions are traded over the counter, for both short and long maturity expiry dates, and for wide range of swap maturities.

(iii) The price of a swaption depends on the strike rate, maturity of the option, and expectations about the future volatility of swap rates.

(iv) The swaption premium is expressed as basis points

Uses of swaptions:

(a) Swaptions can be used as an effective tool to swap into or out of fixed rate or floating rate interest obligations, according to a treasurer's expectation on interest rates. Swaptions can also be used for protection if a particular view on the future direction of

interest rates turned out to be incorrect.

(b) Swaptions can be applied in a variety of ways for both active traders as well as for corporate treasures. Swap traders can use them for speculation purposes or to hedge a portion of their swap books. It is a valuable tool when a borrower has decided to do a swap but is not sure of the timing.

(c) Swaptions have become useful tools for hedging embedded option which is common in the natural course of many businesses.

(d) Swaptions are useful for borrowers targeting an acceptable borrowing rate. By paying an upfront premium, a holder of a payer's swaption can guarantee to pay a maximum fixed rate on a swap, thereby hedging his floating rate borrowings.

(e) Swaptions are also useful to those businesses tendering for contracts. A business, would certainly find it useful to bid on a project with full knowledge of the borrowing rate should the contract be won.

Question 29

Explain the significance of LIBOR in international financial transactions.

Answer

LIBOR stands for London Inter Bank Offered Rate. Other features of LIBOR are as follows:

- It is the base rate of exchange with respect to which most international financial transactions are priced.
- It is used as the base rate for a large number of financial products such as options and swaps.
- Banks also use the LIBOR as the base rate when setting the interest rate on loans, savings and mortgages.
- It is monitored by a large number of professionals and private individuals world-wide.

Question 30

Write short notes on the following:

(a) Embedded derivatives

(b) Arbitrage operations

(c) Rolling settlement.

(d) Mention the functions of a stock exchange.

(e) Interest Swap

Answer

(a) Embedded Derivatives: A derivative is defined as a contract that has all the following characteristics:

- Its value changes in response to a specified underlying, e.g. an exchange rate, interest rate or share price;
- It requires little or no initial net investment;
- It is settled at a future date;
- The most common derivatives are currency forwards, futures, options, interest rate swaps etc.

An embedded derivative is a derivative instrument that is embedded in another contract - the host contract. The host contract might be a debt or equity instrument, a lease, an insurance contract or a sale or purchase contract. Derivatives require to be marked-to-market through the income statement, other than qualifying hedging instruments. This requirement on embedded derivatives are designed to ensure that mark-to-market through the income statement cannot be avoided by including - embedding - a derivative in another contract or financial instrument that is not marked-to market through the income statement.

An embedded derivative can arise from deliberate financial engineering and intentional shifting of certain risks between parties. Many embedded derivatives, however, arise inadvertently through market practices and common contracting arrangements. Even purchase and sale contracts that qualify for executory contract treatment may contain embedded derivatives. An embedded derivative causes modification to a contract's cash flow, based on changes in a specified variable.

(b) Arbitrage Operations: Arbitrage is the buying and selling of the same commodity in different markets. A number of pricing relationships exist in the foreign exchange market, whose violation would imply the existence of arbitrage opportunities - the opportunity to make a profit without risk or investment. These transactions refer to advantage derived in the transactions of foreign currencies by taking the benefits of difference in rates between two currencies at two different centers at the same time or of difference between cross rates and actual rates.

For example, a customer can gain from arbitrage operation by purchase of dollars in the local market at cheaper price prevailing at a point of time and sell the same for sterling in the London market. The Sterling will then be used for meeting his commitment to pay the import obligation from London.

(c) Rolling Settlement: SEBI introduced a new settlement cycle known as the 'rolling settlement cycle'. This cycle starts and ends on the same day and the settlement take place on the 'T+5' day, which is 5 business days from the date of the transaction. Hence, the transaction done on Monday will be settled on the following Monday and the

transaction done on Tuesday will be settled on the following -Tuesday and so on. Hence unlike a BSE or NSE weekly settlement cycle, in the rolling settlement cycle, the decision has to be made at the conclusion of the trading session, on the same day, Rolling settlement cycles were introduced in both exchanges on January 12, 2000.

Internationally, most developed countries follow the rolling settlement system. For instance both the US and the UK follow a roiling settlement (T+3) system, while the German stock exchanges follow a (T+2) settlement cycle.

(d) Functions of Stock Exchange are as follows:

1. Liquidity and marketability of securities- Investors can sell their securities whenever they require liquidity.
2. Fair price determination-The exchange assures that no investor will have an excessive advantage over other market participants
3. Source for long term funds-The Stock Exchange provides companies with the facility to raise capital for expansion through selling shares to the investing public.
4. Helps in Capital formation- Accumulation of saving and its utilization into productive use creates helps in capital formation.
5. Creating investment opportunity of small investor- Provides a market for the trading of securities to individuals seeking to invest their saving or excess funds through the purchase of securities.
6. Transparency- Investor makes informed and intelligent decision about the particular stock based on information. Listed companies must disclose information in timely, complete and accurate manner to the Exchange and the public on a regular basis.

(e) Interest Swap: A swap is a contractual agreement between two parties to exchange, or "swap," future payment streams based on differences in the returns to different securities or changes in the price of some underlying item. Interest rate swaps constitute the most common type of swap agreement. In an interest rate swap, the parties to the agreement, termed the swap counterparties, agree to exchange payments indexed to two different interest rates. Total payments are determined by the specified notional principal amount of the swap, which is never actually exchanged. Financial intermediaries, such as banks, pension funds, and insurance companies, as well as non-financial firms use interest rate swaps to effectively change the maturity of outstanding debt or that of an interest-bearing asset.

Swaps grew out of parallel loan agreements in which firms exchanged loans denominated in different currencies.

Question 31

Write a short note on the factors affecting the value of an option.

Answer

There are a number of different mathematical formulae, or models, that are designed to compute the fair value of an option. You simply input all the variables (stock price, time, interest rates, dividends and future volatility), and you get an answer that tells you what an option should be worth. Here are the general effects the variables have on an option's price:

(a) Price of the Underlying: The value of calls and puts are affected by changes in the underlying stock price in a relatively straightforward manner. When the stock price goes up, calls should gain in value and puts should decrease. Put options should increase in value and calls should drop as the stock price falls.

(b) Time: The option's future expiry, at which time it may become worthless, is an important and key factor of every option strategy. Ultimately, time can determine whether your option trading decisions are profitable. To make money in options over the long term, you need to understand the impact of time on stock and option positions.

With stocks, time is a trader's ally as the stocks of quality companies tend to rise over long periods of time. But time is the enemy of the options buyer. If days pass without any significant change in the stock price, there is a decline in the value of the option. Also, the value of an option declines more rapidly as the option approaches the expiration day. That is good news for the option seller, who tries to benefit from time decay, especially during that final month when it occurs most rapidly.

(c) Volatility: The beginning point of understanding volatility is a measure called statistical (sometimes called historical) volatility, or SV for short. SV is a statistical measure of the past price movements of the stock; it tells you how volatile the stock has actually been over a given period of time.

(d) Interest Rate- Another feature which affects the value of an Option is the time value of money. The greater the interest rates, the present value of the future exercise price is less.

Question 32

Write a short note on Forward Rate Agreements.

Answer

A Forward Rate Agreement (FRA) is an agreement between two parties through which a borrower/ lender protects itself from the unfavourable changes to the interest rate. Unlike futures FRAs are not traded on an exchange thus are called OTC product.

Following are main features of FRA.

- Normally it is used by banks to fix interest costs on anticipated future deposits or interest revenues on variable-rate loans indexed to LIBOR.
- It is an off Balance Sheet instrument.

- It does not involve any transfer of principal. The principal amount of the agreement is termed "notional" because, while it determines the amount of the payment, actual exchange of the principal never takes place.
- It is settled at maturity in cash representing the profit or loss. A bank that sells an FRA agrees to pay the buyer the increased interest cost on some "notional" principal amount if some specified maturity of LIBOR is above a stipulated "forward rate" on the contract maturity or settlement date. Conversely, the buyer agrees to pay the seller any decrease in interest cost if market interest rates fall below the forward rate.
- Final settlement of the amounts owed by the parties to an FRA is determined by the formula

$$\text{Payment} = \frac{(N)(RR - FR)(dtm/DY)}{[1 + RR(dtm/DY)]} \times 100$$

Where,

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date; typically LIBOR or MIBOR

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360 or 365 days.

If LIBOR > FR the seller owes the payment to the buyer, and if LIBOR < FR the buyer owes the seller the absolute value of the payment amount determined by the above formula.

- The differential amount is discounted at post change (actual) interest rate as it is settled in the beginning of the period not at the end.

Thus, buying an FRA is comparable to selling, or going short, a Eurodollar or LIBOR futures contract.

Question 33

Explain the meaning of the following relating to Swap transactions:

(i) Plain Vanila Swaps

(ii) Basis Rate Swaps

(iii) Asset Swaps

(iv) Amortising Swaps

Answer

(i) Plain Vanilla Swap: Also called generic swap andit involves the exchange of a fixed rate loan to a floating rate loan. Floating rate basis can be LIBOR, MIBOR, Prime Lending Rate etc.

(ii) Basis Rate Swap: Similar to plain vanilla swap with the difference payments based on the difference between two different variable rates. For example one rate may be 1 month LIBOR and other may be 3-month LIBOR. In other words two legs of swap are floating but measured against different benchmarks.

(iii) Asset Swap: Similar to plain vanilla swaps with the difference that it is the exchange fixed rate investments such as bonds which pay a guaranteed coupon rate with floating rate investments such as an index.

(iv) Amortising Swap: An interest rate swap in which the notional principal for the interest payments declines during the life of the swap. They are particularly useful for borrowers who have issued redeemable bonds or debentures. It enables them to interest rate hedging with redemption profile of bonds or debentures.

Question 34

Define the following Greeks with respect to options:

(i) Delta

(ii) Gamma

(iii) Vega

(iv) Rho

Answer

(i) ***Delta:*** It is the degree to which an option price will move given a small change in the underlying stock price. For example, an option with a delta of 0.5 will move half a rupee for every full rupee movement in the underlying stock.

The delta is often called the hedge ratio i.e. if you have a portfolio short 'n' options (e.g. you have written n calls) then n multiplied by the delta gives you the number of shares (i.e. units of the underlying) you would need to create a riskless position - i.e. a portfolio which would be worth the same whether the stock price rose by a very small amount or fell by a very small amount.

(ii) ***Gamma:*** It measures how fast the delta changes for small changes in the underlying stock price i.e. the delta of the delta. If you are hedging a portfolio using the delta-hedge technique described under "Delta", then you will want to keep gamma as small as possible, the smaller it is the less often you will have to adjust the hedge to maintain a delta neutral position. If gamma is too large, a small change in stock price could wreck

your hedge. Adjusting gamma, however, can be tricky and is generally done using options.

(iii) ***Vega:*** Sensitivity of option value to change in volatility. Vega indicates an absolute change in option value for a one percentage change in volatility.

(iv) ***Rho:*** The change in option price given a one percentage point change in the risk-free interest rate. It is sensitivity of option value to change in interest rate. Rho indicates the absolute change in option value for a one percent change in the interest rate.

Question 35

Following information is available in respect of dividend, market price and market condition after one year.

Market condition	*Probability*	*Market Price* ₹	*Dividend per share* ₹
Good	*0.25*	*115*	*9*
Normal	*0.50*	*107*	*5*
Bad	*0.25*	*97*	*3*

The existing market price of an equity share is ₹ 106 (F.V. Re. 1), which is cum 10% bonus debenture of ₹ 6 each, per share. M/s. X Finance Company Ltd. had offered the buy-back of debentures at face value.

Find out the expected return and variability of returns of the equity shares.

And also advise-Whether to accept buy back after?

Answer

The Expected Return of the equity share may be found as follows:

Market Condition	*Probability*	*Total Return*	*Cost (*)*	*Net Return*
Good	0.25	₹ 124	₹ 100	₹ 24
Normal	0.50	₹ 112	₹ 100	₹ 12
Bad	0.25	₹ 100	₹ 100	₹ 0

Expected Return = $(24 \times 0.25) + (12 \times 0.50) + (0 \times 0.25)$

$$= \left(\frac{12}{100}\right) \times 100 = 12\%$$

The variability of return can be calculated in terms of standard deviation.

VSD = $0.25\ (24 - 12)^2 + 0.50\ (12 - 12)^2 + 0.25\ (0 - 12)^2$

= $0.25\ (12)^2 + 0.50\ (0)^2 + 0.25\ (-12)^2$

= 36 + 0 + 36

SD = $\sqrt{72}$

SD = 8.485 or say 8.49

(*) The present market price of the share is ₹ 106 cum bonus 10% debenture of ₹ 6 each; hence the net cost is ₹ 100 (There is no cash loss or any waiting for refund of debenture amount).

M/s X Finance company has offered the buyback of debenture at face value. There is reasonable 10% rate of interest compared to expected return 12% from the market. Considering the dividend rate and market price the creditworthiness of the company seems to be very good. The decision regarding buy-back should be taken considering the maturity period and opportunity in the market. Normally, if the maturity period is low say up to 1 year better to wait otherwise to opt buy back option.

Question 36

The share of X Ltd. is currently selling for ₹ 300. Risk free interest rate is 0.8% per month. A three months futures contract is selling for ₹ 312. Develop an arbitrage strategy and show what your riskless profit will be 3 month hence assuming that X Ltd. will not pay any dividend in the next three months.

Answer

The appropriate value of the 3 months futures contract is –

Fo = ₹ 300 $(1.008)^3$ = ₹ 307.26

Since the futures price exceeds its appropriate value it pays to do the following:-

Action	Initial Cash flow	Cash flow at time T (3 months)
Borrow ₹ 300 now and repay with interest after 3 months	+ ₹ 300	- ₹ 300 $(1.008)^3$ = - ₹ 307.26
Buy a share	- ₹ 300	ST
Sell a futures contract (Fo = 312/-)	0	₹ 312 – ST
Total	₹ 0	₹ 4.74

Such an action would produce a risk less profit of ₹ 4.74.

Question 37

A Mutual Fund is holding the following assets in ₹ Crores :

Investments in diversified equity shares	*90.00*
Cash and Bank Balances	*10.00*
	100.00

The Beta of the portfolio is 1.1. The index future is selling at 4300 level. The Fund Manager apprehends that the index will fall at the most by 10%. How many index futures he should short for perfect hedging? One index future consists of 50 units.

Substantiate your answer assuming the Fund Manager's apprehension will materialize.

Answer

Number of index future to be sold by the Fund Manager is:

$$\frac{1.1\times 90,00,00,000}{4,300\times 50} = 4,605$$

Justification of the answer:

Loss in the value of the portfolio if the index falls by 10% is ₹ $\frac{11}{100}$x90 Crore = ₹ 9.90 Crore.

Gain by short covering of index future is: $\frac{0.1\times 4,300\times 50\times 4,605}{1,00,00,000}$ = 9.90 Crore

This justifies the answer cash is not part of the portfolio.

Question 38

A trader is having in its portfolio shares worth ₹ 85 lakhs at current price and cash ₹ 15 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%.

Determine:

(i) Current portfolio beta

(ii) Portfolio beta after 3 months if the trader on current date goes for long position on ₹ 100 lakhs Nifty futures.

Answer

(i) Current portfolio

Current Beta for share = 1.6

Beta for cash = 0

Current portfolio beta = 0.85 x 1.6 + 0 x 0.15 = 1.36

(ii) Portfolio beta after 3 months:

$$\text{Beta for portfolio of shares} = \frac{\text{Change in value of portfolio of share}}{\text{Change in value of market portfolio (Index)}}$$

$$1.6 = \frac{0.032}{\text{Change in value of market portfolio (Index)}}$$

Change in value of market portfolio (Index) = (0.032 / 1.6) x 100 = 2%

Position taken on 100 lakh Nifty futures : Long

Value of index after 3 months = ₹ 100 lakh x (100 - 0.02)
= ₹ 98 lakh

Mark-to-market paid = ₹ 2 lakh

Cash balance after payment of mark-to-market = ₹ 13 lakh

Value of portfolio after 3 months = ₹85 lakh x (1 - 0.032) + ₹13 lakh
= ₹95.28 lakh

Change in value of portfolio = $\frac{₹100 \text{ lakh} - ₹95.28 \text{ lakh}}{₹100 \text{ lakh}}$ = 4.72%

Portfolio beta = 0.0472/0.02 = 2.36

Question 39

The 6-months forward price of a security is ₹208.18. The borrowing rate is 8% per annum payable with monthly rests. What should be the spot price?

Answer

Calculation of spot price

The formula for calculating forward price is:

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

Where A = Forward price
P = Spot Price
r = rate of interest
n = no. of compoundings
t = time

Using the above formula,

$208.18 = P (1 + 0.08/12)^6$

Or 208.18 = P x 1.0409

P = 208.18/1.0409 = 200

Hence, the spot price should be ₹200.

Question 40

BSE	*5000*
Value of portfolio	*₹10,10,000*
Risk free interest rate	*9% p.a.*
Dividend yield on Index	*6% p.a.*
Beta of portfolio	*1.5*

We assume that a future contract on the BSE index with four months maturity is used to hedge the value of portfolio over next three months. One future contract is for delivery of 50 times the index.

Based on the above information calculate:

(i) Price of future contract.

(ii) The gain on short futures position if index turns out to be 4,500 in three months.

Answer

(i) Current future price of the index = $5000 + 5000\ (0.09-0.06)\frac{4}{12}$ = 5000+ 50= 5,050

∴ Price of the future contract = ₹50 x 5,050 = ₹2,52,500

(ii) Hedge ratio = $\frac{1010000}{252500}\times 1.5$ = 6 contracts

Index after there months turns out to be 4500

Future price will be = $4500 + 4500\ (0.09-0.06) \times\frac{1}{12}$ = 4,511.25

Therefore, Gain from the short futures position is = 6 x (5050 – 4511.25) x 50
= ₹1,61,625

Note: Alternatively we can also use daily compounding (exponential) formula.

Question 41

The following data relate to Anand Ltd.'s share price:

Current price per share	*₹1,800*
6 months future's price/share	*₹1,950*

Assuming it is possible to borrow money in the market for transactions in securities at 12% per annum, you are required:

(i) to calculate the theoretical minimum price of a 6-months forward purchase; and

(ii) to explain arbitrate opportunity.

Answer

Anand Ltd

(i) Calculation of theoretical minimum price of a 6 months forward contract-

Theoretical minimum price = ₹ 1,800 + (₹ 1,800 x 12/100 x 6/12) = ₹ 1,908

(ii) Arbitrage Opportunity-

The arbitrageur can borrow money @ 12 % for 6 months and buy the shares at ₹ 1,800. At the same time he can sell the shares in the futures market at ₹ 1,950. On the expiry date 6 months later, he could deliver the share and collect ₹ 1,950 pay off ₹ 1,908 and record a profit of ₹ 42 (₹ 1,950 – ₹ 1,908)

Question 42

Calculate the price of 3 months PQR futures, if PQR (FV ₹10) quotes ₹220 on NSE and the three months future price quotes at ₹230 and the one month borrowing rate is given as 15 percent and the expected annual dividend yield is 25 percent per annum payable before expiry. Also examine arbitrage opportunities.

Answer

Future's Price = Spot + cost of carry – Dividend

F = 220 + 220 × 0.15 × 0.25 – 0.25** × 10 = 225.75

** Entire 25% dividend is payable before expiry, which is ₹2.50.

Thus we see that futures price by calculation is ₹225.75 which is quoted at ₹230 in the exchange.

Analysis:

Fair value of Futures less than Actual futures Price:

Futures Overvalued Hence it is advised to sell. Also do Arbitraging by buying stock in the cash market.

Step I

He will buy PQR Stock at ₹220 by borrowing at 15% for 3 months. Therefore, his outflows are:

Cost of Stock	220.00
Add: Interest @ 15 % for 3 months i.e. 0.25 years (220 × 0.15 × 0.25)	8.25
Total Outflows (A)	228.25

Step II

He will sell March 2000 futures at ₹230. Meanwhile he would receive dividend for his stock.

Hence his inflows are 230.00

Sale proceeds of March 2000 futures	2.50
Total inflows (B)	232.50

Inflow – Outflow = Profit earned by Arbitrageur

= 232.50 – 228.25 = 4.25

Question 43

Sensex futures are traded at a multiple of 50. Consider the following quotations of Sensex futures in the 10 trading days during February, 2009:

Day	*High*	*Low*	*Closing*
4-2-09	*3306.4*	*3290.00*	*3296.50*
5-2-09	*3298.00*	*3262.50*	*3294.40*
6-2-09	*3256.20*	*3227.00*	*3230.40*
7-2-09	*3233.00*	*3201.50*	*3212.30*
10-2-09	*3281.50*	*3256.00*	*3267.50*
11-2-09	*3283.50*	*3260.00*	*3263.80*
12-2-09	*3315.00*	*3286.30*	*3292.00*
14-2-09	*3315.00*	*3257.10*	*3309.30*
17-2-09	*3278.00*	*3249.50*	*3257.80*
18-2-09	*3118.00*	*3091.40*	*3102.60*

Abshishek bought one sensex futures contract on February, 04. The average daily absolute change in the value of contract is ₹ 10,000 and standard deviation of these changes is ₹ 2,000. The maintenance margin is 75% of initial margin.

You are required to determine the daily balances in the margin account and payment on margin calls, if any.

Answer

Initial Margin = $\mu + 3\sigma$

Where μ = Daily Absolute Change

σ = Standard Deviation

Accordingly

Initial Margin = ₹ 10,000 + ₹ 6,000 = ₹ 16,000

Maintenance margin = ₹ 16,000 x 0.75 = ₹ 12,000

Day	Changes in future Values (₹)	Margin A/c (₹)	Call Money (₹)
4/2/09	-	16000	-
5/2/09	50 x (3294.40 - 3296.50) = -105	15895	-

6/2/09	50 x (3230.40 - 3294.40)= -3200	12695	-
7/2/09	50 x (3212.30 - 3230.40)= -905	16000	4210
10/2/09	50x(3267.50 - 3212.30)= 2760	18760	-
11/2/09	50x(3263.80 - 3267.50)= -185	18575	-
12/2/09	50x(3292 - 3263.80) =1410	19985	-
14/2/09	50x(3309.30 - 3292)=865	20850	-
17/2/09	50x(3257.80 - 3309.30)=-2575	18275	-
18/2/09	50x(3102.60 - 3257.80)=-7760	16000	5485

Question 44

On 31-8-2011, the value of stock index was ₹ 2,200. The risk free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	***Dividend Paid p.a.***
January	*3%*
February	*4%*
March	*3%*
April	*3%*
May	*4%*
June	*3%*
July	*3%*
August	*4%*
September	*3%*
October	*3%*
November	*4%*
December	*3%*

Assuming that interest is continuously compounded daily, find out the future price of contract deliverable on 31-12-2011. Given: $e^{0.01583} = 1.01593$

Answer

The duration of future contract is 4 months. The average yield during this period will be:

$$\frac{3\% + 3\% + 4\% + 3\%}{4} = 3.25\%$$

As per Cost to Carry model the future price will be

$F = Se^{(r_f - D)t}$

Where S = Spot Price

r_f = Risk Free interest

D = Dividend Yield

t = Time Period

Accordingly, future price will be

= ₹ 2,200 $e^{(0.08 - 0.0325)\times 4/12}$ = ₹ 2,200 $e^{0.01583}$

= ₹ 2,200 x 1.01593 = ₹ 2235.05

Question 45

Mr. A purchased a 3 month call option for 100 shares in XYZ Ltd. at a premium of ₹ 30 per share, with an exercise price of ₹ 550. He also purchased a 3 month put option for 100 shares of the same company at a premium of ₹ 5 per share with an exercise price of ₹ 450. The market price of the share on the date of Mr. A's purchase of options, is ₹ 500. Calculate the profit or loss that Mr. A would make assuming that the market price falls to ₹ 350 at the end of 3 months.

Answer

Since the market price at the end of 3 months falls to ₹ 350 which is below the exercise price under the call option, the call option will not be exercised. Only put option becomes viable.

	₹
The gain will be:	
Gain per share (₹450 – ₹ 350)	100
Total gain per 100 shares	10,000
Cost or premium paid (₹ 30 x 100) + (₹ 5 x 100)	3,500
Net gain	6,500

Question 46

Sumana wanted to buy shares of EIL which has a range of ₹ 411 to ₹ 592 a month later. The present price per share is ₹ 421. Her broker informs her that the price of this share can sore up to ₹ 522 within a month or so, so that she should buy a one month CALL of EIL. In order to be prudent in buying the call, the share price should be more than or at least ₹ 522 the assurance of which could not be given by her broker.

Though she understands the uncertainty of the market, she wants to know the probability of attaining the share price ₹ 592 so that buying of a one month CALL of EIL at the execution price of ₹ 522 is justified. Advice her. Take the risk free interest to be 3.60% and $e^{0.036} = 1.037$.

Answer

$$p = \frac{e^{rt} - d}{u - d}$$

$e^{rt} = e^{0.036}$

d = 411/421 = 0.976

u = 592/421 = 1.406

$$p = \frac{e^{0.036} - 0.976}{1.406 - 0.976} = \frac{1.037 - 0.976}{0.43} = \frac{0.061}{0.43} = 0.1418$$

Thus probability of rise in price 0.1418

Question 47

Mr. Dayal is interested in purchasing equity shares of ABC Ltd. which are currently selling at ₹ 600 each. He expects that price of share may go upto ₹ 780 or may go down to ₹ 480 in three months. The chances of occurring such variations are 60% and 40% respectively. A call option on the shares of ABC Ltd. can be exercised at the end of three months with a strike price of ₹ 630.

(i) What combination of share and option should Mr. Dayal select if he wants a perfect hedge?

(ii) What should be the value of option today (the risk free rate is 10% p.a.)?

(iii) What is the expected rate of return on the option?

Answer

(i) To compute perfect hedge we shall compute Hedge Ratio (Δ) as follows:

$$\Delta = \frac{C_1 - C_2}{S_1 - S_2} = \frac{150 - 0}{780 - 480} = \frac{150}{300} = 0.50$$

Mr. Dayal should purchase 0.50 share for every 1 call option.

(ii) Value of Option today

If price of share comes out to be ₹780 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 780)	₹ 390
Loss on account of Short Position (₹ 780 – ₹ 630)	₹ 150
	₹ 240

If price of share comes out to be ₹ 480 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 480)	₹ 240

Accordingly, Premium say P shall be computed as follows:

(₹ 300 – P) 1.025 = ₹ 240

P = ₹65.85

(iii) Expected Return on the Option

Expected Option Value = (₹ 780 – ₹ 630) × 0.60 + ₹ 0 × 0.40 = ₹ 90

Expected Rate of Return = $\frac{90-65.85}{65.85}\times 100$ = 36.67%

Question 48

The market received rumour about ABC corporation's tie-up with a multinational company. This has induced the market price to move up. If the rumour is false, the ABC corporation stock price will probably fall dramatically. To protect from this an investor has bought the call and put options.

He purchased one 3 months call with a striking price of ₹42 for ₹2 premium, and paid Re.1 per share premium for a 3 months put with a striking price of ₹40.

(i) Determine the Investor's position if the tie up offer bids the price of ABC Corporation's stock up to ₹43 in 3 months.

(ii) Determine the Investor's ending position, if the tie up programme fails and the price of the stocks falls to ₹36 in 3 months.

Answer

Cost of Call and Put Options

= (₹ 2 per share) x (100 share call) + (₹ 1 per share) x (100 share put)

= ₹ 2 x 100 + 1 x 100

= ₹ 300

(i) Price increases to ₹43. Since the market price is higher than the strike price of the call, the investor will exercise it.

Ending position = (- ₹ 300 cost of 2 option) + (₹ 1 per share gain on call) x 100

= - ₹ 300 + 100

Net Loss = - ₹ 200

(ii) The price of the stock falls to ₹36. Since the market price is lower than the strike price, the investor may not exercise the call option.

Ending Position = (- ₹300 cost of 2 options) + (₹4 per stock gain on put) x 100

= - ₹300 + 400

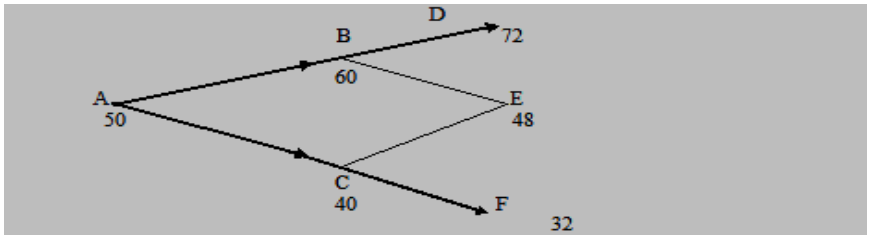
Gain = ₹100

Question 49

Consider a two year American call option with a strike price of ₹ 50 on a stock the current price of which is also ₹ 50. Assume that there are two time periods of one year and in each year the stock price can move up or down by equal percentage of 20%. The risk free interest rate is 6%. Using binominal option model, calculate the probability of price moving up and down. Also draw a two step binomial tree showing prices and payoffs at each node.

Answer

Stock prices in the two step Binominal tree

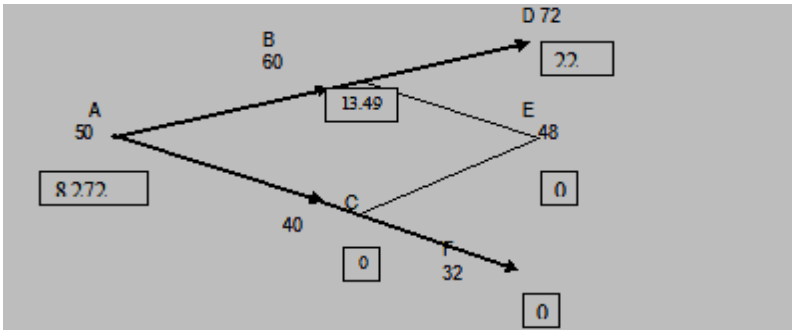


Using the single period model, the probability of price increase is

$$P = \frac{R-d}{u-d} = \frac{1.06-0.80}{1.20-0.80} = \frac{0.26}{0.40} = 0.65$$

therefore the p of price decrease = 1-0.65 = 0.35

The two step Binominal tree showing price and pay off



The value of an American call option at nodes D, E and F will be equal to the value of European option at these nodes and accordingly the call values at nodes D, E and F will be 22, 0 and 0 using the single period binomial model the value of call option at node B is

$$C = \frac{Cup + Cd(1-p)}{R} = \frac{22 \times 0.65 + 0 \times 0.35}{1.06} = 13.49$$

At node B the payoff from early exercise will pay ₹ 10, which is less than the value calculated using the single period binomial model. Hence at node B, early exercise is not preferable and

the value of American option at this node will be ₹ 13.49. If the value of an early exercise had been higher it would have been taken as the value of option. The value of option at node 'A' is

$$\frac{13.49 \times 0.65 + 0 \times 0.35}{1.06} = 8.272$$

Question 50

The current market price of an equity share of Penchant Ltd is ₹ 420. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 500 and ₹ 400 respectively. If the risk free rate of interest be 8% p.a., what should be the value of a 3 months Call option under the "Risk Neutral" method at the strike rate of ₹ 450 ? Given $e^{0.02}$ = 1.0202

Answer

Let the probability of attaining the maximum price be p

(500 - 420) x p+(400 - 420) x (1-p) = 420 x ($e^{0.02}$-1)

or, 80p - 20(1 - p) = 420 x 0.0202

or, 80p – 20 + 20p = 8.48

or, 100p = 28.48

p= 0.2848

The value of Call Option in ₹ $= \frac{0.2848x(500-450)}{1.0202} = \frac{0.2848x50+0.7152\times 0}{1.0202} = 13.96$

Question 51

Mr. X established the following spread on the Delta Corporation's stock :

(i) Purchased one 3-month call option with a premium of ₹ 30 and an exercise price of ₹ 550.

(ii) Purchased one 3-month put option with a premium of ₹ 5 and an exercise price of ₹ 450.

Delta Corporation's stock is currently selling at ₹ 500. Determine profit or loss, if the price of Delta Corporation's :

(i) remains at ₹500 after 3 months.

(ii) falls at ₹350 after 3 months.

(iii) rises to ₹600.

Assume the size option is 100 shares of Delta Corporation.

Answer

(i) Total premium paid on purchasing a call and put option

= (₹30 per share × 100) + (₹5 per share × 100).

= 3,000 + 500 = ₹3,500

In this case, X exercises neither the call option nor the put option as both will result in a loss for him.

Ending value = - ₹3,500 + zero gain = - ₹3,500

i.e Net loss = ₹3,500

(ii) Since the price of the stock is below the exercise price of the call, the call will not be exercised. Only put is valuable and is exercised.

Total premium paid = ₹3,500

Ending value = – ₹3,500 + ₹[(450 – 350) × 100] = – ₹3,500 + ₹10,000 = ₹6,500

∴ Net gain = ₹6,500

(iii) In this situation, the put is worthless, since the price of the stock exceeds the put's exercise price. Only call option is valuable and is exercised.

Total premium paid = ₹3,500

Ending value = -3,500 +[(600 – 550) × 100]

Net Gain = -3,500 + 5,000 = ₹1,500

Question 52

Equity share of PQR Ltd. is presently quoted at ₹ 320. The Market Price of the share after 6 months has the following probability distribution:

Market Price	*₹ 180*	*260*	*280*	*320*	*400*
Probability	*0.1*	*0.2*	*0.5*	*0.1*	*0.1*

A put option with a strike price of ₹ 300 can be written.

You are required to find out expected value of option at maturity (i.e. 6 months)

Answer

Expected Value of Option

(300 – 180) X 0.1	12
(300 – 260) X 0.2	8
(300 – 280) X 0.5	10
(300 – 320) X 0.1	Not Exercised*
(300 – 400) X 0.1	Not Exercised*
	30

* If the strike price goes beyond ₹ 300, option is not exercised at all.

In case of Put option, since Share price is greater than strike price Option Value would be zero.

Question 53

You as an investor had purchased a 4 month call option on the equity shares of X Ltd. of ₹ 10, of which the current market price is ₹ 132 and the exercise price ₹ 150. You expect the price to range between ₹ 120 to ₹ 190. The expected share price of X Ltd. and related probability is given below:

Expected Price (₹)	*120*	*140*	*160*	*180*	*190*
Probability	*.05*	*.20*	*.50*	*.10*	*.15*

Compute the following:

(1) Expected Share price at the end of 4 months.

(2) Value of Call Option at the end of 4 months, if the exercise price prevails.

(3) In case the option is held to its maturity, what will be the expected value of the call option?

Answer

(1) Expected Share Price

= ₹120X 0.05 + ₹140X 0.20 + ₹160X 0.50 + ₹180X 0.10 + ₹190X 0.15

= ₹6 + ₹28 + ₹80 + ₹18 + ₹28.50 = ₹160.50

(2) Value of Call Option

= ₹150 - ₹150 = Nil

(3) If the option is held till maturity the expected Value of Call Option

Expected price (X)	Value of call (C)	Probability (P)	CP
₹ 120	0	0.05	0
₹ 140	0	0.20	0
₹ 160	₹ 10	0.50	₹ 5
₹ 180	₹ 30	0.10	₹ 3
₹ 190	₹ 40	0.15	₹ 6
Total			₹ 14

Alternatively, it can also be calculated as follows:

Expected Value of Option

(120 – 150) X 0.1 Not Exercised*

(140 – 150) X 0.2 Not Exercised*

(160 – 150) X 0.5 5

(180 – 150) X 0.1	3
(190 – 150) X 0.15	6
	14

* If the strike price goes below ₹ 150, option is not exercised at all.

Question 54

The equity share of VCC Ltd. is quoted at ₹ 210. A 3-month call option is available at a premium of ₹ 6 per share and a 3-month put option is available at a premium of ₹ 5 per share. Ascertain the net payoffs to the optionholder of a call option and a put option.

(i) the strike price in both cases in ₹ 220; and

(ii) the share price on the exercise day is ₹ 200,210,220,230,240.

Also indicate the price range at which the call and the put options may be gainfully exercised.

Answer

Net payoff for the holder of the call option

					(₹)
Share price on exercise day	200	210	220	230	240
Option exercise	No	No	No	Yes	Yes
Outflow (Strike price)	Nil	Nil	Nil	220	220
Out flow (premium)	6	6	6	6	6
Total Outflow	6	6	6	226	226
Less inflow (Sales proceeds)	-	-	-	230	240
Net payoff	-6	-6	-6	4	14

Net payoff for the holder of the put option

					(₹)
Share price on exercise day	200	210	220	230	240
Option exercise	Yes	Yes	No	No	No
Inflow (strike price)	220	220	Nil	Nil	Nil
Less outflow (purchase price)	200	210	-	-	-
Less outflow (premium)	5	5	5	5	5
Net Payoff	15	5	-5	-5	-5

The loss of the option holder is restricted to the amount of premium paid. The profit (positive payoff) depends on the difference between the strike price and the share price on the exercise day.

Question 55

A call and put exist on the same stock each of which is exercisable at ₹60. They now trade for:

Market price of Stock or stock index	*₹55*
Market price of call	*₹ 9*
Market price of put	*₹ 1*

Calculate the expiration date cash flow, investment value, and net profit from:

(i) *Buy 1.0 call*

(ii) Write 1.0 call

(iii) Buy 1.0 put

(iv) Write 1.0 put

for expiration date stock prices of ₹50, ₹55, ₹60, ₹65, ₹70.

Answer

Expiration date cash flows

Stock Prices	₹ 50	₹ 55	₹ 60	₹ 65	₹ 70
Buy 1.0 call	0	0	0	-60	-60
Write 1.0 call	0	0	0	60	60
Buy 1.0 put	60	60	0	0	0
Write 1.0 put	-60	-60	0	0	0

Expiration date investment value

Stock Prices	₹ 50	₹ 55	₹ 60	₹ 65	₹ 70
Buy 1.0 call	0	0	0	5	10
Write 1.0 call	0	0	0	-5	-10
Buy 1.0 put	10	5	0	0	0
Write 1.0 put	-10	-5	0	0	0

Expiration date net profits

Stock Prices	₹ 50	₹ 55	₹ 60	₹ 65	₹ 70
Buy 1.0 call	-9	-9	-9	-4	1
Write 1.0 call	9	9	9	4	-1
Buy 1.0 put	9	4	-1	-1	-1
Write 1.0 put	-9	-4	1	1	1

Question 56

From the following data for certain stock, find the value of a call option:

Price of stock now	=	*₹ 80*
Exercise price	=	*₹ 75*
Standard deviation of continuously compounded annual return	=	*0.40*
Maturity period	=	*6 months*
Annual interest rate	=	*12%*

Given

Number of S.D. from Mean, (z)	*Area of the left or right (one tail)*
0.25	*0.4013*
0.30	*0.3821*
0.55	*0.2912*
0.60	*0.2743*

$e^{0.12x0.5}$ = *1.062*

In 1.0667 = *0.0646*

Answer

Applying the Black Scholes Formula,

Value of the Call option now:

The Formula $C = SN(d_1) - Ke^{(-rt)} N(d_2)$

$$d_1 = \frac{\ln(S/K) + (r + \sigma^2/2)t}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

Where,

C = Theoretical call premium

S = Current stock price

t = time until option expiration

K = option striking price

r = risk-free interest rate

N = Cumulative standard normal distribution

e = exponential term

σ = Standard deviation of continuously compounded annual return.

ln = natural logarithim

$$d_1 = \frac{\ln(1.0667) + (12\% + 0.08)0.5}{0.40\sqrt{0.5}}$$

$$= \frac{0.0646 + (0.2)0.5}{0.40 \times 0.7071}$$

$$= \frac{0.1646}{0.2828}$$

= 0.5820

d_2 = 0.5820 – 0.2828 = 0.2992

$N(d_1)$ = N (0.5820)

$N(d_2)$ = N (0.2992)

Price = $SN(d_1) - Ke^{(-rt)} N(d_2)$

= 80 x $N(d_1)$ – (75/1.062) x $N(d_2)$

Value of option

$$= 80\ N(d_1) - \frac{75}{1.062} \times N(d_2)$$

$N(d_1)$ = N (0.5820) = 0.7197

$N(d_2)$ = N(0.2992) = 0.6176

$$\text{Price} = 80 \times 0.7197 - \frac{75}{1.062} \times 0.6176$$

= 57.57 – 70.62 x 0.6176

= 57.57 – 43.61

= ₹13.96

Teaching Notes:

Students may please note following important point:

Values of $N(d_1)$ and $N(d_2)$ have been computed by interpolating the values of areas under respective numbers of SD from Mean (Z) given in the question.

It may also be possible that in question paper areas under Z may be mentioned otherwise e.g. Cumulative Area or Area under Two tails. In such situation the areas of the respective Zs given in the question will be as follows:

Cumulative Area

Number of S.D. from Mean, (z)	*Cumulative Area*
0.25	*0.5987*
0.30	*0.6179*
0.55	*0.7088*
0.60	*0.7257*

Two tail area

Number of S.D. from Mean, (z)	*Area of the left and right (two tail)*
0.25	*0.8026*
0.30	*0.7642*
0.55	*0.5823*
0.60	*0.5485*

Question 57

Following information is available for X Company's shares and Call option:

Current share price	*₹185*
Option exercise price	*₹170*
Risk free interest rate	*7%*
Time of the expiry of option	*3 years*
Standard deviation	*0.18*

Calculate the value of option using Black-Scholes formula.

Answer

$$d_1 = \frac{\ln(S/E) + (r + \frac{\sigma^2}{2})t}{\sigma\sqrt{t}}$$

$$= \frac{\ln(185/170) + (0.07 + \frac{0.18^2}{2})3}{0.18\sqrt{3}}$$

$$= \frac{\ln 1.0882 + (0.07 + 0.0162)3}{0.18\sqrt{3}}$$

$$= \frac{0.08452 + 0.2586}{0.18\sqrt{3}}$$

$$= \frac{0.34312}{0.31177}$$

d_1 = 1.1006

d_2 = $d_1 - \sigma\sqrt{t}$

= 1.1006 – 0.31177 = 0.7888

$N(d_1)$ = 0.8644 (from table)

$N(d_2)$ = 0.7848

Value of option = $V_s N(d_1) - \frac{E}{e^{rt}} N(d_2)$ = 185 (0.8644) - $\frac{170}{e^{0.21}}$ (0.7848)

= 159.914 - $\frac{170}{1.2336}$ × 0.7848

= 159.91 – 108.15 = ₹51.76

Question 58

Suppose a dealer quotes 'All-in-cost' for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is ₹ 5,00,000.

(i) Calculate semi-annual fixed payment.

(ii) Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 6% on the effective date of swap.

In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?

Generic swap is based on 30/360 days basis.

Answer

(i) Semi-annual fixed payment

= (N) (AIC) (Period)

Where N = Notional Principal amount = ₹5,00,000

AIC = All-in-cost = 8% = 0.08

= 5,00,000 × 0.08 $\left(\frac{180}{360}\right)$

= 5,00,000 × 0.08 (0.5)

= 5,00,000 × 0.04 = ₹20,000/-

(ii) Floating Rate Payment

$= N (LIBOR) \left(\frac{dt}{360}\right)$

$= 5,00,000 \times 0.06 \times \frac{181}{360}$

= 5,00,000 × 0.06 (0.503) or 5,00,000 × 0.06 (0.502777)

= 5,00,000 × 0.03018 or 0.30166 = ₹15,090 or 15,083

Both are correct

(iii) Net Amount

= (i) – (ii)

= ₹20,000 – ₹15,090 = ₹4,910

or = ₹20,000 – ₹15,083 = ₹4,917

Question 59

A Inc. and B Inc. intend to borrow $200,000 and $200,000 in ¥ respectively for a time horizon of one year. The prevalent interest rates are as follows:

Company	*¥ Loan*	*$ Loan*
A Inc	*5%*	*9%*
B Inc	*8%*	*10%*

The prevalent exchange rate is $1 = ¥120.

They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ¥ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

Answer

Opportunity gain of A Inc under currency swap	**Receipt**	**Payment**	**Net**
Interest to be remitted to B. Inc in $ 2,00,000x9%=$18,000 Converted into ($18,000x¥120)		¥21,60,000	
Interest to be received from B. Inc in $ converted into ¥ (6%x$2,00,000 x ¥120)	¥14,40,000	-	
Interest payable on ¥ loan	-	¥12,00,000	
	¥14,40,000	¥33,60,000	

Net Payment	¥19,20,000	-	
	¥33,60,000	¥33,60,000	
$ equivalent paid ¥19,20,000 x(1/¥120)			$16,000
Interest payable without swap in $			$18,000
Opportunity gain in $			$ 2,000

Opportunity gain of B inc under currency swap	Receipt	Payment	Net
Interest to be remitted to A. Inc in ($ 2,00,000 x 6%)		$12,000	
Interest to be received from A. Inc in ¥ converted into $ =¥21,60,000/¥120	$18,000		
Interest payable on $ loan@10%	-	$20,000	
	$18,000	$32,000	
Net Payment	$14,000	-	
	$32,000	$32,000	
¥ equivalent paid $14,000 X ¥120			¥16,80,000
Interest payable without swap in ¥ ($2,00,000X¥120X8%)			¥19,20,000
Opportunity gain in ¥			¥ 2,40,000

Alternative Solution

Cash Flows of A Inc

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings	$2,00,000 x ¥120	+ ¥240,00,000
Swap		- ¥240,00,000
Swap		+$2,00,000
Net Amount		+$2,00,000

(ii) At the time of exchange of principal amount

Transactions		Cash Flows
Interest to the lender	¥240,00,000X5%	¥12,00,000
Interest Receipt from B Inc.	¥2,00,000X120X6%	¥14,40,000
Net Saving (in $)	¥2,40,000/¥120	$2,000
Interest to B Inc.	$2,00,000X9%	-$18,000
Net Interest Cost		-$16,000

A Inc. used $2,00,000 at the net cost of borrowing of $16,000 i.e. 8%. If it had not opted for swap agreement the borrowing cost would have been 9%. Thus there is saving of 1%.

Cash Flows of B Inc

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings		+ $2,00,000
Swap		- $2,00,000
Swap	$2,00,000X¥120	+¥240,00,000
Net Amount		+¥240,00,000

(ii) At the time of exchange of principal amount

Transactions		Cash Flows
Interest to the lender	$2,00,000X10%	- $20,000
Interest Receipt from A Inc.		+$18,000
Net Saving (in ¥)	-$2,000X¥120	- ¥2,40,000
Interest to A Inc.	$2,00,000X6%X¥120	- ¥14,40,000
Net Interest Cost		- ¥16,80,000

B Inc. used ¥240,00,000 at the net cost of borrowing of ¥16,80,000 i.e. 7%. If it had not opted for swap agreement the borrowing cost would have been 8%. Thus there is saving of 1%.

Question 60

Derivative Bank entered into a plain vanilla swap through on OIS (Overnight Index Swap) on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 2nd August, 2010 and was to commence on 3rd August, 2010 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

7.75%,8.15%,8.12%,7.95%,7.98%,8.15%.

If Derivative Bank received ₹ 317 net on settlement, calculate Fixed rate and interest under both legs.

Notes:

(i) Sunday is Holiday.

(ii) Work in rounded rupees and avoid decimal working.

Answer

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	10,00,00,000	7.75	21,233
Wednesday	10,00,21,233	8.15	22,334
Thursday	10,00,43,567	8.12	22,256
Friday	10,00,65,823	7.95	21,795
Saturday & Sunday (*)	10,00,87,618	7.98	43,764
Monday	10,01,31,382	8.15	22,358
Total Interest @ Floating			1,53,740
Less: Net Received			317
Expected Interest @ fixed			1,53,423
Thus Fixed Rate of Interest			0.07999914
Approx.			8%

(*) i.e. interest for two days.

Note: Alternatively, answer can also be calculated on the basis of 360 days in a year.

Question 61

M/s. Parker & Co. is contemplating to borrow an amount of ₹ 60 crores for a period of 3 months in the coming 6 month's time from now. The current rate of interest is 9% p.a., but it may go up in 6 month's time. The company wants to hedge itself against the likely increase in interest rate.

The Company's Bankers quoted an FRA (Forward Rate Agreement) at 9.30% p.a.

What will be the effect of FRA and actual rate of interest cost to the company, if the actual rate of interest after 6 months happens to be (i) 9.60% p.a. and (ii) 8.80% p.a.?

Answer

Final settlement amount shall be computed by using formula:

$$= \frac{(N)(RR - FR)(dtm/DY)}{[1 + RR(dtm/DY)]}$$

Where,

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date;

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360or 365 days.

Accordingly,

If actual rate of interest after 6 months happens to be 9.60%

$$= \frac{(₹60\,crore)(0.096-0.093)(3/12)}{[1+0.096(3/12)]}$$

$$= \frac{(₹60\,crore)(0.00075)}{1.024} = ₹\ 4,39,453$$

Thus banker will pay Parker & Co. a sum of ₹ 4,39,453

If actual rate of interest after 6 months happens to be 8.80%

$$= \frac{(₹60\,crore)(0.088-0.093)(3/12)}{[1+0.088(3/12)]}$$

$$= \frac{(₹60\,crore)(-0.00125)}{1.022} = -₹\ 7,33,855$$

Thus Parker & Co. will pay banker a sum of ₹ 7,33,855

Note: It might be possible that students may solve the question on basis of days instead of months (as considered in above calculations). Further there may be also possibility that the FRA days and Day Count convention may be taken in various plausible combinations such as 90 days/360 days, 90 days/ 365 days, 91 days/360 days or 91 days/365days.

Question 62

The following market data is available:

Spot USD/JPY 116.00

Deposit rates p.a.	***USD***	***JPY***
3 months	*4.50%*	*0.25%*
6 months	*5.00%*	*0.25%*

Forward Rate Agreement (FRA) for Yen is Nil.

1. *What should be 3 months FRA rate at 3 months forward?*
2. *The 6 & 12 months LIBORS are 5% & 6.5% respectively. A bank is quoting 6/12 USD FRA at 6.50 – 6.75%. Is any arbitrage opportunity available?*

Calculate profit in such case.

Answer

1. **3 Months Interest rate is 4.50% & 6 Months Interest rate is 5% p.a.**

   Future Value 6 Months from now is a product of Future Value 3 Months now & 3 Months Future Value from after 3 Months.

   $(1+0.05*6/12) = (1+0.045*3/12) \times (1+i_{3,6} *3/12)$

   $i_{3,6} = [(1+0.05* 6/12) /(1+0.045 *3/12) – 1] *12/3$

   i.e. 5.44% p.a.

2. **6 Months Interest rate is 5% p.a & 12 Month interest rate is 6.5% p.a.**

   Future value 12 month from now is a product of Future value 6 Months from now and 6 Months Future value from after 6 Months.

   $(1+0.065) = (1+0.05*6/12) \times (1+i_{6,6} *6/12)$

   $i_{6,6} = [(1+0.065/1.025) – 1] *12/6$

   6 Months forward 6 month rate is 7.80% p.a.

   The Bank is quoting 6/12 USD FRA at 6.50 – 6.75%

   Therefore, there is an arbitrage Opportunity of earning interest @ 7.80% p.a. & Paying @ 6.75%

   Borrow for 6 months, buy an FRA & invest for 12 months

   To get $ 1.065 at the end of 12 months for $ 1 invested today

   To pay $ 1.060# at the end of 12 months for every $ 1 Borrowed today

   Net gain $ 0.005 i.e. risk less profit for every $ borrowed

   # (1+0.05/2) (1+.0675/2) = (1.05959) say 1.060

Question 63

From the following data for Government securities, calculate the forward rates:

Face value (₹)	*Interest rate*	*Maturity (Year)*	*Current price (₹)*
1,00,000	*0%*	*1*	*91,500*
1,00,000	*10%*	*2*	*98,500*
1,00,000	*10.5%*	*3*	*99,000*

Answer

Consider one-year Treasury bill.

$$91{,}500 = \frac{1{,}00{,}000}{(1+r_1)}$$

$$1+r_1 = \frac{100{,}000}{91{,}500} = 1.092896$$

$r_1 = 0.0929$ or 0.093

Consider two-year Government Security

$$98{,}500 = \frac{10{,}000}{1.093} + \frac{1{,}10{,}000}{1.093(1+r_2)}$$

$$98500 = 9149.131 + \frac{1{,}10{,}000}{1.093(1+r_2)}$$

$$\Rightarrow \quad 89350.87 = \frac{100640.4}{1+r_2}$$

$$\Rightarrow \quad 1 + r_2 = 1.126351$$

$$\Rightarrow \quad r_2 = 0.12635$$

$$\Rightarrow \quad r_2 = 0.1263$$

Consider three-year Government Securities:

$$99{,}000 = \frac{10{,}500}{1.093} + \frac{10{,}500}{1.093 \times 1.1263} + \frac{1{,}10{,}500}{1.093 \times 1.1263(1+r_3)}$$

$$\Rightarrow \quad 99{,}000 = 9{,}606.587 + 8{,}529.65 + \frac{89{,}761.07}{1+r3}$$

$$\Rightarrow \quad 80{,}863.763 = \frac{89{,}761.07}{1+r_3}$$

$$\Rightarrow \quad 1+r_3 = 1.1100284$$

$$\Rightarrow \quad r_3 = 0.1100284 \text{ say } 11.003\%$$

Question 64

Given below is the Balance Sheet of S Ltd. as on 31.3.2008:

Liabilities	*₹ (in lakh)*	*Assets*	*₹ (in lakh)*
Share capital		*Land and building*	*40*

(share of ₹ 10)	*100*	*Plant and machinery*	*80*
Reserves and surplus	*40*	*Investments*	*10*
Long Term Debts	*30*	*Stock*	*20*
		Debtors	*15*
	170	*Cash at bank*	*5*
			170

You are required to work out the value of the Company's, shares on the basis of Net Assets method and Profit-earning capacity (capitalization) method and arrive at the fair price of the shares, by considering the following information:

(i) Profit for the current year ₹ 64 lakhs includes ₹ 4 lakhs extraordinary income and ₹ 1 lakh income from investments of surplus funds; such surplus funds are unlikely to recur.

(ii) In subsequent years, additional advertisement expenses of ₹ 5 lakhs are expected to be incurred each year.

(iii) Market value of Land and Building and Plant and Machinery have been ascertained at ₹ 96 lakhs and ₹ 100 lakhs respectively. This will entail additional depreciation of ₹ 6 lakhs each year.

(iv) Effective Income-tax rate is 30%.

(v) The capitalization rate applicable to similar businesses is 15%.

Answer

	₹ lakhs
Net Assets Method	
Assets: Land & Buildings	96
Plant & Machinery	100
Investments	10
Stocks	20
Debtors	15
Cash & Bank	5
Total Assets	246
Less: Long Term Debts	30
Net Assets	216
Value per share	
(a) Number of shares $\frac{1,00,00,000}{10} = 10,00,000$	
(b) Net Assets ₹ 2,16,00,000	
$\frac{₹\ 2,16,00,000}{10,00,000} = ₹\ 21.6$	

Profit-earning Capacity Method		*₹ lakhs*
Profit before tax		64.00
Less: Extraordinary income	4.00	
Investment income (not likely to recur)	1.00	5.00
		59.00
Less: Additional expenses in forthcoming years		
Advertisement	5.00	
Depreciation	6.00	11.00
Expected earnings before taxes		48.00
Less: Income-tax @ 30%		14.40
Future maintainable profits (after taxes)		33.60
Value of business		
Capitalisation factor	$\frac{33.60}{0.15}=$	224
Less: Long term Debts		30
		194
Value per share	$\frac{1,94,00,000}{10,00,000}$	₹ 19.40

Fair Price of share	₹
Value as per Net Assets Method	21.60
Value as per Profit earning capacity (Capitalisation) method	19.40
Fair Price= $\frac{21.60+19.40}{2}=\frac{41.00}{2}=$	₹20.50

Question 65

Which position on the index future gives a speculator, a complete hedge against the following transactions:

(i) The share of Right Limited is going to rise. He has a long position on the cash market of ₹ 50 lakhs on the Right Limited. The beta of the Right Limited is 1.25.

(ii) The share of Wrong Limited is going to depreciate. He has a short position on the cash market of ₹ 25 lakhs on the Wrong Limited. The beta of the Wrong Limited is 0.90.

(iii) The share of Fair Limited is going to stagnant. He has a short position on the cash market of ₹ 20 lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.

Answer

Sl. No.	Company Name	Trend	Amount (₹)	Beta	Index Value (₹)	Position
(i)	Right Ltd.	Rise	50 lakh	1.25	62,50,000	Short
(ii)	Wrong Ltd.	Depreciate	25 lakh	0.90	22,50,000	Long
(iii)	Fair Ltd.	Stagnant	20 lakh	0.75	15,00,000	Long
					25,00,000	Short

Question 66

Ram buys 10,000 shares of X Ltd. at a price of ₹ 22 per share whose beta value is 1.5 and sells 5,000 shares of A Ltd. at a price of ₹ 40 per share having a beta value of 2. He obtains a complete hedge by Nifty futures at ₹ 1,000 each. He closes out his position at the closing price of the next day when the share of X Ltd. dropped by 2%, share of A Ltd. appreciated by 3% and Nifty futures dropped by 1.5%.

What is the overall profit/loss to Ram?

Answer

No. of the Future Contract to be obtained to get a complete hedge

$$= \frac{10000 \times ₹22 \times 1.5 - 5000 \times ₹40 \times 2}{₹1000}$$

$$= \frac{₹3,30,000 - ₹4,00,000}{₹1000} = \textbf{70 contracts}$$

Thus, by purchasing 70 Nifty future contracts to be long to obtain a complete hedge.

Cash Outlay

= 10000 x ₹ 22 – 5000 x ₹ 40 + 70 x ₹ 1,000

= ₹ 2,20,000 – ₹ 2,00,000 + ₹ 70,000 = ₹ 90,000

Cash Inflow at Close Out

= 10000 x ₹ 22 x 0.98 – 5000 x ₹ 40 x 1.03 + 70 x ₹ 1,000 x 0.985

= ₹ 2,15,600 – ₹ 2,06,000 + ₹ 68,950 = ₹ 78,550

Gain/ Loss

= ₹ 78,550 – ₹ 90,000 = - ₹ 11,450 (Loss)

Question 67

On January 1, 2013 an investor has a portfolio of 5 shares as given below:

Security	*Price*	*No. of Shares*	*Beta*
A	*349.30*	*5,000*	*1.15*
B	*480.50*	*7,000*	*0.40*
C	*593.52*	*8,000*	*0.90*
D	*734.70*	*10,000*	*0.95*
E	*824.85*	*2,000*	*0.85*

The cost of capital to the investor is 10.5%per annum.

You are required to calculate:

(i) The beta of his portfolio.

(ii) The theoretical value of the NIFTY futures for February 2013.

(iii) The number of contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio if the current value of NIFTY is 5900 and NIFTY futures have a minimum trade lot requirement of 200 units. Assume that the futures are trading at their fair value.

(iv) The number of future contracts the investor should trade if he desires to reduce the beta of his portfolios to 0.6.

No. of days in a year be treated as 365.

Given: In (1.105) = 0.0998 and $e^{(0.015858)}$ *= 1.01598*

Answer

(i) Calculation of Portfolio Beta

Security	Price of the Stock	No. of shares	Value	Weightage w_i	Beta B_i	Weighted Beta
A	349.30	5,000	17,46,500	0.093	1.15	0.107
B	480.50	7,000	33,63,500	0.178	0.40	0.071
C	593.52	8,000	47,48,160	0.252	0.90	0.227
D	734.70	10,000	73,47,000	0.390	0.95	0.370
E	824.85	2,000	16,49,700	0.087	0.85	0.074
			1,88,54,860			0.849

Portfolio Beta = 0.849

(ii) Calculation of Theoretical Value of Future Contract

Cost of Capital = 10.5% p.a. Accordingly, the Continuously Compounded Rate of Interest ln (1.105) = 0.0998

For February 2013 contract, t= 58/365= 0.1589

Further $F = Se^{rt}$

$F = ₹\ 5,900e^{(0.0998)(0.1589)}$

$F = ₹\ 5,900e^{0.015858}$

F= ₹ 5,900X1.01598 = ₹ 5,994.28

(iii) When total portfolio is to be hedged:

$$= \frac{\text{Value of Spot Position requiring hedging}}{\text{Value of Future Contract}} \times \text{Portfolio Beta}$$

$$= \frac{1,88,54,860}{5994.28 \times 200} \times 0.849 = 13.35 \text{ contracts say 13 or 14 contracts}$$

(iv) When total portfolio beta is to be reduced to 0.6:

$$\text{Number of Contracts to be sold} = \frac{P(\beta_P - \beta_P^{'})}{F}$$

$$= \frac{1,88,54,860(0.849 - 0.600)}{5994.28 \times 200} = 3.92 \text{ contracts say 4 contracts}$$

Question 68

On April 1, 2015, an investor has a portfolio consisting of eight securities as shown below:

Security	*Market Price*	*No. of Shares*	*Value*
A	*29.40*	*400*	*0.59*
B	*318.70*	*800*	*1.32*
C	*660.20*	*150*	*0.87*
D	*5.20*	*300*	*0.35*
E	*281.90*	*400*	*1.16*
F	*275.40*	*750*	*1.24*
G	*514.60*	*300*	*1.05*
H	*170.50*	*900*	*0.76*

The cost of capital for the investor is 20% p.a. continuously compounded. The investor fears a fall in the prices of the shares in the near future. Accordingly, he approaches you for the advice to protect the interest of his portfolio.

You can make use of the following information:

(i) The current NIFTY value is 8500.

(ii) NIFTY futures can be traded in units of 25 only.

(iii) Futures for May are currently quoted at 8700 and Futures for June are being quoted at 8850.

You are required to calculate:

(i) the beta of his portfolio.

(ii) the theoretical value of the futures contract for contracts expiring in May and June.

Given ($e^{0.03}$=1.03045, $e^{0.04}$ = 1.04081, $e^{0.05}$=1.05127)

(iii) the number of NIFTY contracts that he would have to sell if he desires to hedge until June in each of the following cases:

(A) His total portfolio

(B) 50% of his portfolio

(C) 120% of his portfolio

Answer

(i) Beta of the Portfolio

Security	Market Price	No. of Shares	Value	β	Value x β
A	29.40	400	11760	0.59	6938.40
B	318.70	800	254960	1.32	336547.20
C	660.20	150	99030	0.87	86156.10
D	5.20	300	1560	0.35	546.00
E	281.90	400	112760	1.16	130801.60
F	275.40	750	206550	1.24	256122.00
G	514.60	300	154380	1.05	162099.00
H	170.50	900	153450	0.76	116622.00
			994450		1095832.30

$$\text{Portfolio Beta} = \frac{10,95,832.30}{9,94,450} = 1.102$$

(ii) Theoretical Value of Future Contract Expiring in May and June

$F = Se^{rt}$

$F_{May} = 8500 \times e^{0.20 \times (2/12)} = 8500 \times e^{0.0333}$

$e^{0.0333}$ shall be computed using Interpolation Formula as follows:

$e^{0.03}$	= 1.03045
$e^{0.04}$	= 1.04081
$e^{0.01}$	= 0.01036
$e^{0.0033}$	= 0.00342
$e^{0.0067}$	= 0.00694

$e^{0.0333}$ = 1.03045 + 0.00342 = 1.03387 or 1.04081 – 0.00694 = 1.03387

According the price of the May Contract

8500 X 1.03387 = ₹ 8788

Price of the June Contract

F_{May}= 8500 x $e^{0.20 \times (3/12)}$ = 8500 x $e^{0.05}$= 8500 x 1.05127 = 8935.80

(iii) No. of NIFTY Contracts required to sell to hedge until June

$$= \frac{\text{Value of Position to be hedged}}{\text{Value of Future Contract}} \times \beta$$

(A) Total portfolio

$$\frac{994450}{8850 \times 25} \times 1.102 = 4.953 \text{ say 5 contracts}$$

(B) 50% of Portfolio

$$\frac{994450 \times 0.50}{8850 \times 25} \times 1.102 = 2.47 \text{ say 3 contracts}$$

(C) 120% of Portfolio

$$\frac{994450 \times 1.20}{8850 \times 25} \times 1.102 = 5.94 \text{ say 6 contracts}$$

Question 69

A company is long on 10 MT of copper @ ₹ 474 per kg (spot) and intends to remain so for the ensuing quarter. The standard deviation of changes of its spot and future prices are 4% and 6% respectively, having correlation coefficient of 0.75.

What is its hedge ratio? What is the amount of the copper future it should short to achieve a perfect hedge?

Answer

The optional hedge ratio to minimize the variance of Hedger's position is given by:

$$H = \rho \frac{\sigma S}{\sigma F}$$

Where

σS= Standard deviation of ΔS

σF=Standard deviation of ΔF

ρ= coefficient of correlation between ΔS and ΔF

H= Hedge Ratio

ΔS = change in Spot price.

ΔF= change in Future price.

Accordingly

$$H = 0.75 \times \frac{0.04}{0.06} = 0.5$$

No. of contract to be short = 10 x 0.5 = 5

Amount = 5000 x ₹ 474 = ₹ 23,70,000

Question 70

Indira has a fund of ₹ 3 lacs which she wants to invest in share market with rebalancing target after every 10 days to start with for a period of one month from now. The present NIFTY is 5326. The minimum NIFTY within a month can at most be 4793.4. She wants to know as to how she should rebalance her portfolio under the following situations, according to the theory of Constant Proportion Portfolio Insurance Policy, using "2" as the multiplier:

(1) Immediately to start with.

(2) 10 days later-being the 1st day of rebalancing if NIFTY falls to 5122.96.

(3) 10 days further from the above date if the NIFTY touches 5539.04.

For the sake of simplicity, assume that the value of her equity component will change in tandem with that of the NIFTY and the risk free securities in which she is going to invest will have no Beta.

Answer

Maximum decline in one month = $\frac{5326-4793.40}{5326} \times 100 = 10\%$

(1) Immediately to start with

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (3,00,000 – 2,70,000) = ₹ 60,000

Indira may invest ₹ 60,000 in equity and balance in risk free securities.

(2) After 10 days

Value of equity = 60,000 x 5122.96/5326	=	₹ 57,713
Value of risk free investment		₹ 2,40,000
Total value of portfolio	=	₹ 2,97,713
Investment in equity = Multiplier x (Portfolio value – Floor value)		
= 2 (2,97,713 – 2,70,000)	=	₹ 55,426
Revised Portfolio:		
Equity	=	₹ 55,426
Risk free Securities = ₹ 2,97,713 – ₹ 55,426	=	₹ 2,42,287

(3) After another 10 days

Value of equity = 55,426 x 5539.04/5122.96	=	₹ 59,928
Value of risk free investment	=	₹ 2,42,287
Total value of portfolio	=	₹ 3,02,215
Investment in equity = Multiplier x (Portfolio value – Floor value)		
= 2 (3,02,215 – 2,70,000)	=	₹ 64,430
Revised Portfolio:		
Equity	=	₹ 64,430
Risk Free Securities = ₹ 3,02,215 – ₹ 64,430	=	₹ 2,37,785

The investor should off-load ₹ 4502 of risk free securities and divert to Equity.

Question 71

XYZ Limited borrows £ 15 Million of six months LIBOR + 10.00% for a period of 24 months. The company anticipates a rise in LIBOR, hence it proposes to buy a Cap Option from its Bankers at the strike rate of 8.00%. The lump sum premium is 1.00% for the entire reset periods and the fixed rate of interest is 7.00% per annum. The actual position of LIBOR during the forthcoming reset period is as under:

Reset Period	*LIBOR*
1	*9.00%*
2	*9.50%*
3	*10.00%*

You are required to show how far interest rate risk is hedged through Cap Option.

For calculation, work out figures at each stage up to four decimal points and amount nearest to £. It should be part of working notes.

Answer

First of all we shall calculate premium payable to bank as follows:

$$P = \frac{rp}{\left[(1 \div i) - \frac{1}{i \times (1+i)^t}\right]} \text{ X A or } \frac{rp}{PVAF(3.5\%,4)} \times A$$

Where

P = Premium

A = Principal Amount

rp = Rate of Premium

i = Fixed Rate of Interest

t = Time

$$= \frac{0.01}{\left[(1/0.035) - \frac{1}{0.035 \times 1.035^4}\right]} \times £15,000,000 \text{ or } \frac{0.01}{(0.966 + 0.933 + 0.901 + 0.871)} \times £15,000,000$$

$$= \frac{0.01}{\left[(28.5714) - \frac{1}{0.04016}\right]} \times £15,000,000 \text{ or } \frac{£150,000}{3.671} = £\ 40,861$$

Please note above solution has been worked out on the basis of four decimal points at each stage.

Now we see the net payment received from bank

Reset Period	Additional interest due to rise in interest rate	Amount received from bank	Premium paid to bank	Net Amt. received from bank
1	£ 75,000	£ 75,000	£ 40,861	£34,139
2	£ 112,500	£ 112,500	£ 40,861	£71,639
3	£ 150,000	£ 150,000	£ 40,861	£109,139
TOTAL	£ 337,500	£ 337,500	£122,583	£ 214,917

Thus, from above it can be seen that interest rate risk amount of £ 337,500 reduced by £ 214,917 by using of Cap option.

Note: It may be possible that student may compute upto three decimal points or may use different basis. In such case their answer is likely to be different.

Question 72

TM Fincorp has bought a 6 x 9 ₹ 100 crore Forward Rate Agreement (FRA) at 5.25%. On fixing date reference rate i.e. MIBOR turns out be as follows:

Period	*Rate (%)*
3 months	*5.50*
6 months	*5.70*
9 months	*5.85*

You are required to determine:

(a) Profit/Loss to TM Fincorp. in terms of basis points.

(b) The settlement amount.

(Assume 360 days in a year)

Answer

(a) TM will make a profit of 25 basis points since a 6X9 FRA is a contract on 3-month interest rate in 6 months, which turns out to be 5.50% (higher than FRA price).

(b) The settlement amount shall be calculated by using the following formula:

$$\frac{N(RR - FR)(dtm/360)}{1 + RR(dtm/360)}$$

Where

N = Notional Principal Amount

RR = Reference Rate

FR = Agreed upon Forward Rate

Dtm = FRA period specified in days.

Accordingly:

$$\frac{100\,crore\,(5.50\% - 5.25\%)(92^*/360)}{1 + 0.055(92^*/360)} = ₹\ 6,30,032$$

Hence there is profit of ₹ 6,30,032 to TM Fincorp.

* Alternatively it can also be taken as 90 days.

Question 73

XYZ Inc. issues a £ 10 million floating rate loan on July 1, 2013 with resetting of coupon rate every 6 months equal to LIBOR + 50 bp. XYZ is interested in a collar strategy by selling a Floor and buying a Cap. XYZ buys the 3 years Cap and sell 3 years Floor as per the following details on July 1, 2013:

Notional Principal Amount	$ 10 million
Reference Rate	6 months LIBOR
Strike Rate	4% for Floor and 7% for Cap
Premium	0*

*Since Premium paid for Cap = Premium received for Floor

Using the following data you are required to determine:

(i) Effective interest paid out at each reset date,

(ii) The average overall effective rate of interest p.a.

Reset Date	LIBOR (%)
31-12-2013	6.00
30-06-2014	7.00
31-12-2014	5.00
30-06-2015	3.75
31-12-2015	3.25
30-06-2016	4.25

Answer

(a) The pay-off of each leg shall be computed as follows:

Cap Receipt

Max {0, [Notional principal x (LIBOR on Reset date – Cap Strike Rate) x $\frac{\text{Number of days in the settlement period}}{365}$}

Floor Pay-off

Max {0, [Notional principal x (Floor Strike Rate – LIBOR on Reset date) x $\frac{\text{Number of days in the settlement period}}{365}$}

Statement showing effective interest on each re-set date

Reset Date	LIBOR (%)	Days	Interest Payment ($) LIBOR+0.50%	Cap Receipts ($)	Floor Pay-off ($)	Effective Interest
31-12-2013	6.00	184	3,27,671	0	0	3,27,671
30-06-2014	7.00	181	3,71,918	24,795	0	3,47,123
31-12-2014	5.00	184	2,77,260	0	0	2,77,260

30-06-2015	3.75	181	2,10,753	0	0	2,10,753
31-12-2015	3.25	184	1,89,041	0	12,603	2,01,644
30-06-2016	4.25	182	2,36,849	0	0	2,36,849
Total		1096				16,01,300

(b) Average Annual Effective Interest Rate shall be computed as follows:

$$\frac{16,01,300}{1,00,00,000} \times \frac{365}{1096} \times 100 = 5.33\%$$

Question 74

Electraspace is consumer electronics wholesaler. The business of the firm is highly seasonal in nature. In 6 months of a year, firm has a huge cash deposits and especially near Christmas time and other 6 months firm cash crunch, leading to borrowing of money to cover up its exposures for running the business.

It is expected that firm shall borrow a sum of €50 million for the entire period of slack season in about 3 months.

A Bank has given the following quotations:

Spot 5.50% - 5.75%

3 × 6 FRA 5.59% - 5.82%

3 × 9 FRA 5.64% - 5.94%

3 month €50,000 future contract maturing in a period of 3 months is quoted at 94.15 (5.85%).

You are required to determine:

(a) How a FRA, shall be useful if the actual interest rate after 3 months turnout to be:

(i) 4.5% (ii) 6.5%

(b) How 3 months Future contract shall be useful for company if interest rate turns out as mentioned in part (a) above.

Answer

(a) By entering into an FRA, firm shall effectively lock in interest rate for a specified future in the given it is 6 months. Since, the period of 6 months is starting in 3 months, the firm shall opt for 3 × 9 FRA locking borrowing rate at 5.94%.

In the given scenarios, the net outcome shall be as follows:

	If the rate turns out to be 4.50%	**If the rate turns out to be 6.50%**
FRA Rate	5.94%	5.94%

Actual Interest Rate	4.50%	6.50%
Loss/ (Gain)	1.44%	(0.56%)
FRA Payment / (Receipts)	€50 m × 1.44% × ½ = €360,000	€50m × 0.56% × ½ = (€140,000)
Interest after 6 months on €50 Million at actual rates	= €50m × 4.5% × ½ = €1,125,000	= € 50m × 6.5% × ½ = €1,625,000
Net Out Flow	€ 1,485,000	€1,485,000

Thus, by entering into FRA, the firm has committed itself to a rate of 5.94% as follows:

$$\frac{€\ 1,485,000}{€\ 50,000,000} \times 100 \times \frac{12}{6} = 5.94\%$$

(b) Since firm is a borrower it will like to off-set interest cost by profit on Future Contract. Accordingly, if interest rate rises it will gain hence it should sell interest rate futures.

$$\text{No. of Contracts} = \frac{\text{Amount of Borrowing}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{\text{3 months}}$$

$$= \frac{€\ 50,000,000}{€\ 50,000} \times \frac{6}{3} = 2000 \text{ Contracts}$$

The final outcome in the given two scenarios shall be as follows:

	If the interest rate turns out to be 4.5%	**If the interest rate turns out to be 6.5%**
Future Course Action :		
Sell to open	94.15	94.15
Buy to close	95.50 (100 - 4.5)	93.50 (100 - 6.5)
Loss/ (Gain)	1.35%	(0.65%)
Cash Payment (Receipt) for Future Settlement	€50,000×2000× 1.35%×3/12 = €337,500	€50,000×2000×0.65%×3/12 = (€162,500)
Interest for 6 months on €50 million at actual rates	€50 million × 4.5% × ½ = €11,25,000	€50 million × 6.5% × ½ = €16,25,000
	€1,462,500	€1,462,500

Thus, the firm locked itself in interest rate $\frac{€1,462,500}{€\ 50,000,000} \times 100 \times \frac{12}{6} = 5.85\%$

Question 75

Two companies ABC Ltd. and XYZ Ltd. approach the DEF Bank for FRA (Forward Rate Agreement). They want to borrow a sum of ₹ 100crores after 2 years for a period of 1 year. Bank has calculated Yield Curve of both companies as follows:

Year	XYZ Ltd.	ABC Ltd.*
1	3.86	4.12
2	4.20	5.48
3	4.48	5.78

*The difference in yield curve is due to the lower credit rating of ABC Ltd. compared to XYZ Ltd.

(i) You are required to calculate the rate of interest DEF Bank would quote under 2V3 FRA, using the company's yield information as quoted above.

(ii) Suppose bank offers Interest Rate Guarantee for a premium of 0.1% of the amount of loan, you are required to calculate the interest payable by XYZ Ltd. if interest rate in 2 years turns out to be

(a) 4.50%

(b) 5.50%

Answer

(i) DEF Bank will fix interest rate for 2V3 FRA after 2 years as follows:

XYZ Ltd.

$(1+r)\ (1+0.0420)^2 = (1+0.0448)^3$

$(1+r)\ (1.0420)^2 = (1.0448)^3$

$r = 5.04\%$

Bank will quote 5.04% for a 2V3 FRA.

ABC Ltd.

$(1+r)\ (1+0.0548)^2 = (1+0.0578)^3$

$(1+r)\ (1.0548)^2 = (1.0578)^3$

$r = 6.38\%$

Bank will quote 6.38% for a 2V3 FRA.

(ii)

		4.50%- Allow to Lapse	**5.50%-Exercise**
Interest	₹ 100 crores X 4.50% ₹ 100 crores X 5.04%	₹ 4.50 crores -	- ₹ 5.04 crores

Premium (Cost of Option)	₹ 100 crores X 0.1%	₹ 0.10 crores 4.60 crores	₹ 0.10 crores 5.14 crores

Question 76

Trupti Co. Ltd. promoted by a Multinational group "INTERNATIONAL INC" is listed on stock exchange holding 84% i.e. 63 lakhs shares.

Profit after Tax is ₹ 4.80 crores.

Free Float Market Capitalisation is ₹ 19.20 crores.

As per the SEBI guidelines promoters have to restrict their holding to 75% to avoid delisting from the stock exchange. Board of Directors has decided not to delist the share but to comply with the SEBI guidelines by issuing Bonus shares to minority shareholders while maintaining the same P/E ratio.

Calculate

(i) P/E Ratio

(ii) Bonus Ratio

(iii) Market price of share before and after the issue of bonus shares

(iv) Free Float Market capitalization of the company after the bonus shares.

Answer

1. P/E Ratio:

	% of holding	No. of Shares
Promoter's Holding	84%	63 Lacs
Minority Holding	16%	12 Lacs
Total Shares	100%	75 Lacs

Free Float Market Capitalization = ₹ 19.20 crores

Hence Market price $\frac{₹19.20 \text{ crores}}{12.00 \text{ lacs}}$ = ₹160 per share

EPS (PAT/No. of Shares) (₹ 4.80 crores /75 lac) = ₹ 6.40 per share

P/E Ratio (₹ 160/ ₹ 6.40) = 25

2. No. of Bonus Shares to be issued:

Promoters holding 84%, = 63 lacs shares

Shares remains the same, but holding % to be taken as 75%

Hence Total shares = $\frac{63 \text{ lacs}}{75\%}$ = 84 lacs

Shares of Minority = 84 lacs – 63 lacs = 21 lacs

Bonus 9 lacs for 12 lacs i.e. 3 bonus for 4 held or 0.75 shares for 1 share

3. Market price before & after Bonus:

Before Bonus = ₹160 per share

After Bonus

New EPS $\frac{₹ 4.80 \text{ crores}}{84 \text{ lacs}}$ = ₹ 5.71

New Market Price (25 x ₹ 5.71) = ₹ 142.75

4. Free Float Capitalization is

₹ 142.75 x 21 lacs = ₹ 29.9775 crores

6

Security Analysis

BASIC CONCEPTS AND FORMULAE

1. **Introduction:** Security Analysis stands for the proposition that a well-disciplined investor can determine a rough value for a company from all of its financial statements, make purchases when the market inevitably under-prices some of them, earn a satisfactory return, and never be in real danger of permanent loss.

2. **Approaches of Security Analysis:** There are basically two main approaches of security analysis- Fundamental analysis and Technical analysis.

3. **Fundamental Analysis:** Fundamental analysis is based on the assumption that the share prices depend upon the future dividends expected by the shareholders. The present value of the future dividends can be calculated by discounting the cash flows at an appropriate discount rate and is known as the *'intrinsic value of the share'*. The intrinsic value of a share, according to a fundamental analyst, depicts the true value of a share. A share that is priced below the intrinsic value must be bought, while a share quoted above the intrinsic value must be sold.

4. **Models of Fundamental Analysis**

   (a) Dividend Growth Model

   $$P(0) = \frac{D(0)(1+g)}{(k-g)}$$

   Where,

   P(0) = Price of Share

   D(0) = Current Dividend

   g = Growth Rate

   k = Cost of Equity

   (b) Dividend Growth Model and the PE Multiple

   $$P(0) = \frac{bE(0)(1+g)}{(k-g)}$$

Where,

b = Dividend Pay-out fraction or ratio

E(0) = Current EPS

5. **Types of Fundamental Analysis:** There are three types of fundamental analysis- Economic analysis, Industry analysis and Company analysis.

6. **Economic Analysis:** Macro- economic factors e. g. historical performance of the economy in the past/ present and expectations in future, growth of different sectors of the economy in future with signs of stagnation/degradation at present to be assessed while analyzing the overall economy. Trends in peoples' income and expenditure reflect the growth of a particular industry/company in future. Consumption affects corporate profits, dividends and share prices in the market.

7. **Factors Affecting Economic Analysis:** Some of the economy wide factors are as under:

   (a) Growth Rates of National Income and Related Measures

   (b) Growth Rates of Industrial Sector

   (c) Inflation

   (d) Monsoon

8. **Techniques Used For Economic Analysis**

   (i) Anticipatory Surveys*:* They help investors to form an opinion about the future state of the economy.

   (ii) Barometer/Indicator Approach*:* Various indicators are used to find out how the economy shall perform in the future.

   (iii) Economic Model Building Approach*:* In this approach, a precise and clear relationship between dependent and independent variables is determined.

9. **Industry Analysis:** An assessment regarding all the conditions and factors relating to demand of the particular product, cost structure of the industry and other economic and government constraints have to be done.

10. **Factors Affecting Industry Analysis:** The following factors may particularly be kept in mind while assessing the factors relating to an industry :

    (a) Product Life-Cycle;

    (b) Demand Supply Gap;

    (c) Barriers to Entry;

    (d) Government Attitude;

(e) State of Competition in the Industry;

(f) Cost Conditions and Profitability and

(g) Technology and Research.

11. Techniques Used For Industry Analysis

(a) ***Regression Analysis:*** Investor diagnoses the factors determining the demand for output of the industry through product demand analysis.

(b) ***Input – Output Analysis:*** It reflects the flow of goods and services through the economy, intermediate steps in production process as goods proceed from raw material stage through final consumption.

12. Company Analysis: Economic and industry framework provides the investor with proper background against which shares of a particular company are purchased. This requires careful examination of the company's quantitative and qualitative fundamentals.

13. Techniques Used in Company Analysis

(a) ***Correlation & Regression Analysis:*** Simple regression is used when inter relationship covers two variables. For more than two variables, multiple regression analysis is followed.

(b) ***Trend Analysis:*** The relationship of one variable is tested over time using regression analysis. It gives an insight to the historical behavior of the variable.

(c) ***Decision Tree Analysis:*** In decision tree analysis, the decision is taken sequentially with probabilities attached to each sequence. To obtain the probability of final outcome, various sequential decisions are given along with probabilities, then probabilities of each sequence is to be multiplied and then summed up.

14. Technical Analysis: Technical analysis is a method of share price movements based on a study of price graphs or charts on the assumption that share price trends are repetitive, that since investor psychology follows a certain pattern, what is seen to have happened before is likely to be repeated**.**

15. Types of Charts

(i) Bar Chart : In a bar chart, a vertical line (bar) represents the lowest to the highest price, with a short horizontal line protruding from the bar representing the closing price for the period.

(ii) Line Chart: In a line chart, lines are used to connect successive day's prices. The closing price for each period is plotted as a point. These points are joined by a line to form the chart. The period may be a day, a week or a month.

(iii) Point and Figure Chart: Point and Figure charts are more complex than line or bar charts. They are used to detect reversals in a trend.

16. **General Principles and Methods of Technical Analysis:** Certain principles underlying the technical analysis need to be understood and correlated with the tools and techniques of technical analysis. Interpreting any one method in isolation would not result in depicting the correct picture of the market.

17. **The Dow Theory:** The Dow Theory is based upon the movements of two indices, constructed by Charles Dow, Dow Jones Industrial Average (DJIA) and Dow Jones Transportation Average (DJTA). These averages reflect the aggregate impact of all kinds of information on the market. The movements of the market are divided into three classifications, all going at the same time; the primary movement, the secondary movement, and the daily fluctuations. The primary movement is the main trend of the market, which lasts from one year to 36 months or longer. This trend is commonly called bear or bull market. The secondary movement of the market is shorter in duration than the primary movement, and is opposite in direction. It lasts from two weeks to a month or more. The daily fluctuations are the narrow movements from day-to-day.

18. **Market Indicators**

    (i) ***Breadth Index*:** It is an index that covers all securities traded. It is computed by dividing the net advances or declines in the market by the number of issues traded. The breadth index either supports or contradicts the movement of the Dow Jones Averages. If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the averages, it is a sign of technical weakness i.e. a sign that the market will move in a direction opposite to the Dow Jones Averages.

    (ii) ***Volume of Transactions*:** The volume of shares traded in the market provides useful clues on how the market would behave in the near future. A rising index/price with increasing volume would signal buy behaviour because the situation reflects an unsatisfied demand in the market. Similarly, a falling market with increasing volume signals a bear market and the prices would be expected to fall further. A rising market with decreasing volume indicates a bull market while a falling market with dwindling volume indicates a bear market. Thus, the volume concept is best used with another market indicator, such as the Dow Theory.

    (iii) ***Confidence Index:*** It is supposed to reveal how willing the investors are to take a chance in the market. It is the ratio of high-grade bond yields to low-grade bond yields. It is used by market analysts as a method of trading or timing the purchase and sale of stock, and also, as a forecasting device to determine the turning points of the market. A rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop in stock prices. A fall in the confidence index represents the fact that low-grade bond yields are rising faster or falling more slowly than high grade yields. The confidence index is usually, but not always a leading indicator of the market. Therefore, it should be used in conjunction with other market indicators.

(iv) ***Relative Strength Analysis*:** The relative strength concept suggests that the prices of some securities rise relatively faster in a bull market or decline more slowly in a bear market than other securities i.e. some securities exhibit relative strength. Investors will earn higher returns by investing in securities which have demonstrated relative strength in the past because the relative strength of a security tends to remain undiminished over time.

Relative strength can be measured in several ways. Calculating rates of return and classifying those securities with historically high average returns as securities with high relative strength is one of them. Even ratios like security relative to its industry and security relative to the entire market can also be used to detect relative strength in a security or an industry.

(v) ***Odd - Lot Theory:*** This theory is a contrary - opinion theory. It assumes that the average person is usually wrong and that a wise course of action is to pursue strategies contrary to popular opinion. The odd-lot theory is used primarily to predict tops in bull markets, but also to predict reversals in individual securities.

19. Support and Resistance Levels: When the index/price goes down from a peak, the peak becomes the resistance level. When the index/price rebounds after reaching a trough subsequently, the lowest value reached becomes the support level. The price is then expected to move between these two levels. Whenever the price approaches the resistance level, there is a selling pressure because all investors who failed to sell at the high would be keen to liquidate, while whenever the price approaches the support level, there is a buying pressure as all those investors who failed to buy at the lowest price would like to purchase the share. A breach of these levels indicates a distinct departure from status quo, and an attempt to set newer levels.

20. Interpreting Price Patterns

(a) Channel: A series of uniformly changing tops and bottoms gives rise to a channel formation. A downward sloping channel would indicate declining prices and an upward sloping channel would imply rising prices.

(b) Wedge: A wedge is formed when the tops (resistance levels) and bottoms (support levels) change in opposite direction (that is, if the tops, are decreasing then the bottoms are increasing and vice versa), or when they are changing in the same direction at different rates over time.

(c) Head and Shoulders: It is a distorted drawing of a human form, with a large lump (for head) in the middle of two smaller humps (for shoulders). This is perhaps the single most important pattern to indicate a reversal of price trend. The neckline of the pattern is formed by joining points where the head and the shoulders meet. The price movement after the formation of the second shoulder is crucial. If the price goes below the neckline, then a drop in price is indicated, with the drop expected to

be equal to the distance between the top of the head and the neckline.

(d) ***Triangle or Coil Formation*****:** This formation represents a pattern of uncertainty and is difficult to predict which way the price will break out.

(e) ***Flags and Pennants Form*****:** This form signifies a phase after which the previous price trend is likely to continue.

(f) ***Double Top Form:*** This form represents a bearish development, signals that price is expected to fall.

(g) ***Double Bottom Form*****:** This form represents bullish development signaling price is expected to rise.

(h) ***Gap:*** A gap is the difference between the opening price on a trading day and the closing price of the previous trading day. Wider the gap, stronger is the signal for a continuation of the observed trend. On a rising market, if the opening price is considerably higher than the previous closing price, it indicates that investors are willing to pay a much higher price to acquire the scrip. Similarly, a gap in a falling market is an indicator of extreme selling pressure.

21. Decision Using Moving Averages: Moving averages are frequently plotted with prices to make buy and sell decisions. The two types of moving averages used by chartists are the Arithmetic Moving Average (AMA) and the Exponential Moving Average (EMA).

Buy and Sell Signals Provided by Moving Average Analysis

Buy Signal	Sell Signal
(a) Stock price line rise through the moving average line when graph of the moving average line is flattering out.	(a) Stock price line falls through moving average line when graph of the moving average line is flattering out.
(b) Stock price line falls below moving average line which is rising.	(b) Stock price line rises above moving average line which is falling.
(c) Stock price line which is above moving average line falls but begins to rise again before reaching the moving average line	(c) Stock price line which is slow moving average line rises but begins to fall again before reaching the moving average line.

22. Bollinger Bands: A band is plotted two standard deviations away from a simple moving average. Because standard deviation is a measure of volatility, Bollinger bands adjust themselves to the market conditions. When the markets become more volatile, the bands widen (move further away from the average), and during less volatile periods, the bands contract (move closer to the average). The tightening of the bands is often used by

technical traders as an early indication that the volatility is about to increase sharply.

23. **Momentum Analysis:** Momentum measures the speed of price change and provides a leading indicator of changes in trend. The momentum line leads price action frequently enough to signal a potential trend reversal in the market.

24. **Bond Valuation:** A bond or debenture is an instrument of debt issued by a business or government.

    (a) Par Value: Value stated on the face of the bond. It is the amount a firm borrows and promises to repay at the time of maturity.

    (b) Coupon Rate and Interest: A bond carries a specific interest rate known as the coupon rate. The interest payable to the bond holder is par value of the bond × coupon rate.

    (c) Maturity Period: Corporate bonds have a maturity period of 3 to 10 years. While government bonds have maturity periods extending up to 20-25 years. At the time of maturity the par (face) value plus nominal premium is payable to the bondholder.

25. **Bond Valuation Model**

    Value of a bond is:

$$V = \sum_{t=1}^{n} \frac{I}{(1+k_d)^t} + \frac{F}{(1+k_d)^n}$$

$$V = I\,(PVIFA_{k_d,n}) + F(PVIF_{k_d,n})$$

    Where,

    V = Value of the bond

    I = Annual interest payable on the bond

    F = Principal amount (par value) of the bond repayable at the time of maturity

    n = Maturity period of the bond.

    Value of a bond with semi-annual interest is:

$V = {}^{2n}\sum_{t=1} [(I/2) / \{(1+k_d/2)^t\}] + [F / (1+k_d/2)^{2n}]$

$= I/2(PVIFA_{kd/2,2n}) + F(PVIF_{kd/2,2n})$

    Where,

    V = Value of the bond

    I/2 = Semi-annual interest payment

    $K_d/2$ = Discount rate applicable to a half-year period

    F = Par value of the bond repayable at maturity

2n = Maturity period expressed in terms of half-yearly periods.

26. Price Yield Relationship: As the required yield increases, the present value of the cash flow decreases; hence the price decreases. Conversely, when the required yield decreases, the present value of the cash flow increases, hence the price increases.

27. Relationship between Bond Price and Time: Since the price of a bond must be equal to its par value at maturity (assuming that there is no risk of default), bond price changes with time.

28. Yield Curve: It shows how yield to maturity is related to term to maturity for bonds that are similar in all respects, except maturity.

Discount at the yield to maturity : (R_t) PV [CF(t)] = $\frac{CF(t)}{(1+R_t)^t}$

Discount by the product of a spot rate plus the forward rates :

PV [CF(t)] = $\frac{CF(t)}{(1 + r_1)(1 + r_2) ..... (1 + r_t)}$

29. Bond Duration: Duration can also be used to measure risk of investment in bond. It can be calculated by any of following methods.

(i) Macaulay Duration

$$\text{Macaulay Duration} = \frac{\sum_{t=1}^{n} \frac{t * C}{(1+i)^t} + \frac{n * M}{(1+i)^n}}{P}$$

Where

n = Number of cash flows

t = Time to maturity

C = Cash flows

i = Required yield (YTM)

M = Maturity (par) value

P = Bond price

(ii) Short Cut Method: The duration can also be calculated using short-cut method as follows:

$$= \frac{1+y}{y} - \frac{(1+y)+t(c-y)}{c[(1+y)^t - 1]+y}$$

Where

y = Required yield (YTM)

c =Coupon Rate for the period

t = Time to maturity

Question 1

Explain the Efficient Market Theory in and what are major misconceptions about this theory?

Answer

In 1953, Maurice Kendall a distinguished statistician of the Royal Statistical Society, London examined the behaviour of the stock and commodity prices in search of regular cycles instead of discovering any regular price cycle. He found each series to be "wandering one, almost as if once a week, the Demon of Chance drew a random number and added it to the current price to determine next week's price".

Prices appeared to follow a random walk implying that successive price changes are independent of one another. In 1959 two interesting papers supporting the Random Walk Theory were published. Harry Roberts showed that a series obtained by cumulating random numbers bore resemblance to a time series of stock prices. In the second, Osborne, an eminent physicist, examined that the stock price behavior was similar to the movements of very small particles suspended in a liquid medium. Such movement is referred to as the Brownian motion He found a remarkable similarly between stock price movements and the Brownian motion.

Inspired by the works of Kendall, Roberts & Osbome, a number of researchers employed indigenous tests of randomness on stock price behaviour. By and large, these tests have indicated the Random Walk hypothesis.

Search for Theory: When empirical evidence in favour of Random walk hypothesis seemed overwhelming, researchers wanted to know about the Economic processes that produced a Random walk. They concluded that randomness of stock price was a result of efficient market that led to the following view points:

- Information is freely and instantaneously available to all market participants.
- Keen competition among the market participants more or less ensures that market will reflect intrinsic values. This means that they will fully impound all available information.
- Price change only response to new information that is unrelated to previous information and therefore unpredictable.

Misconception about Efficient Market Theory: Though the Efficient Market Theory implies that market has perfect forecasting abilities, in fact, it merely signifies that prices impound all available information and as such does not mean that market possesses perfect forecasting abilities.

Although price tends to fluctuate they cannot reflect fair value. This is because the feature is uncertain and the market springs surprises continually as price reflects the surprises they fluctuate.

Inability of institutional portfolio managers to achieve superior investment performance implies that they lack competence in an efficient market. It is not possible to achieve superior investment performance since market efficiency exists due to portfolio mangers doing this job well in a competitive setting.

The random movement of stock prices suggests that stock market is irrational. Randomness and irrational are two different things, if investors are rational and competitive, price changes are bound to be random.

Question 2

Explain the different levels or forms of Efficient Market Theory in and what are various empirical evidence for these forms?

Answer

That price reflects all available information, the highest order of market efficiency. According to FAMA, there exist three levels of market efficiency:-

(i) *Weak form efficiency* – Price reflect all information found in the record of past prices and volumes.

(ii) *Semi – Strong efficiency* – Price reflect not only all information found in the record of past prices and volumes but also all other publicly available information.

(iii) *Strong form efficiency* – Price reflect all available information public as well as private.

Empirical Evidence on Weak form Efficient Market Theory: According to the Weak form Efficient Market Theory current price of a stock reflect all information found in the record of past prices and volumes. This means that there is no relationship between the past and future price movements.

Three types of tests have been employed to empirically verify the weak form of Efficient Market Theory- Serial Correlation Test, Run Test and Filter Rule Test.

(a) *Serial Correlation Test*: To test for randomness in stock price changes, one has to look at serial correlation. For this purpose, price change in one period has to be correlated with price change in some other period. Price changes are considered to be serially independent. Serial correlation studies employing different stocks, different time lags and different time period have been conducted to detect serial correlation but no significant serial correlation could be discovered. These studies were carried on short term trends viz. daily, weekly, fortnightly and monthly and not in long term trends in stock prices as in such cases. Stock prices tend to move upwards.

(b) *Run Test*: Given a series of stock price changes each price change is designated + if it represents an increase and – if it represents a decrease. The resulting series may be -

,+, - , -, - , +, +.

A run occurs when there is no difference between the sign of two changes. When the sign of change differs, the run ends and new run begins.

$$\frac{++}{1}/\frac{---}{2}/\frac{+}{3}/\frac{-}{4}/\frac{+}{5}/\frac{--}{6}\ \frac{++}{1}/\frac{---}{2}/\frac{+}{3}/\frac{-}{4}/\frac{+}{5}/\frac{--}{6}$$

To test a series of price change for independence, the number of runs in that series is compared with a number of runs in a purely random series of the size and in the process determines whether it is statistically different. By and large, the result of these studies strongly supports the Random Walk Model.

(c) *Filter Rules Test*: If the price of stock increases by at least N% buy and hold it until its price decreases by at least N% from a subsequent high. When the price decreases at least N% or more, sell it. If the behaviour of stock price changes is random, filter rules should not apply in such a buy and hold strategy. By and large, studies suggest that filter rules do not out perform a single buy and hold strategy particular after considering commission on transaction.

Empirical Evidence on Semi-strong Efficient Market Theory: Semi-strong form efficient market theory holds that stock prices adjust rapidly to all publicly available information. By using publicly available information, investors will not be able to earn above normal rates of return after considering the risk factor. To test semi-strong form efficient market theory, a number of studies was conducted which lead to the following queries: Whether it was possible to earn on the above normal rate of return after adjustment for risk, using only publicly available information and how rapidly prices adjust to public announcement with regard to earnings, dividends, mergers, acquisitions, stocksplits?

Several studies support the Semi-strong form Efficient Market Theory. Fama, Fisher, Jensen and Roll in their adjustment of stock prices to new information examined the effect of stock split on return of 940 stock splits in New York Stock Exchange during the period 1957-1959 They found that prior to the split, stock earns higher returns than predicted by any market model.

Boll and Bound in an empirical evaluation of accounting income numbers studied the effect of annual earnings announcements. They divided the firms into two groups. First group consisted of firms whose earnings increased in relation to the average corporate earnings while second group consists of firms whose earnings decreased in relation to the average corporate earnings. They found that before the announcement of earnings, stock in the first group earned positive abnormal returns while stock in the second group earned negative abnormal returns after the announcement of earnings. Stock in both the groups earned normal returns.

There have been studies which have been empirically documented showing the following inefficiencies and anomalies:

- Stock price adjust gradually not rapidly to announcements of unanticipated changes in quarterly earnings.
- Small firms' portfolio seemed to outperform large firms' portfolio.
- Low price earning multiple stock tend to outperform large price earning multiple stock.
- Monday's return is lower than return for the other days of the week.

Empirical Evidence on Strong form Efficient Market Theory: According to the Efficient Market Theory, all available information, public or private, is reflected in the stock prices. This represents an extreme hypothesis.

To test this theory, the researcher analysed returns earned by certain groups viz. corporate insiders, specialists on stock exchanges, mutual fund managers who have access to internal information (not publicly available), or posses greater resource or ability to intensively analyse information in the public domain. They suggested that corporate insiders (having access to internal information) and stock exchange specialists (having monopolistic exposure) earn superior rate of return after adjustment of risk.

Mutual Fund managers do not on an average earn a superior rate of return. No scientific evidence has been formulated to indicate that investment performance of professionally managed portfolios as a group has been any better than that of randomly selected portfolios. This was the finding of Burton Malkiel in his Random Walk Down Wall Street, New York.

Question 3

Explain in detail the Dow Jones Theory?

Answer

Dow Jones Theory is probably the most popular theory regarding the behaviour of stock market prices. The theory derives its name from Charles H. Dow, who established the Dow Jones & Co., and was the first editor of the Wall Street Journal – a leading publication on financial and economic matters in the U.S.A. Although Dow never gave a proper shape to the theory, ideas have been expanded and articulated by many of his successors.

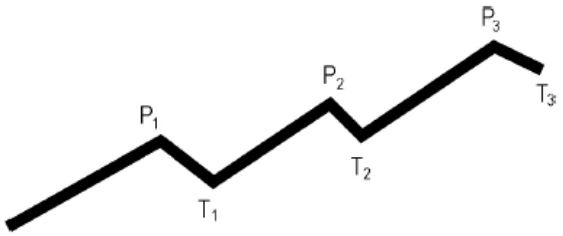
The Dow Jones theory classifies the movements of the prices on the share market into three major categories:

- Primary movements,
- Secondary movements, and
- Daily fluctuations.

(i) ***Primary Movements****:* They reflect the trend of the stock market and last from one year to three years, or sometimes even more.

If the long range behaviour of market prices is seen, it will be observed that the share markets go through definite phases where the prices are consistently rising or falling.

These phases are known as bull and bear phases.

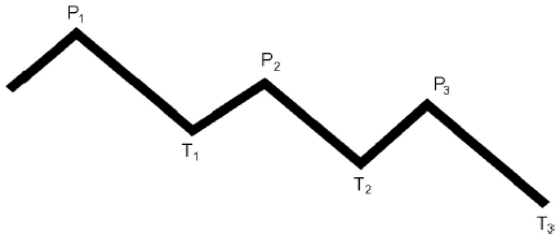


Graph 1

During a bull phase, the basic trend is that of rise in prices. Graph 1 above shows the behaviour of stock market prices in bull phase.

Students would notice from the graph that although the prices fall after each rise, the basic trend is that of rising prices, as can be seen from the graph that each trough prices reach, is at a higher level than the earlier one. Similarly, each peak that the prices reach is on a higher level than the earlier one. Thus P2 is higher than P1 and T2 is higher than T1. This means that prices do not rise consistently even in a bull phase. They rise for some time and after each rise, they fall. However, the falls are of a lower magnitude than earlier. As a result, prices reach higher levels with each rise.

Once the prices have risen very high, the b.ear phase in bound to start, i.e., price will start falling. Graph 2 shows the typical behaviour of prices on the stock exchange in the case of a bear phase. It would be seen that prices are not falling consistently and, after each fall, there is a rise in prices. However, the rise is not much as to take the prices higher than the previous peak. It means that each peak and trough is now lower than the previous peak and trough.



Graph 2

The theory argues that primary movements indicate basic trends in the market. It states that if cyclical swings of stock market price indices are successively higher, the market trend is up and there is a bull market. On the contrary, if successive highs and lows are successively lower, the market is on a downward trend and we are in a bear market. This theory thus relies upon the behaviour of the indices of share market prices in perceiving the trend in the market.

According to this theory, when the lines joining the first two troughs and the lines joining the corresponding two peaks are convergent, there is a rising trend and when both the lines are divergent, it is a declining trend.

(ii) ***Secondary Movements****:* We have seen that even when the primary trend is upward, there are also downward movements of prices. Similarly, even where the primary trend is downward, there is an upward movement of prices also. These movements are known as secondary movements and are shorter in duration and are opposite in direction to the primary movements. These movements normally last from three weeks to three months and retrace 1/3 to 2/3 of the previous advance in a bull market or previous fall in the bear market.

(iii) ***Daily Movements****:* There are irregular fluctuations which occur every day in the market. These fluctuations are without any definite trend. Thus if the daily share market price index for a few months is plotted on the graph it will show both upward and downward fluctuations. These fluctuations are the result of speculative factors. An investment manager really is not interested in the short run fluctuations in share prices since he is not a speculator. It may be reiterated that any one who tries to gain from short run fluctuations in the stock market, can make money only by sheer chance. The investment manager should scrupulously keep away from the daily fluctuations of the market. He is not a speculator and should always resist the temptation of speculating.

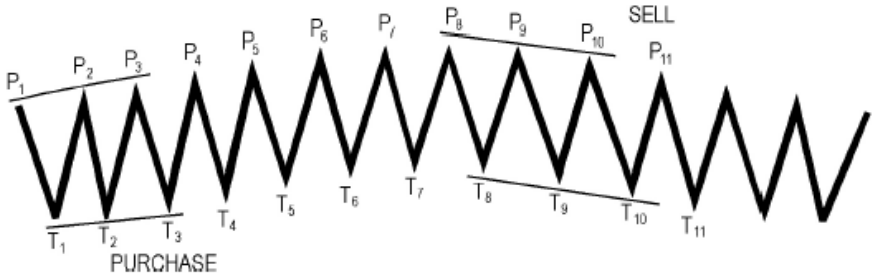
Such a temptation is always very attractive but must always be resisted. Speculation is beyond the scope of the job of an investment manager.

Timing of Investment Decisions on the Basis of Dow Jones Theory: Ideally speaking, the investment manager would like to purchase shares at a time when they have reached the lowest trough and sell them at a time when they reach the highest peak.

However, in practice, this seldom happens. Even the most astute investment manager can never know when the highest peak or the lowest trough has been reached. Therefore, he has to time his decision in such a manner that he buys the shares when they are on the rise and sells them when they are on the fall. It means that he should be able to identify exactly when the falling or the rising trend has begun.

This is technically known as identification of the turn in the share market prices. Identification of this turn is difficult in practice because of the fact that, even in a rising market, prices keep on falling as a part of the secondary movement. Similarly even in a falling market prices keep on rising temporarily. How to be certain that the rise in prices or fall in the same is due to a real turn in prices from a bullish to a bearish phase or *vice versa* or that it is due only to short-run speculative trends?

Dow Jones theory identifies the turn in the market prices by seeing whether the successive peaks and troughs are higher or lower than earlier. Consider the following graph:



Graph 3

According to the theory, the investment manager should purchase investments when the prices are at T1. At this point, he can ascertain that the bull trend has started, since T2 is higher than T1 and P2 is higher than P1.

Similarly, when prices reach P7 he should make sales. At this point he can ascertain that the bearish trend has started, since P9 is lower than P8 and T8 is lower than T7.

Question 4

Explain the Elliot Wave Theory of technical analysis?

Answer

Inspired by the Dow Theory and by observations found throughout nature, Ralph Elliot formulated Elliot Wave Theory in 1934. This theory was based on analysis of 75 years stock price movements and charts. From his studies, he defined price movements in terms of waves. Accordingly, this theory was named Elliot Wave Theory. Elliot found that the markets exhibited certain repeated patterns or waves. As per this theory wave is a movement of the market price from one change in the direction to the next change in the same direction. These waves are resulted from buying and selling impulses emerging from the demand and supply pressures on the market. Depending on the demand and supply pressures, waves are generated in the prices.

As per this theory, waves can be classified into two parts:-

- Impulsive patterns
- Corrective patters

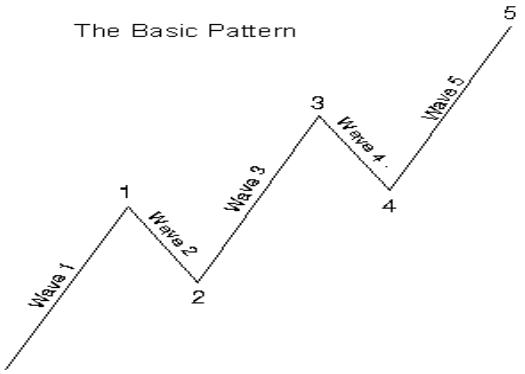
Let us discuss each of these patterns.

(a) Impulsive Patterns-(Basic Waves) - In this pattern there will be 3 or 5 waves in a given direction (going upward or downward). These waves shall move in the direction of the basic movement. This movement can indicate bull phase or bear phase.

(b) Corrective Patterns- (**Reaction Waves) -** These 3 waves are against the basic direction of the basic movement. Correction involves correcting the earlier rise in case of bull market and fall in case of bear market.

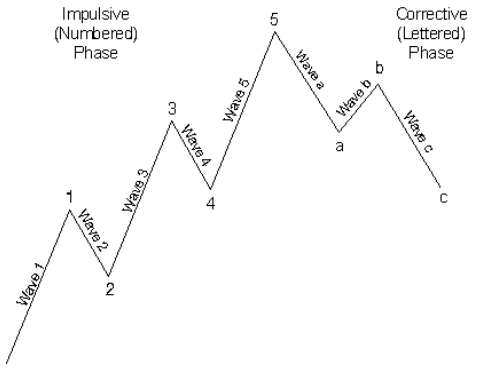
As shown in the following diagram waves 1, 3 and 5 are directional movements, which

are separated or corrected by wave 2 & 4, termed as corrective movements.



Source: http://elliotwave.net/

Complete Cycle - As shown in following figure five-wave impulses is following by a three-wave correction (a,b & c) to form a complete cycle of eight waves.



Source: http://elliotwave.net/

One complete cycle consists of waves made up of two distinct phases, bullish and bearish. On completion of full one cycle i.e. termination of 8 waves movement, the fresh cycle starts with similar impulses arising out of market trading.

Question 5

Why should the duration of a coupon carrying bond always be less than the time to its maturity?

Answer

Duration is nothing but the average time taken by an investor to collect his/her investment. If an investor receives a part of his/her investment over the time on specific intervals before maturity, the

investment will offer him the duration which would be lesser than the maturity of the instrument. Higher the coupon rate, lesser would be the duration.

Question 6

Mention the various techniques used in economic analysis.

Answer

Some of the techniques used for economic analysis are:

(a) Anticipatory Surveys: They help investors to form an opinion about the future state of the economy. It incorporates expert opinion on construction activities, expenditure on plant and machinery, levels of inventory – all having a definite bearing on economic activities. Also future spending habits of consumers are taken into account.

(b) Barometer/Indicator Approach: Various indicators are used to find out how the economy shall perform in the future. The indicators have been classified as under:

(1) Leading Indicators: They lead the economic activity in terms of their outcome. They relate to the time series data of the variables that reach high/low points in advance of economic activity.

(2) Roughly Coincidental Indicators: They reach their peaks and troughs at approximately the same in the economy.

(3) Lagging Indicators: They are time series data of variables that lag behind in their consequences vis-a-vis the economy. They reach their turning points after the economy has reached its own already.

All these approaches suggest direction of change in the aggregate economic activity but nothing about its magnitude.

(c) Economic Model Building Approach: In this approach, a precise and clear relationship between dependent and independent variables is determined. GNP model building or sectoral analysis is used in practice through the use of national accounting framework.

Question 7

Write short notes on Zero coupon bonds.

Answer

As name indicates these bonds do not pay interest during the life of the bonds. Instead, zero coupon bonds are issued at discounted price to their face value, which is the amount a bond will be worth when it matures or comes due. When a zero coupon bond matures, the investor will receive one lump sum (face value) equal to the initial investment plus interest that has been accrued on the investment made. The maturity dates on zero coupon bonds are usually long term. These maturity dates allow an investor for a long range planning. Zero coupon bonds issued by banks, government and private sector companies. However, bonds issued by corporate sector carry a potentially higher degree of risk, depending on the financial strength

of the issuer and longer maturity period, but they also provide an opportunity to achieve a higher return.

Question 8

A company has a book value per share of ₹137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, what is the price of the share today? [adopt the perpetual growth model to arrive at your solution].

Answer

The company earnings and dividend per share after a year are expected to be:

EPS = ₹ 137.8 × 0.15 = ₹ 20.67

Dividend = 0.40 × 20.67 = ₹ 8.27

The growth in dividend would be:

g = 0.6 × 0.15 = 0.09

$$\text{Perpetual growth model Formula}: P_0 = \frac{\text{Dividend}}{K_e - g}$$

$$P_0 = \frac{8.27}{0.18 - 0.09}$$

P_0 = ₹ 91.89

Alternative Solution:

However, in case note given in the bracket is not given in the question and a student follows Walter's approach as against continuous growth model given in previous solution then answer of the question works out to be different. This can be shown as follow:

Given data:

Book value per share = ₹ 137.80

Return on equity = 15%

Dividend Payout = 40%

Cost of capital = 18%

∴ EPS = ₹ 137.80 × 15%

= ₹ 20.67

∴ Dividend = ₹ 20.67 × 40% = ₹ 8.27

Walter's approach showing relationship between dividend and share price can be expressed by the following formula

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

Where,

V_c = Market Price of the ordinary share of the company.

R_a = Return on internal retention i.e. the rate company earns on retained profits.

R_c = Capitalisation rate i.e. the rate expected by investors by way of return from particular category of shares.

E = Earnings per share.

D = Dividend per share.

Hence,

$$V_c = \frac{8.27 + \frac{.15}{.18}(20.67 - 8.27)}{.18}$$

$$= \frac{18.60}{.18}$$

= ₹ 103.35

Question 9

ABC Limited's shares are currently selling at ₹ 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise ₹ 20 lakhs to Finance a new project.

Required:

What are the ex-right price of shares and the value of a right, if

(i) The firm offers one right share for every two shares held.

(ii) The firm offers one right share for every four shares held.

(iii) How does the shareholders' wealth change from (i) to (ii)? How does right issue increases shareholders' wealth?

Answer

(i) Number of shares to be issued : 5,00,000

Subscription price ₹ 20,00,000 / 5,00,000 = ₹ 4

$$\text{Ex-right Price} = \frac{₹\ 1,30,00,000 + ₹\ 20,00,000}{15,00,000} = ₹\ 10$$

$$\text{Value of right} = \frac{₹\ 10 - ₹\ 4}{2} = 3$$

Or = ₹ 10 – ₹ 4 = ₹ 6

(ii) Subscription price ₹ 20,00,000 / 2,50,000 = ₹ 8

$$\text{Ex-right Price} = \frac{₹\ 1,30,00,000 + ₹\ 20,00,000}{12,50,000} = ₹\ 12$$

$$\text{Value of right} = \frac{₹\ 12 - ₹\ 8}{4} = ₹\ 1.$$

Or = ₹ 12 – ₹ 8 = ₹ 4

(iii) Calculation of effect of right issue on wealth of Shareholder's wealth who is holding, say 100 shares.

(a) When firm offers one share for two shares held.

Value of Shares after right issue (150 X ₹ 10)	₹ 1,500
Less: Amount paid to acquire right shares (50X₹4)	₹ 200
	₹1,300

(b) When firm offers one share for every four shares held.

Value of Shares after right issue (125 X ₹ 12)	₹ 1,500
Less: Amount paid to acquire right shares (25X₹8)	₹ 200
	₹1,300

(c) Wealth of Shareholders before Right Issue ₹1,300

Thus, there will be no change in the wealth of shareholders from (i) and (ii).

Question 10

Pragya Limited has issued 75,000 equity shares of ₹ 10 each. The current market price per share is ₹ 24. The company has a plan to make a rights issue of one new equity share at a price of ₹ 16 for every four share held.

You are required to:

(i) Calculate the theoretical post-rights price per share;

(ii) Calculate the theoretical value of the right alone;

(iii) Show the effect of the rights issue on the wealth of a shareholder, who has 1,000 shares assuming he sells the entire rights; and

(iv) Show the effect, if the same shareholder does not take any action and ignores the issue.

Answer

(i) Calculation of theoretical Post-rights (ex-right) price per share:

$$\text{Ex-right value} = \left[\frac{MN + SR}{N + R}\right]$$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

$$= \left[\frac{(₹\ 24 \times 4) + (₹\ 16 \times 1)}{4 + 1}\right] = ₹\ 22.40$$

(ii) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= ₹ 22.40 – ₹ 16 = ₹ 6.40

Or $= \frac{₹\ 22.40 - ₹16}{4} = ₹\ 1.60$

(iii) Calculation of effect of the rights issue on the wealth of a shareholder who has 1,000 shares assuming he sells the entire rights:

		₹
(a)	Value of shares before right issue (1,000 shares × ₹ 24)	24,000
(b)	Value of shares after right issue (1,000 shares × ₹ 22.40)	22,400
	Add: Sale proceeds of rights renunciation (250 shares × ₹ 6.40)	1,600
		24,000

There is no change in the wealth of the shareholder even if he sells his right.

(iv) Calculation of effect if the shareholder does not take any action and ignores the issue:

	₹
Value of shares before right issue (1,000 shares × ₹ 24)	24,000
Less: Value of shares after right issue	

(1,000 shares × ₹ 22.40)	22,400
Loss of wealth to shareholders, if rights ignored	1,600

Question 11

The stock of the Soni plc is selling for £50 per common stock. The company then issues rights to subscribe to one new share at £40 for each five rights held.

(a) What is the theoretical value of a right when the stock is selling rights-on?

(b) What is the theoretical value of one share of stock when it goes ex-rights?

(c) What is the theoretical value of a right when the stock sells ex-rights at £50?

(d) John Speculator has £1,000 at the time Soni plc goes ex-rights at £50 per common stock. He feels that the price of the stock will rise to £60 by the time the rights expire. Compute his return on his £1,000 if he (1) buys Soni plc stock at £50, or (2) buys the rights as the price computed in part c, assuming his price expectations are valid.

Answer

(a) $R_0 = \frac{P_0 - S}{N+1} = \frac{£50 - £40}{5+1} = £1.67$

(b) $P_x = \frac{(P_0 \times N) + S}{N+1} = \frac{(£50 \times 5) + £40}{6} = £48.33$

(c) $R_x = \frac{P_x - S}{N} = \frac{£50 - £40}{5} = £2.00$

(d) (1) £1,000/£50 =20 shares x £60 = £1,200

£1,200 - £1,000 = £200

(2) £1,000 / £2 = 500 rights X £4* = £2,000

£2,000-£1,000 = £1,000

*R_x = (£60 - £40)/5 = £4

Question 12

MNP Ltd. has declared and paid annual dividend of ₹ 4 per share. It is expected to grow @ 20% for the next two years and 10% thereafter. The required rate of return of equity investors is 15%. Compute the current price at which equity shares should sell.

Note: Present Value Interest Factor (PVIF) @ 15%:

For year 1 = 0.8696;

For year 2 = 0.7561

Answer

D_0 = ₹ 4

D_1 = ₹ 4 (1.20) = ₹ 4.80

D_2 = ₹ 4 $(1.20)^2$ = ₹ 5.76

D_3 = ₹ 4 $(1.20)^2$ (1.10) = ₹ 6.336

$$P = \frac{D_1}{(1+k_e)} + \frac{D_2}{(1+k_e)^2} + \frac{TV}{(1+k_e)^2}$$

$$TV = \frac{D_3}{k_e - g} = \frac{6.336}{0.15 - 0.10} = 126.72$$

$$P = \frac{4.80}{(1+0.15)} + \frac{5.76}{(1+0.15)^2} + \frac{126.72}{(1+0.15)^2}$$

= 4.80 x 0.8696 + 5.76 x 0.7561 + 126.72 x 0.7561 = 104.34

Question 13

On the basis of the following information:

Current dividend (Do)	=	*₹ 2.50*
Discount rate (k)	=	*10.5%*
Growth rate (g)	=	*2%*

(i) Calculate the present value of stock of ABC Ltd.

(ii) Is its stock overvalued if stock price is ₹ 35, ROE = 9% and EPS = ₹ 2.25? Show detailed calculation.

Answer

(i) Present Value of the stock of ABC Ltd. Is:-

$$Vo = \frac{2.50(1.02)}{0.105 - 0.02} = ₹30/-.$$

(ii) Value of stock under the PE Multiple Approach

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%

EPS	₹ 2.25
PE Multiple (1/Return on Equity) = 1/9%	11.11
Market Price per Share	₹ 25.00

Since, Actual Stock Price is higher, hence it is overvalued.

Alternatively the Value of the Stock under the Earnings Growth Model

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%
EPS	₹ 2.25
Growth Rate	2%
Market Price per Share [EPS ×(1+g)]/(K_e – g)	₹ 32.79
= ₹ 2.25 × 1.02/0.07	

Since, Actual Stock Price is higher, hence it is overvalued.

Question 14

Given the following information:

Current Dividend	*₹5.00*
Discount Rate	*10%*
Growth rate	*2%*

(i) Calculate the present value of the stock.

(ii) Is the stock over valued if the price is ₹40, ROE = 8% and EPS = ₹ 3.00. Show your calculations under the PE Multiple approach and Earnings Growth model.

Answer

(i) Present Value of the stock:-

$$Vo = \frac{5.00(1.02)}{0.10-0.02} = ₹63.75/-.$$

(ii) Value of stock under the PE Multiple Approach

Particulars	
Actual Stock Price	₹ 40.00
Return on equity	8%

EPS	₹ 3.00
PE Multiple (1/Return on Equity) = 1/8%	12.50
Market Price per Share	₹ 37.50

Since, Actual Stock Price is higher, hence it is overvalued.

(iii) Value of the Stock under the Earnings Growth Model

Particulars	
Actual Stock Price	₹ 40.00
Return on equity	8%
EPS	₹ 3.00
Growth Rate	2%
Market Price per Share [EPS ×(1+g)]/(K_e – g)	₹ 51.00
= ₹ 3.00 × 1.02/0.06	

Since, Actual Stock Price is lower, hence it is undervalued.

Question 15

X Limited, just declared a dividend of ₹ 14.00 per share. Mr. B is planning to purchase the share of X Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years. He also expects the market price of this share to be ₹ 360.00 after three years.

You are required to determine:

(i) the maximum amount Mr. B should pay for shares, if he requires a rate of return of 13% per annum.

(ii) the maximum price Mr. B will be willing to pay for share, if he is of the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.

(iii) the price of share at the end of three years, if 9% growth rate is achieved and assuming other conditions remaining same as in (ii) above.

Calculate rupee amount up to two decimal points.

	Year-1	***Year-2***	***Year-3***
FVIF @ 9%	*1.090*	*1.188*	*1.295*
FVIF @ 13%	*1.130*	*1.277*	*1.443*
PVIF @ 13%	*0.885*	*0.783*	*0.693*

Answer

(i) Expected dividend for next 3 years.

Year 1 (D_1) ₹ 14.00 (1.09) = ₹ 15.26

Year 2 (D_2) ₹ 14.00 $(1.09)^2$ = ₹ 16.63

Year 3 (D_3) ₹ 14.00 $(1.09)^3$ = ₹ 18.13

Required rate of return = 13% (Ke)

Market price of share after 3 years = (P_3) = ₹ 360

The present value of share

$$P_0 = \frac{D_1}{(1+ke)} + \frac{D_2}{(1+ke)^2} + \frac{D_3}{(1+ke)^3} + \frac{P_3}{(1+ke)^3}$$

$$P_0 = \frac{15.26}{(1+0.13)} + \frac{16.63}{(1+0.13)^2} + \frac{18.13}{(1+0.13)^3} + \frac{360}{(1+0.13)^3}$$

P_0 = 15.26(0.885) + 16.63(0.783) +18.13(0.693)+360(0.693)

P_0 = 13.50 + 13.02 + 12.56 + 249.48

P_0 = ₹ 288.56

(ii) If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$P_0 = \frac{D_1}{(ke-g)} = \frac{₹\ 15.26}{0.13\text{-}0.09} = \frac{₹15.26}{0.04} = ₹\ 381.50$$

(iii) Assuming that conditions mentioned above remain same, the price expected after 3 years will be:

$$P_3 = \frac{D_4}{k_e - g} = \frac{D_3(1.09)}{0.13-0.09} = \frac{18.13 \times 1.09}{0.04} = \frac{19.76}{0.04} = ₹\ 494$$

Question 16

Piyush Loonker and Associates presently pay a dividend of Re. 1.00 per share and has a share price of ₹20.00.

(i) If this dividend were expected to grow at a rate of 12% per annum forever, what is the firm's expected or required return on equity using a dividend-discount model approach?

(ii) Instead of this situation in part (i), suppose that the dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter. Now what is the firm's expected, or required, return on equity?

Answer

(i) Firm's Expected or Required Return On Equity

(Using a dividend discount model approach)

According to Dividend discount model approach the firm's expected or required return on equity is computed as follows:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity share capital or (Firm's expected or required return on equity share capital)

D_1 = Expected dividend at the end of year 1

P_0 = Current market price of the share.

g = Expected growth rate of dividend.

Now, $D_1 = D_0 (1 + g)$ or ₹ 1 (1 + 0.12) or ₹ 1.12, P_0 = ₹ 20 and g = 12% per annum

$$\text{Therefore, } K_e = \frac{₹ 1.12}{₹ 20} + 12\%$$

Or, K_e = ₹ 17.6%

(ii) Firm's Expected or Required Return on Equity

(If dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter)

Since in this situation if dividends are expected to grow at a super normal growth rate g_s, for n years and thereafter, at a normal, perpetual growth rate of g_n beginning in the year n + 1, then the cost of equity can be determined by using the following formula:

$$P_0 = \sum_{t=1}^{n} \frac{Div_0 (1+ g_s)^t}{(1+ K_e)^t} + \frac{Div_{n+1}}{K_e - g_n} \times \frac{1}{(1+ K_e)^n}$$

Where,

g_s = Rate of growth in earlier years.

g_n = Rate of constant growth in later years.

P_0 = Discounted value of dividend stream.

K_e = Firm's expected, required return on equity (cost of equity capital).

Now,

g_s = 20% for 5 years, g_n = 10%

Therefore,

$$P_0 = \sum_{t=1}^{n} \frac{D_0 (1+0.20)^t}{(1+K_e)^t} + \frac{Div_{5+1}}{K_e - 0.10} \times \frac{1}{(1+K_e)^t}$$

$$_0 = \frac{1.20}{(1+\ )^1} + \frac{1.44}{(1+\ )^2} + \frac{1.73}{(1+\ )^3} + \frac{2.07}{(1+\ )^4} + \frac{2.49}{(1+\ )^5} + \frac{2.49(1+0.10)}{-0.10} \times \frac{1}{(1+\ )^5}$$

or P_0 = ₹ 1.20 (PVF_1, K_e) + ₹ 1.44 (PVF_2, K_e) + ₹ 1.73 (PVF_3, K_e) + ₹ 2.07 (PVF_4, K_e) + ₹ 2.49 (PVF_5, K_e) + $\frac{Rs.2.74(PVF_5, K_e)}{K_e - 0.10}$

By trial and error we are required to find out K_e

Now, assume K_e = 18% then we will have

P_0 = ₹ 1.20 (0.8475) + ₹ 1.44 (0.7182) + ₹ 1.73 (0.6086) + ₹ 2.07 (0.5158) + ₹ 2.49 (0.4371) + ₹ 2.74 (0.4371) $\times \frac{1}{0.18 - 0.10}$

= ₹ 1.017 + ₹ 1.034 + ₹ 1.053 + ₹ 1.068 + ₹ 1.09 + ₹ 14.97

= ₹ 20.23

Since the present value of dividend stream is more than required it indicates that Ke is greater than 18%.

Now, assume K_e = 19% we will have

P_0 = ₹ 1.20 (0.8403) + ₹ 1.44 (0.7061) + ₹ 1.73 (0.5934) + ₹ 2.07 (0.4986) + ₹ 2.49 (0.4190) + ₹ 2.74 (0.4190) $\times \frac{1}{0.19 - 0.10}$

= ₹ 1.008 + ₹ 1.017 + ₹ 1.026+ ₹ 1.032 + ₹ 1.043 + ₹ 12.76

= ₹ 17.89

Since the market price of share (expected value of dividend stream) is ` 20. Therefore, the discount rate is closer to 18% than it is to 19%, we can get the exact rate by interpolation by using the following formula:

$$K_e = LR + \frac{NPV\ at\ LR}{NPV\ at\ LR - NPV\ at\ HR} \times \Delta r$$

Where,

LR = Lower Rate

NPV at LR = Present value of share at LR

NPV at HR = Present value of share at Higher Rate

Δr = Difference in rates

$$K = 18\% + \frac{(₹\ 20.23 - ₹\ 20)}{₹\ 20.23 - ₹\ 17.89} \times 1\%$$

$$= 18\% + \frac{₹\ 0.23}{₹ 2.34} \times 1\%$$

= 18% + 0.10% = 18.10%

Therefore, the firm's expected, or required, return on equity is 18.10%. At this rate the present discounted value of dividend stream is equal to the market price of the share.

Question 17

Capital structure of Sun Ltd., as at 31.3.2003 was as under:

	(₹ in lakhs)
Equity share capital	*80*
8% Preference share capital	*40*
12% Debentures	*64*
Reserves	*32*

Sun Ltd., earns a profit of ₹ 32 lakhs annually on an average before deduction of income-tax, which works out to 35%, and interest on debentures.

Normal return on equity shares of companies similarly placed is 9.6% provided:

(a) Profit after tax covers fixed interest and fixed dividends at least 3 times.

(b) Capital gearing ratio is 0.75.

(c) Yield on share is calculated at 50% of profits distributed and at 5% on undistributed profits.

Sun Ltd., has been regularly paying equity dividend of 8%.

Compute the value per equity share of the company.

Answer

(a) Calculation of Profit after tax (PAT)

	₹
Profit before interest and tax (PBIT)	32,00,000

Less: Debenture interest (₹ 64,00,000 × 12/100)		7,68,000
Profit before tax (PBT)		24,32,000
Less: Tax @ 35%		8,51,200
Profit after tax (PAT)		15,80,800
Less: Preference Dividend		
(₹ 40,00,000 × 8/100)	3,20,000	
Equity Dividend (₹ 80,00,000 × 8/100)	6,40,000	9,60,000
Retained earnings (Undistributed profit)		6,20,800

Calculation of Interest and Fixed Dividend Coverage

$$= \frac{\text{PAT} + \text{Debenture interest}}{\text{Debenture interest} + \text{Preference dividend}}$$

$$= \frac{15,80,800 + 7,68,000}{7,68,000 + 3,20,000} = \frac{23,48,800}{10,88,000} = 2.16 \text{ times}$$

(b) Calculation of Capital Gearing Ratio

$$\text{Capital Gearing Ratio} = \frac{\text{Fixed interest bearing funds}}{\text{Equity shareholders' funds}}$$

$$= \frac{\text{Preference Share Capital} + \text{Debentures}}{\text{Equity Share Capital} + \text{Reserves}} = \frac{40,00,000 + 64,00,000}{80,00,000 + 32,00,000} = \frac{1,04,00,000}{1,12,00,000} = 0.93$$

(c) Calculation of Yield on Equity Shares:

Yield on equity shares is calculated at 50% of profits distributed and 5% on undistributed profits:

	(₹)
50% on distributed profits (₹ 6,40,000 × 50/100)	3,20,000
5% on undistributed profits (₹ 6,20,800 × 5/100)	31,040
Yield on equity shares	3,51,040

$$\text{Yield on equity shares \%} = \frac{\text{Yield on shares}}{\text{Equity share capital}} \times 100$$

$$= \frac{3,51,040}{80,00,000} \times 100 = 4.39\% \text{ or, } 4.388\%.$$

Calculation of Expected Yield on Equity shares

Note: There is a scope for assumptions regarding the rates (in terms of percentage for every one time of difference between Sun Ltd. and Industry Average) of risk premium involved with respect to Interest and Fixed Dividend Coverage and Capital Gearing Ratio. The below solution has been worked out by assuming the risk premium as:

(i) 1% for every one time of difference for Interest and Fixed Dividend Coverage.

(ii) 2% for every one time of difference for Capital Gearing Ratio.

(a) Interest and fixed dividend coverage of Sun Ltd. is 2.16 times but the industry average is 3 times. Therefore, risk premium is added to Sun Ltd. Shares @ 1% for every 1 time of difference.

Risk Premium = 3.00 – 2.16 (1%) = 0.84 (1%) = 0.84%

(b) Capital Gearing ratio of Sun Ltd. is 0.93 but the industry average is 0.75 times. Therefore, risk premium is added to Sun Ltd. shares @ 2% for every 1 time of difference.

Risk Premium = (0.75 – 0.93) (2%)

= 0.18 (2%) = 0.36%

	(%)
Normal return expected	9.60
Add: Risk premium for low interest and fixed dividend coverage	0.84
Add: Risk premium for high interest gearing ratio	0.36
	10.80

Value of Equity Share

$$= \frac{\text{Actual yield}}{\text{Expected yield}} \times \text{Paid-up value of share} = \frac{4.39}{10.80} \times 100 = ₹\ 40.65$$

Question 18

ABC Ltd. has been maintaining a growth rate of 10 percent in dividends. The company has paid dividend @ ₹3 per share. The rate of return on market portfolio is 12 percent and the risk free rate of return in the market has been observed as 8 percent. The Beta co-efficient of company's share is 1.5.

You are required to calculate the expected rate of return on company's shares as per CAPM model and equilibrium price per share by dividend growth model.

Answer

CAPM formula for calculation of Expected Rate of Return is :

ER $= R_f + \beta (R_m - R_f)$

$= 8 + 1.5 (12 - 8)$

$= 8 + 1.5 (4)$

$= 8 + 6$

$=14\%$ or 0.14

Applying Dividend Growth Model for the calculation of per share equilibrium price:

$$ER = \frac{D_1}{P_0} + g$$

$$0.14 = \frac{3 (1.10)}{P_0} + 0.10$$

$$0.14 - 0.10 = \frac{3.30}{P_0}$$

$$0.04\ P_0 = 3.30$$

$$P_0 = \frac{3.30}{0.04} = ₹\ 82.50$$

Per share equilibrium price will be ₹ 82.50.

Question 19

A Company pays a dividend of ₹ 2.00 per share with a growth rate of 7%. The risk free rate is 9% and the market rate of return is 13%. The Company has a beta factor of 1.50. However, due to a decision of the Finance Manager, beta is likely to increase to 1.75. Find out the present as well as the likely value of the share after the decision.

Answer

In order to find out the value of a share with constant growth model, the value of K_e should be ascertained with the help of 'CAPM' model as follows:

$$K_e = R_f + \beta (K_m - R_f)$$

Where,

K_e = Cost of equity

R_f = Risk free rate of return

β = Portfolio Beta i.e. market sensitivity index

K_m = Expected return on market portfolio

By substituting the figures, we get

$K_e = 0.09 + 1.5 (0.13 – 0.09) = 0.15$ or 15%

and the value of the share as per constant growth model is

$$P_0 = \frac{D_1}{(k_e - g)}$$

Where,

P_0 = Price of a share

D_1 = Dividend at the end of the year 1

K_e = Cost of equity

G = growth

$$P_0 = \frac{2.00}{(k_e - g)}$$

$$P_0 = \frac{2.00}{0.15 - 0.07} = ₹ 25.00$$

Alternatively it can also be found as follows:

$$\frac{2.00 (1.07)}{0.15 - 0.07} = ₹ 26.75$$

However, if the decision of finance manager is implemented, the beta (β) factor is likely to increase to 1.75 therefore, K_e would be

$K_e = R_f + \beta (K_m – R_f)$

$= 0.09 + 1.75 (0.13 – 0.09) = 0.16$ or 16%

The value of share is

$$P_0 = \frac{D_1}{(k_e - g)}$$

$$P_0 = \frac{2.00}{0.16 - 0.07} = ₹ 22.22$$

Alternatively it can also be found as follows:

$$\frac{2.00 (1.07)}{0.16 - 0.07} = ₹ 23.78$$

Question 20

Calculate the value of share from the following information:

Profit of the company	*₹ 290 crores*
Equity capital of company	*₹ 1,300 crores*
Par value of share	*₹ 40 each*
Debt ratio of company (Debt/ Debt + Equity)	*27%*
Long run growth rate of the company	*8%*
Beta 0.1; risk free interest rate	*8.7%*
Market returns	*10.3%*
Capital expenditure per share	*₹ 47*
Depreciation per share	*₹ 39*
Change in Working capital	*₹ 3.45 per share*

Answer

$$\text{No. of Shares} = \frac{₹\ 1{,}300\ \text{crores}}{₹\ 40} = 32.5\ \text{Crores}$$

$$\text{EPS} = \frac{\text{PAT}}{\text{No.of shares}}$$

$$\text{EPS} = \frac{₹\ 290\ \text{crores}}{32.5\ \text{crores}} = ₹\ 8.923$$

FCFE = Net income – [(1-b) (capex – dep) + (1-b) (ΔWC)]

FCFE = 8.923 – [(1-0.27) (47-39) + (1-0.27) (3.45)]

= 8.923 – [5.84 + 2.5185] = 0.5645

Cost of Equity = R_f + ß (R_m – R_f)

= 8.7 + 0.1 (10.3 – 8.7) = 8.86%

$$\text{Po} = \frac{\text{FCFE}(1+g)}{K_e - g} = \frac{0.5645(1.08)}{0.0886 - .08} = \frac{0.60966}{0.0086} = ₹\ 70.89$$

Question 21

XYZ company has current earnings of ₹ 3 per share with 5,00,000 shares outstanding. The company plans to issue 40,000, 7% convertible preference shares of ₹ 50 each at par. The preference shares are convertible into 2 shares for each preference shares held. The equity share has a current market price of ₹ 21 per share.

(i) What is preference share's conversion value?

(ii) What is conversion premium?

(iii) Assuming that total earnings remain the same, calculate the effect of the issue on the basic earning per share (a) before conversion (b) after conversion.

(iv) If profits after tax increases by ₹ 1 million what will be the basic EPS (a) before conversion and (b) on a fully diluted basis?

Answer

(i) Conversion value of preference share

Conversion Ratio x Market Price

2 × ₹ 21 = ₹ 42

(ii) Conversion Premium

(₹ 50/ ₹ 42) – 1 = 19.05%

(iii) Effect of the issue on basic EPS

	₹
Before Conversion	
Total (after tax) earnings 3 × ₹ 5,00,000	15,00,000
Dividend on Preference shares	1,40,000
Earnings available to equity holders	13,60,000
No. of shares	5,00,000
EPS	2.72
On Diluted Basis	
Earnings	15,00,000
No of shares (5,00,000 + 80,000)	5,80,000
EPS	2.59

(iv) EPS with increase in Profit

	₹
Before Conversion	
Earnings	25,00,000
Dividend on Pref. shares	1,40,000
Earning for equity shareholders	23,60,000
No. of equity shares	5,00,000
EPS	4.72

On Diluted Basis	
Earnings	25,00,000
No. of shows	5,80,000
EPS	4.31

Question 22

Shares of Voyage Ltd. are being quoted at a price-earning ratio of 8 times. The company retains 45% of its earnings which are ₹ 5 per share.

You are required to compute

(1) The cost of equity to the company if the market expects a growth rate of 15% p.a.

(2) If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.

(3) If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share.

Answer

(1) Cost of Capital

Retained earnings (45%)	₹ 5 per share
Dividend (55%)	₹ 6.11 per share
EPS (100%)	₹ 11.11 per share
P/E Ratio	8 times
Market price	₹ 11.11 × 8 = ₹ 88.88

Cost of equity capital

$$= \left(\frac{\text{Div}}{\text{Price}} \times 100\right) + \text{Growth \%} = \frac{₹\ 6.11}{₹\ 88.88} \times 100 + 15\% = 21.87\%$$

(2) Market Price $= \left(\frac{\text{Dividend}}{\text{Cost of Capital(\%) - Growth Rate(\%)}}\right)$

$$= \frac{₹\ 6.11}{(21.87-16)\%} = ₹\ 104.08 \text{ per share}$$

(3) Market Price $= \frac{₹ 6.11}{(20-19)\%} = ₹\ 611.00$ per share

Alternative Solution

As in the question the sentence "The company retains 45% of its earnings which are ₹ 5 per share" amenable to two interpretations i.e. one is ₹ 5 as retained earnings (45%) and another is ₹ 5 is EPS (100%). Alternative solution is as follows:

(1) Cost of capital

EPS (100%)	₹ 5 per share
Retained earnings (45%)	₹ 2.25 per share
Dividend (55%)	₹ 2.75 per share
P/E Ratio	8 times
Market Price	₹ 5 × 8 = ₹ 40

Cost of equity capital

$$= \left(\frac{\text{Div}}{\text{Price}} \times 100\right) + \text{Growth \%} = \frac{₹\ 2.75}{₹\ 40.00} \times 100 + 15\% = 21.87\%$$

(2) Market Price $= \left(\frac{\text{Dividend}}{\text{Cost of Capital(\%)} - \text{Growth Rate(\%)}}\right) = \frac{₹\ 2.75}{(21.87 - 16)\%}$

= ₹ 46.85 per share

(3) Market Price $= \frac{₹\ 2.75}{(20 - 19)\%}$ = ₹ 275.00 per share

Question 23

A share of Tension-free Economy Ltd. is currently quoted at, a price earnings ratio of 7.5 times. The retained earnings per share being 37.5% is ₹ 3 per share. Compute:

(1) The company's cost of equity, if investors expect annual growth rate of 12%.

(2) If anticipated growth rate is 13% p.a., calculate the indicated market price, with same cost of capital.

(3) If the company's cost of capital is 18% and anticipated growth rate is 15% p.a., calculate the market price per share, assuming other conditions remain the same.

Answer

1. Calculation of cost of capital

Retained earnings		37.5%	₹ 3 per share
Dividend*		62.5%	₹ 5 per share
EPS		100.0%	₹ 8 per share
P/E ratio	7.5 times		

Market price is ₹ 7.5 × 8 = ₹ 60 per share

Cost of equity capital = (Dividend/price × 100) + growth %

= (5/60 × 100) + 12% = 20.33%.

* $\left(\frac{₹\,3}{37.5} \times 62.5 = ₹\,5\right)$

2. Market price = Dividend/(cost of equity capital % – growth rate %) = 5/(20.33% – 13%) = 5/7.33% = ₹ 68.21 per share.

3. Market price = Dividend/(cost of equity capital % – growth rate %) = 5/(18% – 15%) = 5/3% = ₹ 166.66 per share.

Question 24

Following Financial data are available for PQR Ltd. for the year 2008:

	(₹ in lakh)
8% debentures	*125*
10% bonds (2007)	*50*
Equity shares (₹ 10 each)	*100*
Reserves and Surplus	*300*
Total Assets	*600*
Assets Turnovers ratio	*1.1*
Effective interest rate	*8%*
Effective tax rate	*40%*
Operating margin	*10%*
Dividend payout ratio	*16.67%*
Current market Price of Share	*₹14*
Required rate of return of investors	*15%*

You are required to:

(i) Draw income statement for the year

(ii) Calculate its sustainable growth rate

(iii) Calculate the fair price of the Company's share using dividend discount model, and

(iv) What is your opinion on investment in the company's share at current price?

Answer

Workings:

Asset turnover ratio	= 1.1
Total Assets	= ₹ 600
Turnover ₹ 600 lakhs × 11	= ₹ 660 lakhs
Effective interest rate	$= \frac{\text{Interest}}{\text{Libilities}} = 8\%$
Liabilities	= ₹ 125 lakhs + 50 lakhs = 175 lakh
Interest	= ₹ 175 lakhs × 0.08 = ₹ 14 lakh
Operating Margin	= 10%
Hence operating cost	= (1 - 0.10) ₹ 660 lakhs = ₹ 594 lakh
Dividend Payout	= 16.67%
Tax rate	= 40%

(i) Income statement

	(₹ Lakhs)
Sale	660
Operating Exp	594
EBIT	66
Interest	14
EBT	52
Tax @ 40%	20.80
EAT	31.20
Dividend @ 16.67%	5.20
Retained Earnings	26.00

(ii) SGR = G = ROE (1-b)

$$\text{ROE} = \frac{\text{PAT}}{\text{NW}} \text{ and NW} = ₹\,100\,\text{lakh} + ₹\ 300\,\text{lakh} = 400\,\text{lakh}$$

$$\text{ROE} = \frac{₹\,31.2\ \text{lakhs}}{₹\,400\ \text{lakhs}} \times 100 = 7.8\%$$

SGR = 0.078(1 - 0.1667) = 6.5%

(iii) Calculation of fair price of share using dividend discount model

$$P_o = \frac{D_0(1+g)}{k_e - g}$$

$$\text{Dividends} = \frac{₹\ 5.2 \text{ lakhs}}{₹\ 10 \text{ lakhs}} = ₹\ 0.52$$

Growth Rate = 6.5%

$$\text{Hence } P_o = \frac{₹\ 0.52(1+0.065)}{0.15\text{-}0.065} = \frac{₹\ 0.5538}{0.085} = ₹\ 6.51$$

(iv) Since the current market price of share is ₹ 14, the share is overvalued. Hence the investor should not invest in the company.

Question 25

M/s X Ltd. has paid a dividend of ₹ 2.5 per share on a face value of ₹ 10 in the financial year ending on 31st March, 2009. The details are as follows:

Current market price of share	*₹ 60*
Growth rate of earnings and dividends	*10%*
Beta of share	*0.75*
Average market return	*15%*
Risk free rate of return	*9%*

Calculate the intrinsic value of the share.

Answer

$$\text{Intrinsic Value } P_0 = \frac{D1}{k - g}$$

Using CAPM

$k = R_f + \beta (R_m - R_f)$

R_f = Risk Free Rate

β = Beta of Security

R_m = Market Return

= 9% + 0.75 (15% - 9%) = 13.5%

$$P = \frac{2.5 \times 1.1}{0.135 - 0.10} = \frac{2.75}{0.035} = ₹ 78.57$$

Question 26

Mr. A is thinking of buying shares at ₹ 500 each having face value of ₹ 100. He is expecting a bonus at the ratio of 1:5 during the fourth year. Annual expected dividend is 20% and the same rate is expected to be maintained on the expanded capital base. He intends to sell the shares at the end of seventh year at an expected price of ₹ 900 each. Incidental expenses for purchase and sale of shares are estimated to be 5% of the market price. He expects a minimum return of 12% per annum.

Should Mr. A buy the share? If so, what maximum price should he pay for each share? Assume no tax on dividend income and capital gain.

Answer

P.V. of dividend stream and sales proceeds

Year	Divd. /Sale	PVF (12%)	PV (₹)
1	₹ 20/-	0.893	17.86
2	₹ 20/-	0.797	15.94
3	₹ 20/-	0.712	14.24
4	₹ 24/-	0.636	15.26
5	₹ 24/	0.567	13.61
6	₹ 24/	0.507	12.17
7	₹ 24/	0.452	10.85
7	₹ 1026/- (₹ 900 x 1.2 x 0.95)	0.452	463.75
			₹ 563.68
	Less : - Cost of Share (₹ 500 x 1.05)		₹ 525.00
	Net gain		₹ 38.68

Since Mr. A is gaining ₹ 38.68 per share, he should buy the share.

Maximum price Mr. A should be ready to pay is ₹ 563.68 which will include incidental expenses. So the maximum price should be ₹ 563.68 x 100/105 = ₹ 536.84

Question 27

The risk free rate of return R_f is 9 percent. The expected rate of return on the market portfolio R_m is 13 percent. The expected rate of growth for the dividend of Platinum Ltd. is 7 percent.

The last dividend paid on the equity stock of firm A was ₹ 2.00. The beta of Platinum Ltd. equity stock is 1.2.

(i) What is the equilibrium price of the equity stock of Platinum Ltd.?

(ii) How would the equilibrium price change when

- The inflation premium increases by 2 percent?
- The expected growth rate increases by 3 percent?

The beta of Platinum Ltd. equity rises to 1.3?

Answer

(i) Equilibrium price of Equity using CAPM

= 9% + 1.2(13% - 9%)

= 9% + 4.8%= 13.8%

$$P=\frac{D_1}{k_e - g} = \frac{2.00(1.07)}{0.138 - 0.07} = \frac{2.14}{0.068} = ₹ 31.47$$

(ii) New Equilibrium price of Equity using CAPM

= 9.18% + 1.3(13% - 9.18%)

= 9.18% + 4.966%= 14.146%

$$P=\frac{D_1}{k_e - g} = \frac{2.00(1.10)}{0.14146 - 0.10} = \frac{2.20}{0.04146} = ₹ 53.06$$

Question 28

Seawell Corporation, a manufacturer of do-it-yourself hardware and housewares, reported earnings per share of € 2.10 in 2003, on which it paid dividends per share of €0.69. Earnings are expected to grow 15% a year from 2004 to 2008, during this period the dividend payout ratio is expected to remain unchanged. After 2008, the earnings growth rate is expected to drop to a stable rate of 6%, and the payout ratio is expected to increase to 65% of earnings. The firm has a beta of 1.40 currently, and is expected to have a beta of 1.10 after 2008. The market risk premium is 5.5%. The Treasury bond rate is 6.25%.

(a) What is the expected price of the stock at the end of 2008?

(b) What is the value of the stock, using the two-stage dividend discount model?

Answer

The expected rate of return on equity after 2008 = 0.0625 + 1.10(0.055) = 12.3%

The dividends from 2003 onwards can be estimated as:

Year	2003	2004	2005	2006	2007	2008	2009
Earnings Per Share (€)	2.1	2.415	2.78	3.19	3.67	4.22	4.48
Dividends Per Share (€)	0.69	0.794	0.913	1.048	1.206	1.387	2.91

a. The price as of 2008 = €2.91/(0.123- 0.06) = €46.19

b. The required rate of return upto 2008 = 0.0625 + 1.4(0.055) = 13.95%. The dividends upto 2008 are discounted using this rate as follow:

Year	PV of Dividend
2004	0.794/1.1395 = 0.70
2005	$0.913/(1.1395)^2$ = 0.70
2006	$1.048/(1.1395)^3$ = 0.70
2007	$1.206/(1.1395)^4$ = 0.72
2008	$1.387/(1.1395)^5$ = 0.72
Total	3.54

The current price = €3.54 + €46.19/$(1.1395)^5$= €27.58.

* Values have been rounded off.

Question 29

SAM Ltd. has just paid a dividend of ₹ 2 per share and it is expected to grow @ 6% p.a. After paying dividend, the Board declared to take up a project by retaining the next three annual dividends. It is expected that this project is of same risk as the existing projects. The results of this project will start coming from the 4th year onward from now. The dividends will then be ₹ 2.50 per share and will grow @ 7% p.a.

An investor has 1,000 shares in SAM Ltd. and wants a receipt of atleast ₹ 2,000 p.a. from this investment.

Show that the market value of the share is affected by the decision of the Board. Also show as to how the investor can maintain his target receipt from the investment for first 3 years and improved income thereafter, given that the cost of capital of the firm is 8%.

Answer

Value of share at present = $\frac{D_1}{k_e - g}$

$= \frac{2(1.06)}{0.08 - 0.06}$ = ₹ 106

However, if the Board implement its decision, no dividend would be payable for 3 years and the dividend for year 4 would be ₹ 2.50 and growing at 7% p.a. The price of the share, in this case, now would be:

$$P_0 = \frac{2.50}{0.08-0.07} \times \frac{1}{(1+0.08)^3} = ₹\ 198.46$$

So, the price of the share is expected to increase from ₹ 106 to ₹ 198.45 after the announcement of the project. The investor can take up this situation as follows:

Expected market price after 3 years	$= \frac{2.50}{0.08-0.07}$	₹ 250.00
Expected market price after 2 years	$\frac{2.50}{0.08-0.07} \times \frac{1}{(1+0.08)}$	₹ 231.48
Expected market price after 1 years	$\frac{2.50}{0.08-0.07} \times \frac{1}{(1+0.08)^2}$	₹ 214.33

In order to maintain his receipt at ₹ 2,000 for first 3 year, he would sell

10 shares in first year @ ₹ 214.33 for	₹ 2,143.30
9 shares in second year @ ₹ 231.48 for	₹ 2,083.32
8 shares in third year @ ₹ 250 for	₹ 2,000.00

At the end of 3rd year, he would be having 973 shares valued @ ₹ 250 each i.e. ₹ 2,43,250. On these 973 shares, his dividend income for year 4 would be @ ₹ 2.50 i.e. ₹ 2,432.50.

So, if the project is taken up by the company, the investor would be able to maintain his receipt of at least ₹ 2,000 for first three years and would be getting increased income thereafter.

Question 30

XYZ Ltd. paid a dividend of ₹ 2 for the current year. The dividend is expected to grow at 40% for the next 5 years and at 15% per annum thereafter. The return on 182 days T-bills is 11% per annum and the market return is expected to be around 18% with a variance of 24%.

The co-variance of XYZ's return with that of the market is 30%. You are required to calculate the required rate of return and intrinsic value of the stock.

Answer

$$\beta = \frac{\text{Covariance of Market Return and Security Return}}{\text{Variance of Market Return}}$$

$\beta = \frac{30\%}{24\%}$ = 1.25

Expected Return = $R_f + \beta(R_m - R_f)$

= 11% + 1.25(18% - 11%)

= 11% + 8.75% = 19.75%

Intrinsic Value

Year	Dividend (₹)	PVF (19.75%,n)	Present Value (₹)
1	2.80	0.835	2.34
2	3.92	0.697	2.73
3	5.49	0.582	3.19
4	7.68	0.486	3.73
5	10.76	0.406	4.37
			16.36

PV of Terminal Value = = $\frac{10.76(1.15)}{0.1975-0.15} \times 0.406$ = ₹ 105.77

Intrinsic Value = ₹ 16.36 + ₹ 105.77 = ₹ 122.13

Question 31

Nominal value of 10% bonds issued by a company is ₹100. The bonds are redeemable at ₹ 110 at the end of year 5.Determine the value of the bond if required yield is (i) 5%, (ii) 5.1%, (iii) 10% and (iv) 10.1%.

Answer

Case (i) Required yield rate = 5%

Year	Cash Flow ₹	DF (5%)	Present Value ₹
1-5	10	4.3295	43.295
5	110	0.7835	86.185
Value of bond			129.48

Case (ii) Required yield rate = 5.1%

Year	Cash Flow ₹	DF (5.1%)	Present Value ₹
1-5	10	4.3175	43.175
5	110	0.7798	85.778
Value of bond			128.953

Case (iii) Required yield rate = 10%

Year	Cash Flow ₹	DF (10%)	Present Value ₹
1-5	10	3.7908	37.908
5	110	0.6209	68.299
Value of bond			106.207

Case (iv) Required yield rate = 10.1%

Year	Cash Flow ₹	DF (10.1%)	Present Value ₹
1-5	10	3.7811	37.811
5	110	0.6181	67.991
Value of bond			105.802

Question 32

Pet feed plc has outstanding, a high yield Bond with following features:

Face Value	*£ 10,000*
Coupon	*10%*
Maturity Period	*6 Years*
Special Feature	*Company can extend the life of Bond to 12 years.*

Presently the interest rate on equivalent Bond is 8%.

(a) If an investor expects that interest will be 8%, six years from now then how much he should pay for this bond now.

(b) Now suppose, on the basis of that expectation, he invests in the Bond, but interest rate turns out to be 12%, six years from now, then what will be his potential loss/ gain.

Answer

(a) If the current interest rate is 8%, the company will not extent the duration of Bond and the maximum amount the investor would ready to pay will be:

= £1,000 PVIAF (8%, 6) + £10,000 PVIF (8%, 6)

= £1,000 x 4.623 + £10,000 x 0.630

= £4,623 + £ 6,300

= £ 10,923

(b) If the current interest rate is 12%, the company will extent the duration of Bond. After six years the value of Bond will be

= £1,000 PVIAF (12%, 6) + £10,000 PVIF (12%, 6)

= £1,000 x 4.111 + £10,000 x 0.507

= £4,111 + £5,070

= £9,181

Thus, potential loss will be £9,181-£10,923=£1,742

Question 33

A convertible bond with a face value of ₹ 1,000 is issued at ₹ 1,350 with a coupon rate of 10.5%. The conversion rate is 14 shares per bond. The current market price of bond and share is ₹ 1,475 and ₹ 80 respectively. What is the premium over conversion value?

Answer

Conversion rate is 14 shares per bond. Market price of share ₹ 80

Conversion Value 14 x ₹ 80 = ₹ 1120

Market price of bond = ₹ 1475

Premium over Conversion Value (₹ 1475- ₹ 1120) = $\frac{355}{1120}$ x 100 = 31.7%

Question 34

Saranam Ltd. has issued convertible debentures with coupon rate 12%. Each debenture has an option to convert to 20 equity shares at any time until the date of maturity. Debentures will be redeemed at ₹ 100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5-year security. As an investor when will you exercise conversion for given market prices of the equity share of (i) ₹ 4, (ii) ₹ 5 and (iii) ₹ 6.

Cumulative PV factor for 8% for 5 years : 3.993

PV factor for 8% for year 5 : 0.681

Answer

If Debentures are not converted its value is as under: -

	PVF @ 8 %	₹
Interest - ₹ 12 for 5 years	3.993	47.916
Redemption - ₹ 100 in 5th year	0.681	68.100
		116.016

Value of equity shares:-

Market Price	No.	Total
₹ 4	20	₹ 80
₹ 5	20	₹ 100
₹ 6	20	₹ 120

Hence, unless the market price is ₹ 6 conversion should not be exercised.

Question 35

The data given below relates to a convertible bond :

Face value	*₹ 250*
Coupon rate	*12%*
No. of shares per bond	*20*
Market price of share	*₹ 12*
Straight value of bond	*₹ 235*
Market price of convertible bond	*₹ 265*

Calculate:

(i) Stock value of bond.

(ii) The percentage of downside risk.

(iii) The conversion premium

(iv) The conversion parity price of the stock.

Answer

(i) Stock value or conversion value of bond

12 × 20 = ₹ 240

(ii) Percentage of the downside risk

$\frac{₹\ 265 - ₹\ 235}{₹\ 235} = 0.1277$ or 12.77% or $\frac{₹\ 265 - ₹\ 235}{₹\ 265} = 0.1132$ or 11.32%

This ratio gives the percentage price decline experienced by the bond if the stock becomes worthless.

(iii) Conversion Premium

$$\frac{\text{Market Price} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$$

$$\frac{₹265 - ₹240}{₹240} \times 100 = 10.42\%$$

(iv) Conversion Parity Price

$$\frac{\text{Bond Price}}{\text{No. of Shares on Conversion}}$$

$$\frac{₹265}{20} = ₹13.25$$

This indicates that if the price of shares rises to ₹ 13.25 from ₹ 12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that ₹ 1.25 (₹ 13.25 – ₹ 12.00) is 10.42% of ₹ 12, the Conversion Premium.

Question 36

Pineapple Ltd has issued fully convertible 12 percent debentures of ₹ 5,000 face value, convertible into 10 equity shares. The current market price of the debentures is ₹ 5,400. The present market price of equity shares is ₹ 430.

Calculate:

(i) the conversion percentage premium, and

(ii) the conversion value

Answer

(i) As per the conversion terms 1 Debenture = 10 equity share and since face value of one debenture is ₹ 5000 the value of equity share becomes ₹ 500 (5000/10).

The conversion terms can also be expressed as: 1 Debenture of ₹ 500 = 1 equity share.

The cost of buying ₹ 500 debenture (one equity share) is:

$$₹500 \times \frac{5400}{5000} = ₹540$$

Market Price of share is ₹ 430. Hence conversion premium in percentage is:

$$\frac{540 - 430}{430} \times 100 = 25.58\%$$

(ii) The *conversion value* can be calculated as follows:

Conversion value = Conversion ratio X Market Price of Equity Shares

= 10 × ₹ 430 = ₹ 4300

Question 37

Rahul Ltd. has surplus cash of ₹ 100 lakhs and wants to distribute 27% of it to the shareholders. The company decides to buy back shares. The Finance Manager of the company estimates that its share price after re-purchase is likely to be 10% above the buyback price-if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is ₹ 3.

You are required to determine:

(i) The price at which the shares can be re-purchased, if the market capitalization of the company should be ₹ 210 lakhs after buyback,

(ii) The number of shares that can be re-purchased, and

(iii) The impact of share re-purchase on the EPS, assuming that net income is the same.

Answer

(i) Let P be the buyback price decided by Rahul Ltd.

Market Capitalisation after Buyback

1.1P (Original Shares – Shares Bought Back)

$$= 1.1P\left(10 \text{ lakhs} - \frac{27\% \text{ of } 100 \text{ lakhs}}{P}\right)$$

= 11 lakhs × P – 27 lakhs × 1.1 = 11 lakhs P – 29.7 lakhs

Again, 11 lakhs P – 29.7 lakhs

or 11 lakhs P = 210 lakhs + 29.7 lakhs

$$\text{or } P = \frac{239.7}{11} = ₹ 21.79 \text{ per share}$$

(ii) Number of Shares to be Bought Back :-

$$\frac{₹ 27 \text{ lakhs}}{₹ 21.79} = 1.24 \text{ lakhs (Approx.) or } 123910 \text{ share}$$

(iii) New Equity Shares :-

10 lakhs – 1.24 lakhs = 8.76 lakhs or 1000000 – 123910 = 876090 shares

$$\therefore \text{EPS} = \frac{3 \times 10 \text{ lakhs}}{8.76 \text{ lakhs}} = ₹ 3.43$$

Thus, EPS of Rahul Ltd., increases to ₹ 3.43.

Question 38

Abhishek Ltd. has a surplus cash of ₹90 lakhs and wants to distribute 30% of it to the shareholders. The Company decides to buyback shares. The Finance Manager of the Company estimates that its share price after re-purchase is likely to be 10% above the buyback price; if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is ₹3.

You are required to determine:

(a) The price at which the shares can be repurchased, if the market capitalization of the company should be ₹200 lakhs after buyback.

(b) The number of shares that can be re-purchased.

(c) The impact of share re-purchase on the EPS, assuming the net income is same.

Answer

(a) Let P be the buyback price decided by Abhishek Ltd.

Market Capitalisation After Buyback:

1.1 P (Original Shares – Shares Bought back)

$$= \left[1.1P\left(10\,\text{Lakhs} - \frac{30\%\ \text{of}\ 90\,\text{lakhs}}{P}\right)\right]$$

= 11 Lakhs x P – 27 lakhs x 1.1= 11 lakhs x P – 29.7 lakhs

Market capitalization rate after buyback is 200 lakhs.

Thus, we have:

11 Lakhs x P – 29.7 lakhs = ₹200 lakhs

or 11P = 200 + 29.7

$$\text{or } P = \frac{229.7}{11} = ₹\ 20.88$$

(b) Number of shares to be bought back:

$$= \frac{27\,\text{Lakhs}}{20.88} = 1.29\ \text{lakhs (Approximaely)}$$

(c) New Equity Shares

= (10 – 1.29) lakhs = 8.71 lakhs

$$\text{EPS} = \frac{3 \times 10\,\text{lakhs}}{8.71\,\text{lakhs}} = \frac{30\,\text{L}}{8.71\,\text{L}} = \text{Rs. } 3.44$$

Thus EPS of Abhishek Ltd., increases to ₹3.44

Question 39

If the market price of the bond is ₹ 95; years to maturity = 6 yrs: coupon rate = 13% p.a (paid annually) and issue price is ₹ 100. What is the yield to maturity?

Answer

$$YTM = \frac{C + \frac{(F - P)}{n}}{\frac{F + P}{2}}$$ C= Coupon Rate; F= Face Value (Issue Price) ; P= Market Price of Bond

$$YTM = \frac{13 + \frac{(100 - 95)}{6}}{\frac{100 + 95}{2}} = 0.1418 \text{ or } 14.18\%$$

Question 40

An investors is considering the purchase of the following Bond:

Face value	*₹ 100*
Coupon rate	*11%*
Maturity	*3 years*

(i) If he wants a yield of 13% what is the maximum price he should be ready to pay for?

(ii) If the Bond is selling for ₹ 97.60, what would be his yield?

Answer

(i) Calculation of Maximum price

B_o = ₹ 11 × PVIFA (13%,3) + ₹ 100 × PVIF (13%,3)

= ₹ 11 × 2.361 + ₹ 100 × 0.693 = ₹ 25.97 + ₹ 69.30 = ₹ 95.27

(ii) Calculation of yield

At 12% the value = ₹ 11 × PVIFA (12%,3) + 100 × PVIF (12%,3)

= ₹ 11×2.402 + ₹ 100×0.712 = ₹ 26.42 + ₹ 71.20 = ₹ 97.62

It the bond is selling at ₹ 97.60 which is more than the fair value, the YTM of the bond would be less than 13%. This value is almost equal to the amount price of ₹ 97.60. Therefore, the YTM of the bond would be 12%.

Alternatively

$$YTM = \frac{₹\ 11 + \frac{(₹\ 100 - ₹\ 97.60)}{3}}{\frac{(₹\ 100 + ₹\ 97.60)}{2}} = 0.1194 \text{ or } 11.94\% \text{ say } 12\%$$

Question 41

Calculate Market Price of:

(i) 10% Government of India security currently quoted at ₹ 110, but yield is expected to go up by 1%.

(ii) A bond with 7.5% coupon interest, Face Value ₹ 10,000 & term to maturity of 2 years, presently yielding 6% . Interest payable half yearly.

Answer

(i) Current yield = (Coupon Interest / Market Price) X 100

(10/110) X 100 = 9.09%

If current yield go up by 1% i.e. 10.09 the market price would be

10.09 = 10 / Market Price X 100

Market Price = ₹ 99.11

(ii) Market Price of Bond = P.V. of Interest + P.V. of Principal

= ₹ 1,394 + ₹ 8,885 = ₹ 10,279

Question 42

Find the current market price of a bond having face value ₹ 1,00,000 redeemable after 6 year maturity with YTM at 16% payable annually and duration 4.3202 years. Given $1.16^6 = 2.4364$.

Answer

The formula for the duration of a coupon bond is as follows:

$$= \frac{1+YTM}{YTM} - \frac{(1+YTM)+t(c-YTM)}{c\left[(1+YTM)^t-1\right]+YTM}$$

Where YTM = Yield to Maturity

c= Coupon Rate

t= Years to Maturity

Accordingly, since YTM =0.16 and t= 6

$$4.3202 = \frac{1.16}{0.16} - \frac{1.16+6(c\ \ 0.16)}{c\left[(1.16)^6-1\right]+0.16}$$

$$4.3202 = 7.25 - \frac{1.16+(6c-0.96)}{1.4364c+0.16}$$

$$\frac{1.16 + 6c - 0.96}{1.4364\,c + 0.16} = 2.9298$$

0.2 + 6c = 4.20836472 c + 0.468768

1.79163528c = 0.268768

C = 0.150012674

∴ c = 0.15

Where c = Coupon rate

Therefore, current price = ₹(1,00,000/- x 0.15 x 3.685 + 1,00,000/- x 0.410) = ₹96,275/-.

Alternatively, it can also be calculated as follows:

Let x be annual coupon payment. Accordingly, the duration (D) of the Bond shall be

Year	CF	PVIF 16% PV (CF)	PV (CF)
1	x	0.862	0.862x
2	x	0.743	0.743x
3	x	0.641	0.641x
4	x	0.552	0.552x
5	x	0.476	0.476x
6	X +100000	0.410	0.410x + 41000
			3.684x + 41000

$$D = \frac{0.862x}{3.684x + 41000} \times 1 + \frac{0.743x}{3.684x + 41000} \times 2 + \frac{0.641x}{3.684x + 41000} \times 3$$

$$+ \frac{0.552x}{3.684x + 41000} \times 4 + \frac{0.476x}{3.684x + 41000} \times 5 + \frac{(0.410x + 41000)}{3.684x + 41000} \times 6$$

$$4.3202 = \frac{11.319x + 246000}{3.684x + 41000}$$

x = ₹ 14,983 i.e. 14.98% say 15%

Accordingly, current price of the Bond shall be:

= 1,00,000 × 0.15 × PVAF (16%, 6) + 1,00,000 × PVF (16%, 6)

= 15,000 × 3.685 + 1,00,000 × 0.410 = ₹ 96,275

Question 43

There is a 9% 5-year bond issue in the market. The issue price is ₹ 90 and the redemption price ₹ 105. For an investor with marginal income tax rate of 30% and capital gains tax rate of 10% (assuming no indexation), what is the post-tax yield to maturity?

Answer

Calculation of yield to Maturity (YTM)

$$YTM = \frac{\text{Coupon} + \text{Pro - rated discount}}{(\text{Redemption price} + \text{Purchase Price})/2}$$

After tax coupon = $9 \times (1 - .30) = 6.3\%$

After tax redemption price = $105 - (15 \times .10)$ or ₹ 103.5

After tax capital gain = 103.50 – 90 = ₹ 13.50

$$YTM = \frac{6.3 + (13.5/5)}{(103.5 + 90)/2} \text{ or } \frac{9.00}{96.75} = 9.30\%$$

Question 44

ABC Ltd. issued 9%, 5 year bonds of ₹ 1,000/- each having a maturity of 3 years. The present rate of interest is 12% for one year tenure. It is expected that Forward rate of interest for one year tenure is going to fall by 75 basis points and further by 50 basis points for every next year in further for the same tenure. This bond has a beta value of 1.02 and is more popular in the market due to less credit risk.

Calculate

(i) Intrinsic value of bond

(ii) Expected price of bond in the market

Answer

(i) Intrinsic value of Bond

PV of Interest + PV of Maturity Value of Bond

Forward rate of interests

1st Year 12%

2nd Year 11.25%

3rd Year 10.75%

$$\text{PV of interest} = \frac{₹\ 90}{(1+0.12)} + \frac{₹\ 90}{(1+0.12)(1+0.1125)} + \frac{₹\ 90}{(1+0.12)(1+0.1125)(1+0.1075)} = ₹\ 217.81$$

PV of Maturity Value of Bond = $\frac{₹1000}{(1+0.12)(1+0.1125)(1+0.1075)}$ = ₹ 724.67

Intrinsic value of Bond = ₹ 217.81 + ₹ 724.67 = ₹ 942.48

(ii) Expected Price = Intrinsic Value x Beta Value

= ₹ 948.48 x 1.02 = ₹ 961.33

Question 45

MP Ltd. issued a new series of bonds on January 1, 2010. The bonds were sold at par (₹1,000), having a coupon rate 10% p.a. and mature on 31st December, 2025. Coupon payments are made semiannually on June 30th and December 31st each year. Assume that you purchased an outstanding MP Ltd. bond on 1st March, 2018 when the going interest rate was 12%.

Required:

(i) What was the YTM of MP Ltd. bonds as on January 1, 2010?

(ii) What amount you should pay to complete the transaction? Of that amount how much should be accrued interest and how much would represent bonds basic value.

Answer

(i) Since the bonds were sold at par, the original YTM was 10%.

YTM = $\frac{\text{Interest}}{\text{Principal}} = \frac{₹100}{₹1,000} = 10\%$

(ii) Price of the bond as on 1st July, 2018 = ₹ 50 $\times$ 9.712 + ₹ 1,000 x 0.417

= ₹ 485.60 + ₹ 417

= ₹ 902.60

Total value of the bond on the next = ₹ 902.60 + ₹ 50 interest date = ₹952.60

∴ Value of bond at purchase date = ₹ 952.60 x $\frac{1}{(1+0.06)^{2/3}}$

= ₹ 952.60 x 0.9620 (by using excel)

= ₹ 916.40†

The amount to be paid to complete the transaction is ₹916.40. Out of this amount ₹ 48.10 represent accrued interest* and ₹868.30 represent the bond basic value.

† Alternatively, it can also be calculated as follows:

$$= ₹\ 952.60 \times \frac{1}{(1+0.06 \times \frac{2}{3})}$$

$$= ₹\ 952.60 \times \frac{1}{(1+0.04)}$$

$$= ₹\ 915.96$$

The amount to be paid to complete the transaction is ₹915.96. Out of this amount ₹ 48.08 represent accrued interest* and ₹867.88 represent the bond basic value.

*Alternatively, Accrued Interest can also be calculated as follows:

Accrued Interest on Bonds = $1,000 \times \frac{10}{100} \times \frac{2}{12} = 16.67$

Question 46

Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

Credit Rating	*Discount Rate*
AAA	*364 day T bill rate + 3% spread*
AA	*AAA + 2% spread*
A	*AAA + 3% spread*

He is considering to invest in AA rated, ₹ 1,000 face value bond currently selling at ₹ 1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364 day T-bill rate to be 9%).

You are required to calculate the intrinsic value of the bond for Mr. Z. Should he invest in the bond? Also calculate the current yield and the Yield to Maturity (YTM) of the bond.

Answer

The appropriate discount rate for valuing the bond for Mr. Z is:

R = 9% + 3% + 2% = 14%

Time	CF	PVIF 14% PV (CF)	PV (CF)
1	150	0.877	131.55
2	150	0.769	115.35
3	150	0.675	101.25
4	150	0.592	88.80
5	1150	0.519	596.85
		$\sum$ PV (CF) i.e. P_0 =	1033.80

Since, the current market value is less than the intrinsic value; Mr. Z should buy the bond. Current yield = Annual Interest / Price = 150 / 1025.86 = 14.62%

The YTM of the bond is calculated as follows:

@15%

$P = 150 \times PVIFA_{15\%, 4} + 1150 \times PVIF_{15\%, 5}$

$= 150 \times 2.855 + 1150 \times 0.497 = 428.25 + 571.55 = 999.80$

@14%

As found in sub part (a) $P_0 = 1033.80$

By interpolation we get,

$$= 14\% + \frac{7.94}{7.94 - (-26.06)} \times (15\% - 14\%) = 14\% + \frac{7.94}{34}\%$$

YTM = 14.23%

Question 47

M/s Agfa Industries is planning to issue a debenture series on the following terms:

Face value	*₹ 100*
Term of maturity	*10 years*
Yearly coupon rate	
Years	
1 – 4	*9%*
5 – 8	*10%*
9 – 10	*14%*

The current market rate on similar debentures is 15 per cent per annum. The Company proposes to price the issue in such a manner that it can yield 16 per cent compounded rate of return to the investors. The Company also proposes to redeem the debentures at 5 per cent premium on maturity. Determine the issue price of the debentures.

Answer

The issue price of the debentures will be the sum of present value of interest payments during 10 years of its maturity and present value of redemption value of debenture.

Years	*Cash out flow (₹)*	*PVIF @ 16%*	*PV*
1	9	.862	7.758
2	9	.743	6.687

3	9	.641	5.769
4	9	.552	4.968
5	10	.476	4.76
6	10	.410	4.10
7	10	.354	3.54
8	10	.305	3.05
9	14	.263	3.682
10	14 + 105 = 119	.227	3.178 + 23.835
			71.327

Thus the debentures should be priced at ₹ 71.327

Question 48

On 31st March, 2013, the following information about Bonds is available:

Name of Security	Face Value ₹	Maturity Date	Coupon Rate	Coupon Date(s)
Zero coupon	10,000	31st March, 2023	N.A.	N.A.
T-Bill	1,00,000	20th June, 2013	N.A.	N.A.
10.71% GOI 2023	100	31st March, 2023	10.71	31st March
10 % GOI 2018	100	31st March, 2018	10.00	31st March & 30th September

Calculate:

(i) If 10 years yield is 7.5% p.a. what price the Zero Coupon Bond would fetch on 31st March, 2013?

(ii) What will be the annualized yield if the T-Bill is traded @ 98500?

(iii) If 10.71% GOI 2023 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)?

(iv) If 10% GOI 2018 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2013 (after coupon payment on 31st March)?

Answer

(i) Rate used for discounting shall be yield. Accordingly ZCB shall fetch:

$$= \frac{10000}{(1+0.075)^{10}} = ₹\ 4,852$$

(ii) The day count basis is actual number days / 365. Accordingly annualized yield shall be:

$$\text{Yield} = \frac{\text{FV-Price}}{\text{Price}} \times \frac{365}{\text{No. of days}} = \frac{100000\text{-}98500}{98500} \times \frac{365}{81} = 6.86\%$$

Note: Alternatively, it can also computed on 360 days a year.

(iii) Price GOI 2023 would fetch

= ₹ 10.71 PVAF(8%, 10) + ₹ 100 PVF (8%, 10)

= ₹ 10.71 x 6.71 + ₹ 100 x 0.4632

= ₹ 71.86 + ₹ 46.32 = ₹ 118.18

(iv) Price GOI 2018 Bond would fetch:

= ₹ 5 PVAF (4%, 10) + ₹ 100 PVF (4%, 10)

= ₹ 5 x 8.11 + ₹ 100 x 0.6756

= 40.55 + 67.56 = 108.11

Question 49

ABC Ltd. has ₹ 300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 9 million being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

Answer

1. Calculation of initial outlay:-

		₹ (million)
a.	Face value	300
	Add:-Call premium	12
	Cost of calling old bonds	312
b.	Gross proceed of new issue	300
	Less: Issue costs	6
	Net proceeds of new issue	294
c.	Tax savings on call premium and unamortized cost 0.30 (12 + 9)	6.3

∴ Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million = ₹ 11.7 million

2. Calculation of net present value of refunding the bond:-

Saving in annual interest expenses	₹ (million)
[300 x (0.12 – 0.10)]	6.00
Less:- Tax saving on interest and amortization	
0.30 x [6 + (9-6)/6]	1.95
Annual net cash saving	4.05
PVIFA (7%, 6 years)	4.766
∴ Present value of net annual cash saving	₹ 19.30 million
Less:- Initial outlay	₹ 11.70 million
Net present value of refunding the bond	₹ 7.60 million

Decision: The bonds should be refunded

Question 50

M/s Transindia Ltd. is contemplating calling ₹ 3 crores of 30 years, ₹ 1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of ₹ 1,140 and had initially collected proceeds of ₹ 2.91 crores due to a discount of ₹ 30 per bond. The initial floating cost was ₹ 3,60,000. The Company intends to sell ₹ 3 crores of 12 per cent coupon rate, 25 years bonds to raise funds for retiring the old bonds. It proposes to sell the new bonds at their par value of ₹ 1,000. The estimated floatation cost is ₹ 4,00,000. The company is paying 40% tax and its after tax cost of debt is 8 per cent. As the new bonds must first be sold and their proceeds, then used to retire old bonds, the company expects a two months period of overlapping interest during which interest must be paid on both the old and new bonds. What is the feasibility of refunding bonds?

Answer

NPV for bond refunding

	₹
PV of annual cash flow savings (W.N. 2)	
(3,49,600 × PVIFA 8%,25) i.e. 10.675	37,31,980
Less: Initial investment (W.N. 1)	29,20,000
NPV	8,11,980

Recommendation: Refunding of bonds is recommended as NPV is positive.

Working Notes:

(1) Initial investment:

(a)	Call premium		
	Before tax (1,140 – 1,000) × 30,000	42,00,000	
	Less tax @ 40%	16,80,000	
	After tax cost of call prem.		25,20,000
(b)	Floatation cost		4,00,000
(c)	Overlapping interest		
	Before tax (0.14 × 2/12 × 3 crores)	7,00,000	
	Less tax @ 40%	2,80,000	4,20,000
(d)	Tax saving on unamortised discount on old bond 25/30 × 9,00,000 × 0.4		(3,00,000)
(e)	Tax savings from unamortised floatation Cost of old bond 25/30 × 3,60,000 × 0.4		(1,20,000)
			29,20,000

(2) Annual cash flow savings:

(a)	Old bond			
	(i)	Interest cost (0.14 × 3 crores)	42,00,000	
		Less tax @ 40%	16,80,000	25,20,000
	(ii)	Tax savings from amortisation of discount 9,00,000/30 × 0.4		(12,000)
	(iii)	Tax savings from amortisation of floatation cost 3,60,000/30 × 0.4		(4,800)
	Annual after tax cost payment under old Bond (A)			25,03,200
(b)	New bond			
	(i)	Interest cost before tax (0.12 × 3 crores)	36,00,000	
		Less tax @ 40%	14,40,000	
		After tax interest		21,60,000
	(ii)	Tax savings from amortisation of floatation cost (0.4 × 4,00,000/25)		(6,400)

Annual after tax payment under new Bond (B)	21,53,600
Annual Cash Flow Saving (A) – (B)	3,49,600

Question 51

The following data are available for a bond

Face value	*₹ 1,000*
Coupon Rate	*16%*
Years to Maturity	*6*
Redemption value	*₹ 1,000*
Yield to maturity	*17%*

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if increase in required yield is by 75 basis points.

Answer

1. Calculation of Market price:

$$TM = \frac{\text{Coupon interest} + \left(\frac{\text{Discount or premium}}{\text{Years left}}\right)}{\frac{\text{Face Value} + \text{Market value}}{2}}$$

Discount or premium – YTM is more than coupon rate, market price is less than Face Value i.e. at discount.

Let x be the market price

$$0.17 = \frac{160 + \left\{\frac{(1{,}000 - x)}{6}\right\}}{\frac{1{,}000 + x}{2}} \quad x = ₹\ 960.26$$

Alternatively, the candidate may attempt by

160 (PVIAF 17%,6) + 1,000 (PVIF 17%,6)

= 160 (3.589) + 1,000 (0.390) = 574.24 + 390 = 964.24

2. Duration

Year	*Cash flow*	*P.V. @ 17%*		*Proportion of bond value*	*Proportion of bond value x time (years)*
1	160	.855	136.80	0.142	0.142
2	160	.731	116.96	0.121	0.246

3	160	.624	99.84	0.103	0.309
4	160	.534	85.44	0.089	0.356
5	160	.456	72.96	0.076	0.380
6	1160	.390	452.40	0.469	2.814
			964.40	1.000	4.247

Duration of the Bond is 4.247 years

Alternatively, as per Short Cut Method

$$D = \frac{1+YTM}{YTM} - \frac{(1+YTM)+t(c-YTM)}{c\left[(1+YTM)^t-1\right]+YTM}$$

Where YTM = Yield to Maturity

c= Coupon Rate

t= Years to Maturity

$$= \frac{1.17}{0.17} - \frac{1.17+6(0.16-0.17)}{0.16\left[(1.17)^6-1\right]+0.17}$$

D = 4.24 years

3. Volatility

$$\text{Volatility of the bonds} = \frac{\text{Duration}}{(1+\text{yields})} = \frac{4.247}{1.17} = 3.63$$

$$\text{Or} = \frac{4.2422}{1.17} = 3.6258$$

4. The expected market price if increase in required yield is by 75 basis points.

= ₹ 960.26 × .75 (3.63/100) = ₹ 26.142

Hence expected market price is ₹ 960.26 – ₹ 26.142 = ₹ 934.118

Hence, the market price will decrease

This portion can also be alternatively done as follows

= ₹ 964.40 × .75 (3.63/100) = ₹ 26.26

then the market price will be

= ₹ 964.40 – 26.26 = ₹ 938.14

Question 52

Mr. A will need ₹ 1,00,000 after two years for which he wants to make one time necessary investment now. He has a choice of two types of bonds. Their details are as below:

	Bond X	*Bond Y*
Face value	*₹ 1,000*	*₹ 1,000*
Coupon	*7% payable annually*	*8% payable annually*
Years to maturity	*1*	*4*
Current price	*₹ 972.73*	*₹ 936.52*
Current yield	*10%*	*10%*

Advice Mr. A whether he should invest all his money in one type of bond or he should buy both the bonds and, if so, in which quantity? Assume that there will not be any call risk or default risk.

Answer

Duration of Bond X

Year	*Cash flow*	*P.V. @ 10%*		*Proportion of bond value*	*Proportion of bond value x time (years)*
1	1070	.909	972.63	1.000	1.000

Duration of the Bond is 1 year

Duration of Bond Y

Year	*Cash flow*	*P.V. @ 10%*		*Proportion of bond value*	*Proportion of bond value x time (years)*
1	80	.909	72.72	0.077	0.077
2	80	.826	66.08	0.071	0.142
3	80	.751	60.08	0.064	0.192
4	1080	.683	737.64	0.788	3.152
			936.52	1.000	3.563

Duration of the Bond is 3.563 years

Let x_1 be the investment in Bond X and therefore investment in Bond Y shall be $(1 - x_1)$. Since the required duration is 2 year the proportion of investment in each of these two securities shall be computed as follows:

$2 = x_1 + (1 - x_1)\ 3.563$

$x_1 = 0.61$

Accordingly, the proportion of investment shall be 61% in Bond X and 39% in Bond Y respectively.

Amount of investment

Bond X	*Bond Y*
PV of ₹ 1,00,000 for 2 years @ 10% x 61% = ₹ 1,00,000 (0.826) x 61% = ₹ 50,386 No. of Bonds to be purchased = ₹ 50,386/₹ 972.73 = 51.79 i.e. approx. 52 bonds	PV of ₹ 1,00,000 for 2 years @ 10% x 39% = ₹ 1,00,000 (0.826) x 39% = ₹ 32,214 No. of Bonds to be purchased = ₹ 32,214/₹ 936.52 = 34.40 i.e. approx. 34 bonds

Note: The investor has to keep the money invested for two years. Therefore, the investor can invest in both the bonds with the assumption that Bond X will be reinvested for another one year on same returns.

Question 53

XL Ispat Ltd. has made an issue of 14 per cent non-convertible debentures on January 1, 2007. These debentures have a face value of ₹ 100 and is currently traded in the market at a price of ₹ 90.

Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2011 at the end of 5 years.

Required :

(i) Estimate the current yield and YTM of the bond.

(ii) Calculate the duration of the NCD.

(iii) Assuming that intermediate coupon payments are, not available for reinvestment calculate the realised yield on the NCD.

Answer

(i) Current yield = $\frac{₹\ 7}{₹\ 90} \times \frac{12}{6}$ = 0.1555 or 15.55%

YTM can be determined from the following equation

7 × PVIFA (YTM, 10) + 100 × PVIF (YTM, 10) = 90

Let us discount the cash flows using two discount rates 7.50% and 9% as follows:

Year	Cash Flows	PVF@7.50%	PV@7.50%	PVF@9%	PV@9%
0	-90	1	-90	1	-90
1	7	0.930	6.51	0.917	6.419
2	7	0.865	6.055	0.842	5.894
3	7	0.805	5.635	0.772	5.404
4	7	0.749	5.243	0.708	4.956
5	7	0.697	4.879	0.650	4.550
6	7	0.648	4.536	0.596	4.172
7	7	0.603	4.221	0.547	3.829
8	7	0.561	3.927	0.502	3.514
9	7	0.522	3.654	0.460	3.220
10	107	0.485	51.90	0.422	45.154
			6.560		-2.888

Now we use interpolation formula

$$7.50\% + \frac{6.560}{6.560-(-2.888)} \times 1.50\%$$

$$7.50\% + \frac{6.560}{9.448} \times 1.50\% = 7.50\% + 1.041\%$$

YTM = 8.541% say 8.54%

Note: Students can also compute the YTM using rates other than 15% and 18%.

(ii) The duration can be calculated as follows:

Year	Cash Flow	PVF@ 8.54%	PV @ 8.54%	Proportion of NCD value	Proportion of NCD value × time
1	7	0.921	6.447	0.0717	0.0717
2	7	0.849	5.943	0.0661	0.1322
3	7	0.782	5.474	0.0608	0.1824
4	7	0.721	5.047	0.0561	0.2244
5	7	0.664	4.648	0.0517	0.2585

6	7	0.612	4.284	0.0476	0.2856
7	7	0.563	3.941	0.0438	0.3066
8	7	0.519	3.633	0.0404	0.3232
9	7	0.478	3.346	0.0372	0.3348
10	107	0.441	47.187	0.5246	5.2460
			89.95		7.3654

Duration = 7.3654 half years i.e. 3.683 years.

(iii) Realized Yield can be calculated as follows:

$$\frac{(7\times10)+100}{(1+R)^{10}}=90$$

$$(1+R)^{10}=\frac{170}{90}$$

$$R=\left(\frac{170}{90}\right)^{1/10}-1=0.06380 \text{ or } 6.380\% \text{ for half yearly and } 12.76\% \text{ annually.}$$

Question 54

Mr. A is planning for making investment in bonds of one of the two companies X Ltd. and Y Ltd. The detail of these bonds is as follows:

Company	Face Value	Coupon Rate	Maturity Period
X Ltd.	₹ 10,000	6%	5 Years
Y Ltd.	₹ 0,000	4%	5 Years

The current market price of X Ltd.'s bond is ₹ 10,796.80 and both bonds have same Yield To Maturity (YTM). Since Mr. A considers duration of bonds as the basis of decision making, you are required to calculate the duration of each bond and you decision.

Answer

To calculate duration of bond we need YTM, which shall be calculated as follows:

Let us try NPV of Bond @ 5%

$$=\frac{600}{(1.05)^1}+\frac{600}{(1.05)^2}+\frac{600}{(1.05)^3}+\frac{600}{(1.05)^4}+\frac{10,600}{(1.05)^5}-10,796.80$$

= ₹ 571.43 + ₹ 544.22 + ₹ 518.30 + ₹ 493.62 + ₹ 8,305.38 – ₹ 10,796.80 = – ₹ 363.85

Let us now try NPV @ 4%

$$= \frac{600}{(1.04)^1} + \frac{600}{(1.04)^2} + \frac{600}{(1.04)^3} + \frac{600}{(1.04)^4} + \frac{10,600}{(1.04)^5} - 10,796.80$$

= ₹ 576.92 + ₹ 554.73 + ₹ 533.40 + ₹ 512.88 +₹ ,712.43 – ₹ 10,796.80 = ₹ 93.56

Let us now interpolation formula

$$= 4\% + \frac{93.56}{93.56 - (-363.85)} \times (5\% - 4\%)$$

$$= 4\% + \frac{93.56}{93.56 + 363.85}$$

$$= 4\% + \frac{93.56}{457.41} = 4.20\%$$

Duration of X Ltd.' s Bond

Year	Cash flow	P.V. @ 4.2%		Proportion of bond value	Proportion of bond value x time (years)
1	600	0.9597	575.82	0.0533	0.0533
2	600	0.9210	552.60	0.0512	0.1024
3	600	0.8839	530.34	0.0491	0.1473
4	600	0.8483	508.98	0.0472	0.1888
5	10600	0.8141	8,629.46	0.7992	3.9960
			10,797.20	1.0000	4.4878

Duration of the Bond is 4.4878 years say 4.49 years.

Duration of Y Ltd.'s Bond

Year	Cash flow	P.V. @ 4.2%		Proportion of bond value	Proportion of bond value x time (years)
1	400	0.9597	383.88	0.0387	0.0387
2	400	0.9210	368.40	0.0372	0.0744
3	400	0.8839	353.56	0.0357	0.1071
4	400	0.8483	339.32	0.0342	0.1368
5	10400	0.8141	8,466.64	0.8542	4.2710
			9,911.80	1.0000	4.6280

Duration of the Bond is 4.6280 years say 4.63 years.

Decision: Since the duration of Bond of Y Ltd. is lower hence it should be preferred. However difference between the duration of bond is not much higher and with higher coupon rate of X Ltd.'s bond, Mr. A should go for X Ltd.'s bond.

Question 55

The following data is available for a bond:

Face Value	*₹ 1,000*
Coupon Rate	*11%*
Years to Maturity	*6*
Redemption Value	*₹ 1,000*
Yield to Maturity	*15%*

(Round-off your answers to 3 decimals)

Calculate the following in respect of the bond:

(i) Current Market Price.

(ii) Duration of the Bond.

(iii) Volatility of the Bond.

(iv) Expected market price if increase in required yield is by 100 basis points.

(v) Expected market price if decrease in required yield is by 75 basis points.

Answer

(i) Calculation of Market price:

$$TM = \frac{\text{Coupon interest} + \left(\frac{\text{Discount or premium}}{\text{Years left}}\right)}{\frac{\text{Face Value} + \text{Market value}}{2}}$$

Discount or premium – YTM is more than coupon rate, market price is less than Face Value i.e. at discount.

Let *x* be the market price

$$0.15 = \frac{110 + \left\{\frac{(1{,}000 - x)}{6}\right\}}{\frac{1{,}000 + x}{2}}$$

x = ₹ 834.48

(ii) Duration

Year	*Cash flow*	*P.V. @ 15%*		*Proportion of bond value*	*Proportion of bond value x time (years)*
1	110	.870	95.70	0.113	0.113
2	110	.756	83.16	0.098	0.196
3	110	.658	72.38	0.085	0.255
4	110	.572	62.92	0.074	0.296
5	110	.497	54.67	0.064	0.320
6	1110	.432	479.52	0.565	3.39
			848.35	1.000	4.570

Duration of the Bond is 4.570 years

(iii) Volatility

$$\text{Volatility of the bond} = \frac{\text{Duration}}{(1 + \text{yields})} = \frac{4.570}{1.15} = 3.974$$

(iv) The expected market price if increase in required yield is by 100 basis points.

= ₹ 834.48× 1.00 (3.974/100) = ₹ 33.162

Hence expected market price is ₹ 834.48 – ₹ 33.162 = ₹ 801.318

Hence, the market price will decrease

(v) The expected market price if decrease in required yield is by 75 basis points.

= ₹ 834.48× 0.75 (3.974/100) = ₹ 24.87

Hence expected market price is ₹ 834.48 + ₹ 24.87 = ₹ 859.35

Hence, the market price will increase

Question 56

GHI Ltd., AAA rated company has issued, fully convertible bonds on the following terms, a year ago:

Face value of bond	*₹ 1000*
Coupon (interest rate)	*8.5%*
Time to Maturity (remaining)	*3 years*
Interest Payment	*Annual, at the end of year*
Principal Repayment	*At the end of bond maturity*

Conversion ratio (Number of shares per bond)	*25*
Current market price per share	*₹ 45*
Market price of convertible bond	*₹ 1175*

AAA rated company can issue plain vanilla bonds without conversion option at an interest rate of 9.5%.

Required: Calculate as of today:

(i) Straight Value of bond.

(ii) Conversion Value of the bond.

(iii) Conversion Premium.

(iv) Percentage of downside risk.

(v) Conversion Parity Price.

t	*1*	*2*	*3*
$PVIF_{0.095, t}$	*0.9132*	*0.8340*	*0.7617*

Answer

(i) Straight Value of Bond

₹ 85 x 0.9132 + ₹ 85 x 0.8340 + ₹ 1085 x 0.7617 = ₹ 974.96

(ii) Conversion Value

Conversion Ration x Market Price of Equity Share

= ₹ 45 x 25 = ₹ 1,125

(iii) Conversion Premium

Conversion Premium = Market Conversion Price - Market Price of Equity Share

$= \frac{₹\,1,175}{25} - ₹\,45 = ₹\,2$

or = ₹ 1,175 - ₹ 45 x 25 = ₹ 50

or $\frac{₹\,1,175 - ₹\,1,125}{₹\,1,125} = 4.47\%$

(iv) Percentage of Downside Risk

$= \frac{₹\,1,175 - ₹\,974.96}{₹\,974.96} \times 100 = 20.52\%$ or $\frac{₹\,1,175 - ₹\,974.96}{₹\,1,175} = 17.02\%$

(v) Conversion Parity Price

$$\frac{\text{Bond Price}}{\text{No. of Share on Conversion}}$$

$$= \frac{₹\,1,175}{25} = ₹\,47$$

Question 57

The following data is related to 8.5% Fully Convertible (into Equity shares) Debentures issued by JAC Ltd. at ₹ 1000.

Market Price of Debenture	₹ 900
Conversion Ratio	30
Straight Value of Debenture	₹ 700
Market Price of Equity share on the date of Conversion	₹ 25
Expected Dividend Per Share	₹ 1

You are required to calculate:

(a) Conversion Value of Debenture

(b) Market Conversion Price

(c) Conversion Premium per share

(d) Ratio of Conversion Premium

(e) Premium over Straight Value of Debenture

(f) Favourable income differential per share

(g) Premium pay back period

Answer

(a) Conversion Value of Debenture

= Market Price of one Equity Share X Conversion Ratio

= ₹ 25 X 30 = ₹ 750

(b) Market Conversion Price

$$= \frac{\text{Market Price of Convertible Debenture}}{\text{Conversion Ratio}}$$

$$= \frac{₹\ 900}{30} = ₹\ 30$$

(c) Conversion Premium per share

Market Conversion Price – Market Price of Equity Share

= ₹ 30 – ₹ 25 = ₹ 5

(d) Ratio of Conversion Premium

$$\frac{\text{Conversion premium per share}}{\text{Market Price of Equity Share}} = \frac{₹\ 5}{₹\ 25} = 20\%$$

(e) Premium over Straight Value of Debenture

$$\frac{\text{Market Price of Convertible Bond}}{\text{Straight Value of Bond}} - 1 = \frac{₹\ 900}{₹\ 700} - 1 = 28.6\%$$

(f) Favourable income differential per share

$$\frac{\text{Coupon Interest from Debenture - Conversion Ratio} \times \text{Dividend Per Share}}{\text{Conversion Ratio}}$$

$$\frac{₹\ 85 - 30 \times ₹1}{30} = ₹\ 1.833$$

(g) Premium pay back period

$$\frac{\text{Conversion premium per share}}{\text{Favourable Income Differntial Per Share}} = \frac{₹\ 5}{₹\ 1.833} = 2.73 \text{ years}$$

Question 58

(a) Consider two bonds, one with 5 years to maturity and the other with 20 years to maturity. Both the bonds have a face value of ₹ 1,000 and coupon rate of 8% (with annual interest payments) and both are selling at par. Assume that the yields of both the bonds fall to 6%, whether the price of bond will increase or decrease? What percentage of this increase/decrease comes from a change in the present value of bond's principal amount and what percentage of this increase/decrease comes from a change in the present value of bond's interest payments?

(b) Consider a bond selling at its par value of ₹ 1,000, with 6 years to maturity and a 7% coupon rate (with annual interest payment), what is bond's duration?

(c) If the YTM of the bond in (b) above increases to 10%, how it affects the bond's duration? And why?

Answer

(a) If the yield of the bond falls the price will always increase. This can be shown by following calculation.

IF YIELD FALLS TO 6%

Price of 5yr. bond

₹ 80 (PVIFA 6%, 5yrs.) + ₹ 1000 (PVIF 6%, 5yrs.)

₹ 80 (4.212)+ ₹ 1000 (0.747)

₹ 336.96 + ₹ 747.00 = ₹ 1,083.96

Increase in 5 year's bond price = ₹ 83.96

Current price of 20 year bond

₹ 80 (PVIFA 6%, 20) + ₹ 1,000 (PVIF 6%, 20)

₹ 80 (11.47) + ₹ 1,000 (0.312)

₹ 917.60 + ₹ 312.00 = ₹ 1229.60

So increase in bond price is ₹ 229.60

PRICE INCREASE DUE TO CHANGE IN PV OF PRINCIPAL

5 yrs. Bond

₹ 1,000 (PVIF 6%, 5) – ₹ 1,000 (PVIF 8%, 5)

₹ 1,000 (0.747) – ₹ 1,000 (0.681)

₹ 747.00 – ₹ 681.00 = ₹ 66.00

& change in price due to change in PV of Principal

(₹ 66/ ₹ 83.96) x 100 = 78.6%

20 yrs. Bond

₹ 1,000 (PVIF 6%, 20) – ₹ 1,000 (PVIF 8%, 20)

₹ 1,000 (0.312) – ₹ 1,000 (0.214)

₹ 312.00 – ₹ 214.00 = ₹ 98.00

& change in price due to change in PV of Principal

(₹ 98/ ₹ 229.60) x 100 = 42.68%

PRICE CHANGE DUE TO CHANGE IN PV OF INTEREST

5 yrs. Bond

₹ 80 (PVIFA 6%, 5) – ₹ 80 (PVIFA 8%, 5)

₹ 80 (4.212) – ₹ 80 (3.993)

₹ 336.96 – ₹ 319.44 = ₹ 17.52

% change in price $\frac{₹\,17.52}{₹\,83.96}$ x 100 = 20.86%

20 yrs. Bond

₹ 80 (PVIFA 6%, 20) – ₹ 80 (PVIFA 8%,20)

₹ 80 (11.47) – ₹ 80 (9.82)

₹ 917.60 – ₹ 785.60 = ₹ 132

& change in price = $\frac{₹\,132}{₹\,229.60}$ x 100 = 57.49%

(b) Duration in the average time taken to recollect back the investment

Years (A)	Coupon Payments (₹)	Redemption (₹)	Total (₹) (B)	PVIF @ 7% (₹) (C)	(A)x(B)x (C) (₹)
1	70	-	70	0.935	65.45
2	70	-	70	0.873	122.22
3	70	-	70	0.816	171.36
4	70	-	70	0.763	213.64
5	70	-	70	0.713	249.55
6	70	1000	1070	0.666	4,275.72
				Σ ABC	5,097.94

Duration = $\frac{\Sigma ABC}{\text{Purchase Price}} = \frac{₹\,5097.94}{₹\,1000}$ = 5.098 years

(c) If YTM goes up to 10%, current price of the bond will decrease to

₹ 70 x PVIFA (10%,6) + ₹ 1000 PVIF (10%,6)

₹ 304.85 + ₹ 564.00 = ₹ 868.85

Year (A)	Inflow (₹) (B)	PVIF @ 10% (C)	(A)x(B)x (C) (₹)
1	70	0.909	63.63
2	70	0.826	115.64
3	70	0.751	157.71
4	70	0.683	191.24
5	70	0.621	217.35
6	1070	0.564	3,620.88
		Σ ABC	4,366.45

New Duration ₹ 4,366.45/ ₹ 868.85 = 5.025 years

The duration of bond decreases, reason being the receipt of slightly higher portion of one's investment on the same intervals.

Question 59

Closing values of BSE Sensex from 6th to 17th day of the month of January of the year 200X were as follows:

Days	*Date*	*Day*	*Sensex*
1	*6*	*THU*	*14522*
2	*7*	*FRI*	*14925*
3	*8*	*SAT*	*No Trading*
4	*9*	*SUN*	*No Trading*
5	*10*	*MON*	*15222*
6	*11*	*TUE*	*16000*
7	*12*	*WED*	*16400*
8	*13*	*THU*	*17000*
9	*14*	*FRI*	*No Trading*
10	*15*	*SAT*	*No Trading*
11	*16*	*SUN*	*No Trading*
12	*17*	*MON*	*18000*

Calculate Exponential Moving Average (EMA) of Sensex during the above period. The 30 days simple moving average of Sensex can be assumed as 15,000. The value of exponent for 30 days EMA is 0.062.

Give detailed analysis on the basis of your calculations.

Answer

Date	**1** **Sensex**	**2** **EMA for Previous day**	**3** **1-2**	**4** **3×0.062**	**5** **EMA** **2 ± 4**
6	14522	15000	(478)	(29.636)	14970.364
7	14925	14970.364	(45.364)	(2.812)	14967.55
10	15222	14967.55	254.45	15.776	14983.32
11	16000	14983.32	1016.68	63.034	15046.354
12	16400	15046.354	1353.646	83.926	15130.28
13	17000	15130.28	1869.72	115.922	15246.202
17	18000	15246.202	2753.798	170.735	15416.937

Conclusion – The market is bullish. The market is likely to remain bullish for short term to medium term if other factors remain the same. On the basis of this indicator (EMA) the investors/brokers can take long position.

Question 60

The closing value of Sensex for the month of October, 2007 is given below:

Date Closing	*Sensex Value*
1.10.07	*2800*
3.10.07	*2780*
4.10.07	*2795*
5.10.07	*2830*
8.10.07	*2760*
9.10.07	*2790*
10.10.07	*2880*
11.10.07	*2960*
12.10.07	*2990*
15.10.07	*3200*
16.10.07	*3300*
17.10.07	*3450*
19.10.07	*3360*
22.10.07	*3290*
23.10.07	*3360*
24.10.07	*3340*
25.10.07	*3290*
29.10.07	*3240*
30.10.07	*3140*
31.10.07	*3260*

You are required to test the weak form of efficient market hypothesis by applying the run test at 5% and 10% level of significance.

Following value can be used :

Value of t at 5% is 2.101 at 18 degrees of freedom

Value of t at 10% is 1.734 at 18 degrees of freedom

Value of t at 5% is 2.086 at 20 degrees of freedom.

Value of t at 10% is 1.725 at 20 degrees of freedom.

Answer

Date	Closing Sensex	Sign of Price Charge
1.10.07	2800	
3.10.07	2780	-
4.10.07	2795	+
5.10.07	2830	+
8.10.07	2760	-
9.10.07	2790	+
10.10.07	2880	+
11.10.07	2960	+
12.10.07	2990	+
15.10.07	3200	+
16.10.07	3300	+
17.10.07	3450	+
19.10.07	3360	-
22.10.07	3290	-
23.10.07	3360	+
24.10.07	3340	-
25.10.07	3290	-
29.10.07	3240	-
30.10.07	3140	-
31.10.07	3260	+

Total of sign of price changes (r) = 8

No of Positive changes = n_1 = 11

No. of Negative changes = n_2 = 8

$$\mu_r = \frac{2n_1n_2}{n_1 + n_2} + 1$$

$$\mu = \frac{2 \times 11 \times 8}{11 + 8} + 1 = 176/19 + 1 = 10.26$$

$$\hat{\sigma}_r = \sqrt{\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}}$$

$$\hat{\sigma}_r = \sqrt{\frac{(2\times11\times8)\,(2\times11\times8 - 11 - 8)}{(11+8)^2(11+8-1)}} = \sqrt{\frac{176\times157}{(19)^2(18)}} = \sqrt{4.252} = 2.06$$

Since too few runs in the case would indicate that the movement of prices is not random. We employ a two- tailed test the randomness of prices.

Test at 5% level of significance at 18 degrees of freedom using t- table

The lower limit

$= \mu - t \times \hat{\sigma}_r = 10.26 - 2.101 \times 2.06 = 5.932$

Upper limit

$= \mu + t \times \hat{\sigma}_r = 10.26 + 2.101 \times 2.06 = 14.588$

At 10% level of significance at 18 degrees of freedom

Lower limit

= 10.26 – 1.734 × 2.06 = 6.688

Upper limit

= 10.26 + 1.734 × 2.06 = 13.832

As seen r lies between these limits. Hence, the market exhibits weak form of efficiency.

*For a sample of size n, the t distribution will have n-1 degrees of freedom.

Question 61

Tiger Ltd. is presently working with an Earning Before Interest and Taxes (EBIT) of ₹ 90 lakhs. Its present borrowings are as follows:

	₹ In lakhs
12% term loan	*300*
Working capital borrowings:	
From Bank at 15%	*200*
Public Deposit at 11%	*100*

The sales of the company are growing and to support this, the company proposes to obtain additional borrowing of ₹ 100 lakhs expected to cost 16%.The increase in EBIT is expected to be 15%.

Calculate the change in interest coverage ratio after the additional borrowing is effected and comment on the arrangement made.

Answer

Calculation of Present Interest Coverage Ratio

Present EBIT = ₹ 90 lakhs

Interest charges (Present)	₹*lakhs*
Term loan @ 12%	36.00
Bank Borrowings @ 15%	30.00
Public Deposit @ 11%	11.00
	77.00

$$\text{Present Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Charges}}$$

$$= \frac{₹\ 90\ \text{lakhs}}{₹\ 77\ \text{lakhs}} = 1.169$$

Calculation of Revised Interest Coverage Ratio

Revised EBIT (115% of ₹ 90 lakhs)	₹103.50 lakhs
Proposed interest charges	
Existing charges	₹ 77.00 *lakhs*
Add: Additional charges (16% of additional Borrowings i.e. ₹100 lakhs)	₹ 16.00 *lakhs*
Total	₹ 93.00 *lakhs*

$$\text{Revised Interest Coverage Ratio} = \frac{₹\ 103.50\ \text{lakhs}}{₹\ 93.00\ \text{lakhs}} = 1.113$$

Analysis: With the proposed increase in the sales the burden of interest on additional borrowings of ₹100 lakhs will adversely affect the interest coverage ratio which has been reduced. (i.e. from 1.169 to 1.113).

Question 62

The HLL has ₹ 8.00 crore of 10% mortgage bonds outstanding under an open-end scheme. The scheme allows additional bonds to be issued as long as all of the following conditions are met:

(1) Pre-tax interest coverage $\left(\frac{\text{Income before tax} + \text{Bond Interest}}{\text{Bond Interest}}\right)$ *remains greater than 4.*

(2) Net depreciated value of mortgage assets remains twice the amount of the mortgage debt.

(3) Debt-to-equity ratio remains below 0.50.

The HLL has net income after taxes of ₹ 2 crores and a 40% tax-rate, ₹ 40 crores in equity and ₹ 30 crores in depreciated assets, covered by the mortgage.

Assuming that 50% of the proceeds of a new issue would be added to the base of mortgaged assets and that the company has no Sinking Fund payments until next year, how much more 10% debt could be sold under each of the three conditions? Which protective covenant is binding?

Answer

Let x be the crores of Rupees of new 10% debt which would be sold under each of the three given conditions. Now, the value of x under each of the three conditions is as follows:

1. Pre - tax interest coverage $\left(\frac{\text{Income before tax} + \text{Bond Interest}}{\text{Bond Interest}}\right)$ remains greater than 4.

$$\frac{₹\ 2 \text{ crores} / (1-0.4) + 8 \text{ crores} \times 0.1 + x \times 0.1}{(8 \text{ crores} \times 0.1) + (x \times 0.1)} = 4$$

$$\text{Or } \frac{₹\ 3.33 \text{ crores} + 0.80 \text{ crores} + 0.10x}{(0.80 \text{ crores} + ₹\ 0.10x)} = 4$$

$$\text{Or } \frac{₹\ 4.13 \text{ crores} + 0.10x}{₹\ 0.80 \text{ crores} + ₹\ 0.10x} = 4$$

Or ₹ 4.13 crores + 0.10x = 4 (₹ 0.80 crores + ₹ 0.10x)

Or ₹ 4.13 crores + 0.10x = ₹ 3.2 crores + ₹ 0.40x

Or ₹ 0.30 x = 0.93

Or x = ₹ 0.93/0.30

Or x = ₹ 3.10 crores

Additional mortgage required shall be a maximum of ₹ 3.10 crores.

2. Net depreciated value of mortgage assets remains twice the amount of mortgage debt

(Assuming that 50% of the proceeds of new issue would be added to the base of mortgaged assets)

$$\text{i.e. } \frac{₹\ 30 \text{ crores} + 0.5\ x}{₹\ 8 \text{ crores} + x} = 2$$

or ₹ 30 crores + 0.5x = 2 (₹ 8 crores + x)

or ₹ 1.5x = ₹ 14 crores

$$\text{or } = \frac{₹\ 14 \text{ crores}}{1.5}$$

or x = 9.33 crores

Additional mortgage required to satisfy condition No. 2 is ₹ 9.33 crores

3. Debt to equity ratio remains below 5

$$\text{i.e. } \frac{₹\ 8 \text{ crores} + x}{₹\ 40 \text{ crores}} = 0.50$$

or ₹ 8 crores + x = ₹ 20 crores

or x = ₹ 12 crores

Since all the conditions are to be met, the least i.e. ₹ 3.10 crores (as per condition – 1) can be borrowed by issuing additional bonds.

Thus, binding conditions are met and it limits the amount of new debt to 3.10 crore.

Question 63

John inherited the following securities on his uncle's death:

Types of Security	*Nos.*	*Annual Coupon %*	*Maturity Years*	*Yield %*
Bond A (₹1,000)	*10*	*9*	*3*	*12*
Bond B (₹1,000)	*10*	*10*	*5*	*12*
Preference shares C (₹100)	*100*	*11*	*	*13**
Preference shares D (₹100)	*100*	*12*	*	*13**

**likelihood of being called at a premium over par.*

Compute the current value of his uncle's portfolio.

Answer

Computation of current value of John's portfolio

(i) *10 Nos. Bond A, ₹1,000 par value, 9% Bonds maturity 3 years:*

		₹
Current value of interest on bond A		
1-3 years:	₹ 900 × Cumulative P.V. @ 12% (1-3 years)	
	= ₹ 900 × 2.402	2,162

	Add: Current value of amount received on maturity of Bond A		
	End of 3rd year: ₹ 1,000 × 10 × P.V. @ 12% (3rd year)		
	= ₹ 10,000 × 0.712	7,120	9,282
(ii)	*10 Nos. Bond B, ₹1,000 par value, 10% Bonds maturity 5 years:*		
	Current value of interest on bond B		
	1-5 years: ₹ 1,000 × Cumulative P.V. @ 12% (1-5 years)		
	= ₹ 1,000 × 3.605	3,605	
	Add: Current value of amount received on maturity of Bond B		
	End of 5th year: ₹ 1,000 × 10 × P.V. @ 12% (5th year)		
	= ₹ 10,000 × 0.567	5,670	9,275
(iii)	*100 Preference shares C, ₹100 par value, 11% coupon*		
	$\frac{11\% \times 100 \text{ Nos.} \times ₹ 100}{13\%} = \frac{1,100}{0.13}$	8,462	
(iv)	*100 Preference shares D, ₹100 par value, 12% coupon*		
	$\frac{12\% \times 100 \text{ Nos.} \times ₹ 100}{13\%} = \frac{1,200}{0.13}$	9,231	17,693
	Total current value of his portfolio [(i) + (ii) + (iii) + (iv)]		36,250

7
Portfolio Theory

BASIC CONCEPTS AND FORMULAE

1. Introduction

Portfolio theory guides investors about the method of selecting securities that will provide the highest expected rate of return for any given degree of risk or that will expose the investor to a degree of risk for a given expected rate of return.

2. Different Portfolio Theories

Some of the important theories of portfolio management are:

(a) Traditional Approach

The traditional approach to portfolio management concerns itself with the investor's profile; definition of portfolio objectives with reference to maximising the investors' wealth which is subject to risk; investment strategy; diversification and selection of individual investment.

(b) Dow Jones Theory

The Dow Jones theory classifies the movements of the prices on the share market into three major categories:

- **Primary movements**: They reflect the trend of the stock market and last from one year to three years, or sometimes even more.
- **Secondary movements**: They are shorter in duration and are opposite in direction to the primary movements.
- **Daily fluctuations**: These are irregular fluctuations which occur every day in the market. These fluctuations are without any definite trend.

Dow Jones theory identifies the turn in the market prices by seeing whether the successive peaks and troughs are higher or lower than earlier.

(c) Efficient Market Theory

The basic premise of this theory is that all market participants receive and act on all the relevant information as soon as it becomes available in the stock market. There exists three levels of market efficiency:-

- *Weak form efficiency* – Prices reflect all information found in the record of past prices and volumes.
- *Semi – Strong efficiency* – Prices reflect not only all information found in the record of past prices and volumes but also all other publicly available information.
- *Strong form efficiency* – Prices reflect all available information public as well as private.

(d) Random Walk Theory

Random Walk hypothesis states that the behaviour of stock market prices is unpredictable and that there is no relationship between the present prices of the shares and their future prices. Basic premises of the theory are as follows:

- Prices of shares in stock market can never be predicted. The reason is that the price trends are not the result of any underlying factors, but that they represent a statistical expression of past data.
- There may be periodical ups or downs in share prices, but no connection can be established between two successive peaks (high price of stocks) and troughs (low price of stocks).

3. Markowitz Model of Risk-Return Optimization

According to the model, investors are mainly concerned with two properties of an asset: risk and return, but by diversification of portfolio it is possible to trade off between them. The essence of the theory is that risk of an individual asset hardly matters to an investor. The investor is more concerned to the contribution it makes to his total risk.

Efficient Frontier: Markowitz has formalised the risk return relationship and developed the concept of efficient frontier. For selection of a portfolio, comparison between combinations of portfolios is essential. The investor has to select a portfolio from amongst all those represented by the efficient frontier. This will depend upon his risk-return preference. As different investors have different preferences with respect to expected return and risk, the optimal portfolio of securities will vary considerably among investors.

As a rule, a portfolio is not efficient if there is another portfolio with:

- A higher expected value of return and a lower standard deviation (risk).
- A higher expected value of return and the same standard deviation (risk)
- The same expected value but a lower standard deviation (risk)

4. Capital Asset Pricing Model (CAPM)

CAPM model describes the linear relationship risk-return trade-off for

securities/portfolios. A graphical representation of CAPM is the Security Market Line, (SML), which indicates the rate of return required to compensate at a given level of risk. The risks to which a security/portfolio is exposed are divided into two groups, diversifiable and non-diversifiable.

The **diversifiable risk** can be eliminated through a portfolio consisting of large number of well diversified securities. Whereas, the **non-diversifiable risk** is attributable to factors that affect all businesses like Interest Rate Changes, Inflation, Political Changes, etc.

As diversifiable risk can be eliminated by an investor through diversification, the non-diversifiable risk is the only risk a business should be concerned with. The CAPM method also is solely concerned with non-diversifiable risk.

The non-diversifiable risks are assessed in terms of beta coefficient, β, through fitting regression equation between return of a security/portfolio and the return on a market portfolio.

$R_j = R_f + \beta (R_m - R_f)$

Where,

R_f = Risk free rate

R_m= Market Rate

β= Beta of Portfolio

5. Arbitrage Pricing Theory Model (APT)

The APT was developed by Ross in 1976. It holds that there are four factors which explain the risk premium relationship of a particular security- inflation and money supply, interest rate, industrial production and personal consumption. It is a multi-factor model having a whole set of Beta Values – one for each factor. Further, it states that the expected return on an investment is dependent upon how that investment reacts to a set of individual macro-economic factors (degree of reaction measured by the Betas) and the risk premium associated with each of the macro – economic factors.

$$E(R_i) = R_f + \lambda_1\beta_{i_1} + \lambda_2\beta_{i_2} + \lambda_3\beta_{i_3} + \lambda_4\beta_{i_4}$$

Where, $\lambda_1, \lambda_2, \lambda_3, \lambda_4$ are average risk premium for each of the four factors in the model and $\beta_{i_1}, \beta_{i_2}, \beta_{i_3}, \beta_{i_4}$ are measures of sensitivity of the particular security i to each of the four factors.

6. Sharpe Index Model

(a) Single Index Model

William Sharpe developed the Single index model. The single index model is based on the assumption that stocks vary together because of the common movement in the stock market and there are no effects beyond the market (i.e. any fundamental factor effects) that account the stocks co-movement. The expected return, standard deviation and co-variance of the single index model represent the joint movement of securities. The return on stock is:

$$R_i = \alpha_i + \beta_i R_m + \in_i$$

The mean return is:

$$R_i = \alpha_i + \beta_i \, R_m + \in_i$$

Where,

R_i = expected return on security i

α_i = intercept of the straight line or alpha co-efficient

β_i = slope of straight line or beta co-efficient

R_m = the rate of return on market index

$\in_i$ = error term.

The variance of security's return:

$$\sigma^2 = \beta^2_i \, \sigma^2_m + \sigma^2_{\in i}$$

The covariance of returns between securities i and; j is:

$$\sigma_{ij} = \beta_i \beta_j \sigma^2_m$$

Systematic risk = β^2_i × variance of market index

$$= \beta^2_i \, \sigma^2_m$$

Unsystematic risk = Total variance - Systematic risk.

$\in_i^2$ = σ_i^2 - Systematic risk.

Thus, the total risk = Systematic risk + Unsystematic risk.

$$= \beta_i^2 \ \sigma_m^2 + \in_i^2.$$

Portfolio variance can be derived

$$\sigma_p^2 = \left[\left(\sum_{i=1}^{N} X_i \beta_i\right)^2 \sigma_m^2\right] + \left[\left(\sum_{i=1}^{N} X_i^2 \in_i^2\right)\right]$$

Expected return on the portfolio

$$R_P = \sum_{i=1}^{N} x_i (\alpha_i + \beta_i R_m)$$

A portfolio's alpha value is a weighted average of the alpha values for its component securities using the proportion of the investment in a security as weight.

$$\sigma_p = \sum_{i=1}^{N} x_i \alpha_i$$

A portfolio's beta value is the weighted average of the beta values of its component stocks using relative share of them in the portfolio as weights.

$$\sigma_p = \sum_{i=1}^{N} x_i \beta_i$$

(b) Sharpe's and Treynor's Ratio

These two ratios measure the Risk Premium per unit of Risk for a security or a portfolio of securities and provide the tools for comparing the performance of diverse securities and portfolios.

Sharpe Ratio is defined as

$$\frac{R_i - R_f}{\sigma_i}$$

and Treynor Ratio is defined as

$$\frac{R_i - R_f}{\beta_i}$$

Where,

R = Expected return on stock i

R_f = Return on a risk less asset

σ_i = Standard Deviation of the rates of return for the ith Security

β_i = Expected change in the rate of return on stock i associated with one unit change in the market return

(c) Sharpe's Optimal Portfolio

The steps for finding out the stocks to be included in the optimal portfolio are given below:

(i) Find out the "excess return to beta" ratio for each stock under consideration.

(ii) Rank them from the highest to the lowest.

(iii) Proceed to calculate Ci for all the stocks/portfolios according to the ranked order using the following formula:

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^{N} \frac{\left(R_i - R_f\right)\beta_i}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^{N} \frac{\beta_i^2}{\sigma_{ei}^2}}$$

Where,

σ^2_m = variance of the market index

σ^2_{ei} = variance of a stock's movement that is not associated with the movement of market index i.e. stock's unsystematic risk.

(iv) Compute the cut-off point which the highest value of Ci and is taken as C*. The stock whose excess-return to risk ratio is above the cut-off ratio are selected and all whose ratios are below are rejected. The main reason for this selection is that since securities are ranked from highest excess return to Beta to lowest, and if particular security belongs to optional portfolio all higher ranked securities also belong to optimal portfolio.

(v) Once we came to know which securities are to be included in the optimum portfolio, we shall calculate the percent to be invested in each security by using the following formula:

$$X_i^o = \frac{Z_i}{\sum_{j=1}^{N} Z_i}$$

where

$$Zi = \frac{\beta_i}{\sigma_{ei}^2}\left(\frac{R_i - R_o}{\beta_i} - C^*\right)$$

The first portion determines the weight each stock and total comes to 1 to ensure that all funds are invested and second portion determines the relative investment in each security.

7. Portfolio Management

The objective of portfolio management is to achieve the maximum return from a portfolio which has been delegated to be managed by an individual manager or a financial institution. The manager has to balance the parameters which define a good investment i.e. security, liquidity and return. The goal is to obtain the highest return for the investor of the portfolio.

(a) Objectives of Portfolio Management

(i) Security/Safety of Principal;

(ii) Stability of Income;

(iii) Capital Growth;

(iv) Marketability i.e. the case with which a security can be bought or sold;

(v) Liquidity i.e. nearness to money;

(vi) Diversification; and

(vii) Favourable Tax Status.

(b) Activities in Portfolio Management

The following three major activities are involved in an efficient portfolio management:

(i) Identification of assets or securities, allocation of investment and identifying asset classes.

(ii) Deciding about major weights/proportion of different assets/securities in the portfolio.

(iii) Security selection within the asset classes as identified earlier.

(c) Basic Principles of Portfolio Management

(i) Effective investment planning for the investment in securities; and

(ii) Constant review of investment.

(d) Factors Affecting Investment Decision in Portfolio Management

Given a certain amount of funds, the investment decision basically depends upon the following factors:

(i) Objectives of Investment Portfolio

(ii) Selection of Investment, and

(iii) Timing of Purchases.

(e) Formulation of Portfolio Strategy

(i) **Active Portfolio Strategy (APS):** An APS is followed by most investment professionals and aggressive investors who strive to earn superior return after adjustment for risk.

(i) **Passive Portfolio Strategy:** Passive strategy rests on the tenet that the capital market is fairly efficient with respect to the available information.

8. Principles and Management of Hedge Funds

Hedge Fund is an aggressively managed portfolio of investments that uses advanced investment strategies such as leverage, long, short and derivative positions in both domestic and international markets with the goal of generating high returns.

9. International Portfolio Management

The objective of portfolio investment management is to consider an optimal portfolio where the risk-return trade off is optimal. The return may be maximum at a certain level of risk or the risk may be minimum at a certain level of return. It is therefore necessary to determine whether optimization of international portfolio can be achieved by striking a balance between risk and return.

10. Important Formulae

(a) Expected Return from a Security

$1 + R_{HC} = [1 + (S_1 - S_0 + I) / S_O] \times 1 + e$

Where,

S_o = Home country currency value of security during preceding time period t_0

S_1 = Home country currency value of security during succeeding time period t_1

I = Income from interest and dividend

e = Change in exchange rate.

(b) Portfolio Return

$R_P = R_A W_A + R_B W_B$

(c) Covariance between two sets of returns A1, and A2 is given by:

$$Cov\ (A_1,A_2) = P_1(A_1 - \overline{A}\ )\ (A_2 - \overline{A}\ ) + P_2\ (A_1 - \overline{A}\ )\ (A_2 - \overline{A}\ )$$

$$\text{Corelation Coefficient } \rho_{12} = \frac{Cov(A_1A_2)}{\sigma_1\sigma_2}$$

(d) Portfolio Risk

$$\sigma_p = \left[w_1^2\ \text{Var}\ A_1 + w_2^2\ \text{Var}\ A_2 + 2(w_1)(w_2)\ \text{Cov}\ (A_1,A_2) \right]^{\frac{1}{2}}$$

Question 1

Write short note on Factors affecting investment decisions in portfolio management.

Answer

Factors affecting Investment Decisions in Portfolio Management

(i) **Objectives of investment portfolio:** There can be many objectives of making an investment. The manager of a provident fund portfolio has to look for security (low risk) and may be satisfied with none too higher return. An aggressive investment company may, however, be willing to take a high risk in order to have high capital appreciation.

(ii) Selection of investment

(a) What types of securities to buy or invest in? There is a wide variety of investments opportunities available i.e. debentures, convertible bonds, preference shares, equity shares, government securities and bonds, income units, capital units etc.

(b) What should be the proportion of investment in fixed interest/dividend securities and variable interest/dividend bearing securities?

(c) In case investments are to be made in the shares or debentures of companies, which particular industries show potential of growth?

(d) Once industries with high growth potential have been identified, the next step is to select the particular companies, in whose shares or securities investments are to be made.

(iii) **Timing of purchase:** At what price the share is acquired for the portfolio depends entirely on the timing decision. It is obvious if a person wishes to make any gains, he should "buy cheap and sell dear" i.e. buy when the shares are selling at a low price and sell when they are at a high price.

Question 2

(a) What sort of investor normally views the variance (or Standard Deviation) of an individual security's return as the security's proper measure of risk?

(b) What sort of investor rationally views the beta of a security as the security's proper measure of risk? In answering the question, explain the concept of beta.

Answer

(a) A rational risk-averse investor views the variance (or standard deviation) of her portfolio's return as the proper risk of her portfolio. If for some reason or another the investor can hold only one security, the variance of that security's return becomes the variance of the portfolio's return. Hence, the variance of the security's return is the security's proper measure of risk.

While risk is broken into diversifiable and non-diversifiable segments, the market generally does not reward for diversifiable risk since the investor himself is expected to diversify the risk himself. However, if the investor does not diversify he cannot be considered to be an efficient investor. The market, therefore, rewards an investor only for the non-diversifiable risk. Hence, the investor needs to know how much non-diversifiable risk he is taking. This is measured in terms of beta.

An investor therefore, views the beta of a security as a proper measure of risk, in evaluating how much the market reward him for the non-diversifiable risk that he is assuming in relation to a security. An investor who is evaluating the non-diversifiable element of risk, that is, extent of deviation of returns viz-a-viz the market therefore consider beta as a proper measure of risk.

(b) If an individual holds a diversified portfolio, she still views the variance (or standard deviation) of her portfolios return as the proper measure of the risk of her portfolio. However, she is no longer interested in the variance of each individual security's return. Rather she is interested in the contribution of each individual security to the variance of the portfolio.

Under the assumption of homogeneous expectations, all individuals hold the market portfolio. Thus, we measure risk as the contribution of an individual security to the variance of the market portfolio. The contribution when standardized properly is the beta of the security. While a very few investors hold the market portfolio exactly, many hold reasonably diversified portfolio. These portfolios are close enough to the market portfolio so that the beta of a security is likely to be a reasonable measure of its risk.

In other words, beta of a stock measures the sensitivity of the stock with reference to a broad based market index like BSE sensex. For example, a beta of 1.3 for a stock would indicate that this stock is 30 per cent riskier than the sensex. Similarly, a beta of a 0.8 would indicate that the stock is 20 per cent (100 – 80) less risky than the sensex. However, a beta of one would indicate that the stock is as risky as the stock market index.

Question 3

Distinguish between 'Systematic risk' and 'Unsystematic risk'.

Answer

Systematic risk refers to the variability of return on stocks or portfolio associated with changes in return on the market as a whole. It arises due to risk factors that affect the overall market such as changes in the nations' economy, tax reform by the Government or a change in the world energy situation. These are risks that affect securities overall and, consequently, cannot be diversified away. This is the risk which is common to an entire class of assets or liabilities. The value of investments may decline over a given time period simply because of economic changes or other events that impact large portions of the market. Asset allocation and diversification can protect against systematic risk because different portions of the market tend to underperform at different times. This is also called market risk.

Unsystematic risk however, refers to risk unique to a particular company or industry. It is avoidable through diversification. This is the risk of price change due to the unique circumstances of a specific security as opposed to the overall market. This risk can be virtually eliminated from a portfolio through diversification.

Question 4

Briefly explain the objectives of "Portfolio Management".

Answer

Objectives of Portfolio Management

Portfolio management is concerned with efficient management of portfolio investment in financial assets, including shares and debentures of companies. The management may be by professionals or others or by individuals themselves. A portfolio of an individual or a corporate unit is the holding of securities and investment in financial assets. These holdings are the result of individual preferences and decisions regarding risk and return.

The investors would like to have the following objectives of portfolio management:

(a) Capital appreciation.

(b) Safety or security of an investment.

(c) Income by way of dividends and interest.

(d) Marketability.

(e) Liquidity.

(f) Tax Planning - Capital Gains Tax, Income tax and Wealth Tax.

(g) Risk avoidance or minimization of risk.

(h) Diversification, i.e. combining securities in a way which will reduce risk.

It is necessary that all investment proposals should be assessed in terms of income, capital appreciation, liquidity, safety, tax implication, maturity and marketability i.e., saleability (i.e., saleability of securities in the market). The investment strategy should be based on the above

objectives after a thorough study of goals of the investor, market situation, credit policy and economic environment affecting the financial market.

The portfolio management is a complex task. Investment matrix is one of the many approaches which may be used in this connection. The various considerations involved in investment decisions are liquidity, safety and yield of the investment. Image of the organization is also to be taken into account. These considerations may be taken into account and an overall view obtained through a matrix approach by allotting marks for each consideration and totaling them.

Question 5

Discuss the various kinds of Systematic and Unsystematic risk?

Answer

There are two types of Risk - Systematic (or non-diversifiable) and unsystematic (or diversifiable) relevant for investment - also, called as general and specific risk.

Types of Systematic Risk

(i) *Market risk:* Even if the earning power of the corporate sector and the interest rate structure remain more or less uncharged prices of securities, equity shares in particular, tend to fluctuate. Major cause appears to be the changing psychology of the investors. The irrationality in the security markets may cause losses unrelated to the basic risks. These losses are the result of changes in the general tenor of the market and are called market risks.

(ii) *Interest Rate Risk:* The change in the interest rate has a bearing on the welfare of the investors. As the interest rate goes up, the market price of existing fixed income securities falls and vice versa. This happens because the buyer of a fixed income security would not buy it at its par value or face value if its fixed interest rate is lower than the prevailing interest rate on a similar security.

(iii) *Social or Regulatory Risk:* The social or regulatory risk arises, where an otherwise profitable investment is impaired as a result of adverse legislation, harsh regulatory climate, or in extreme instance nationalization by a socialistic government.

(iv) *Purchasing Power Risk:* Inflation or rise in prices lead to rise in costs of production, lower margins, wage rises and profit squeezing etc. The return expected by investors will change due to change in real value of returns.

Classification of Unsystematic Risk

(i) Business Risk: As a holder of corporate securities (equity shares or debentures) one is exposed to the risk of poor business performance. This may be caused by a variety of factors like heigthtened competition, emergence of new technologies, development of substitute products, shifts in consumer preferences, inadequate supply of essential

inputs, changes in governmental policies and so on. Often of course the principal factor may be inept and incompetent management.

(ii) Financial Risk: This relates to the method of financing, adopted by the company, high leverage leading to larger debt servicing problem or short term liquidity problems due to bad debts, delayed receivables and fall in current assets or rise in current liabilities.

(iii) Default Risk: Default risk refers to the risk accruing from the fact that a borrower may not pay interest and/or principal on time. Except in the case of highly risky debt instrument, investors seem to be more concerned with the perceived risk of default rather than the actual occurrence of default. Even though the actual default may be highly unlikely, they believe that a change in the perceived default risk of a bond would have an immediate impact on its market price.

Question 6

Discuss the Capital Asset Pricing Model (CAPM) and its relevant assumptions.

Answer

Capital Asset Pricing Model: The mechanical complexity of the Markowitz's portfolio model kept both practitioners and academics away from adopting the concept for practical use. Its intuitive logic, however, spurred the creativity of a number of researchers who began examining the stock market implications that would arise if all investors used this model As a result what is referred to as the Capital Asset Pricing Model (CAPM), was developed.

The Capital Asset Pricing Model was developed by Sharpe, Mossin and Linter in 1960. The model explains the relationship between the expected return, non diversifiable risk and the valuation of securities. It considers the required rate of return of a security on the basis of its contribution to the total risk. It is based on the premises that the diversifiable risk of a security is eliminated when more and more securities are added to the portfolio. However, the systematic risk cannot be diversified and is or related with that of the market portfolio. All securities do not have same level of systematic risk. The systematic risk can be measured by beta, ß under CAPM, the expected return from a security can be expressed as:

Expected return on security = R_f + Beta (R_m – R_f)

The model shows that the expected return of a security consists of the risk-free rate of interest and the risk premium. The CAPM, when plotted on the graph paper is known as the Security Market Line (SML). A major implication of CAPM is that not only every security but all portfolios too must plot on SML. This implies that in an efficient market, all securities are expected returns commensurate with their riskiness, measured by ß.

Relevant Assumptions of CAPM

(i) The investor's objective is to maximize the utility of terminal wealth;

(ii) Investors make choices on the basis of risk and return;

(iii) Investors have identical time horizon;

(iv) Investors have homogeneous expectations of risk and return;

(v) Information is freely and simultaneously available to investors;

(vi) There is risk-free asset, and investor can borrow and lend unlimited amounts at the risk-free rate;

(vii) There are no taxes, transaction costs, restrictions on short rates or other market imperfections;

(viii) Total asset quantity is fixed, and all assets are marketable and divisible.

Thus, CAPM provides a conceptual frame work for evaluating any investment decision where capital is committed with a goal of producing future returns. However, there are certain limitations of the theory. Some of these limitations are as follows:

(i) **Reliability of Beta:** Statistically reliable Beta might not exist for shares of many firms. It may not be possible to determine the cost of equity of all firms using CAPM. All shortcomings that apply to Beta value apply to CAPM too.

(ii) **Other Risks:** It emphasis only on systematic risk while unsystematic risks are also important to share holders who do not possess a diversified portfolio.

(iii) **Information Available:** It is extremely difficult to obtain important information on risk-free interest rate and expected return on market portfolio as there are multiple risk- free rates for one while for another, markets being volatile it varies over time period.

Question 7

Discuss the Random Walk Theory.

Answer

Many investment managers and stock market analysts believe that stock market prices can never be predicted because they are not a result of any underlying factors but are mere statistical ups and downs. This hypothesis is known as Random Walk hypothesis which states that the behaviour of stock market prices is unpredictable and that there is no relationship between the present prices of the shares and their future prices. Proponents of this hypothesis argue that stock market prices are independent. A British statistician, M. G. Kendell, found that changes in security prices behave nearly as if they are generated by a suitably designed roulette wheel for which each outcome is statistically independent of the past history. In other words, the fact that there are peaks and troughs in stock exchange prices is a mere statistical happening – successive peaks and troughs are unconnected. In the layman's language it may be said that prices on the stock exchange behave exactly the way a drunk would behave while walking in a blind lane, i.e., up and down, with an unsteady way going in any direction he likes, bending on the side once and on the other side the second time.

The supporters of this theory put out a simple argument. It follows that:

(a) Prices of shares in stock market can never be predicted. The reason is that the price trends are not the result of any underlying factors, but that they represent a statistical expression of past data.

(c) There may be periodical ups or downs in share prices, but no connection can be established between two successive peaks (high price of stocks) and troughs (low price of stocks).

Question 8

Explain the three form of Efficient Market Hypothesis.

Answer

The EMH theory is concerned with speed with which information effects the prices of securities. As per the study carried out technical analyst it was observed that information is slowly incorporated in the price and it provides an opportunity to earn excess profit. However, once the information is incorporated then investor can not earn this excess profit.

Level of Market Efficiency: That price reflects all available information, the highest order of market efficiency. According to FAMA, there exist three levels of market efficiency:-

(i) *Weak form efficiency* – Price reflect all information found in the record of past prices and volumes.

(ii) *Semi – Strong efficiency* – Price reflect not only all information found in the record of past prices and volumes but also all other publicly available information.

(iii) *Strong form efficiency* – Price reflect all available information public as well as private.

Question 9

Explain the different challenges to Efficient Market Theory.

Answer

Information inadequacy – Information is neither freely available nor rapidly transmitted to all participants in the stock market. There is a calculated attempt by many companies to circulate misinformation. Other challenges are as follows:

(a) Limited information processing capabilities – Human information processing capabilities are sharply limited. According to Herbert Simon every human organism lives in an environment which generates millions of new bits of information every second but the bottle necks of the perceptual apparatus does not admit more than thousand bits per seconds and possibly much less.

David Dreman maintained that under conditions of anxiety and uncertainty, with a vast interacting information grid, the market can become a giant.

(b) Irrational Behaviour – It is generally believed that investors' rationality will ensure a close correspondence between market prices and intrinsic values. But in practice this is not true. J. M. Keynes argued that all sorts of consideration enter into the market valuation which is in no way relevant to the prospective yield. This was confirmed by L. C. Gupta who found that the market evaluation processes work haphazardly almost like a blind man firing a gun. The market seems to function largely on hit or miss tactics rather than on the basis of informed beliefs about the long term prospects of individual enterprises.

(c) Monopolistic Influence – A market is regarded as highly competitive. No single buyer or seller is supposed to have undue influence over prices. In practice, powerful institutions and big operators wield great influence over the market. The monopolistic power enjoyed by them diminishes the competitiveness of the market.

Question 10

Discuss how the risk associated with securities is effected by Government policy.

Answer

The risk from Government policy to securities can be impacted by any of the following factors.

(i) Licensing Policy

(ii) Restrictions on commodity and stock trading in exchanges

(iii) Changes in FDI and FII rules.

(iv) Export and import restrictions

(v) Restrictions on shareholding in different industry sectors

(vi) Changes in tax laws and corporate and Securities laws.

Question 11

A stock costing ₹ 120 pays no dividends. The possible prices that the stock might sell for at the end of the year with the respective probabilities are:

Price	*Probability*
115	*0.1*
120	*0.1*
125	*0.2*
130	*0.3*
135	*0.2*
140	*0.1*

Required:

(i) Calculate the expected return.

(ii) Calculate the Standard deviation of returns.

Answer

Here, the probable returns have to be calculated using the formula

$$R = \frac{D}{P_0} + \frac{P_1 - P_0}{P_0}$$

Calculation of Probable Returns

Possible prices (P_1) ₹	P_1-P_0 ₹	[(P_1-P_0)/ P_0] x 100 Return (per cent)
115	-5	-4.17
120	0	0.00
125	5	4.17
130	10	8.33
135	15	12.50
140	20	16.67

Alternatively, it can be calculated as follows:

Calculation of Expected Returns

Possible return X_i	Probability $p(X_i)$	Product X_1-$p(X_i)$
-4.17	0.1	-0.417
0.00	0.1	0.000
4.17	0.2	0.834
8.33	0.3	2.499
12.50	0.2	2.500
16.67	0.1	1.667
		X = 7.083

Expected return X = 7.083 per

Alternatively, it can also be calculated as follows:

Expected Price = 115 x 0.1 + 120 x 0.1 + 125 x 0.2 + 130 x 0.3 + 135 x 0.2 + 140 x 0.1 = 128.50

Return = $\frac{128.50 - 120}{120} \times 100 = 7.0833\%$

Calculation of Standard Deviation of Returns

Probable return X_i	Probability $p(X_i)$	Deviation $(X_i - X)$	Deviation squared $(X_i - X)^2$	Product $(X_i - X)^2 p(X_i)$
-4.17	0.1	-11.253	126.63	12.66
0.00	0.1	-7.083	50.17	5.017
4.17	0.2	-2.913	8.49	1.698
8.33	0.3	1.247	1.56	0.467
12.50	0.2	5.417	29.34	5.869
16.67	0.1	9.587	91.91	9.191
				σ^2 = 34.902

Variance, σ^2 = 34.902 per cent

Standard deviation, $\sigma = \sqrt{34.902}$ = 5.908 per cent

Question 12

Following information is available in respect of expected dividend, market price and market condition after one year.

Market condition	Probability	Market Price	Dividend per share
		₹	₹
Good	0.25	115	9
Normal	0.50	107	5
Bad	0.25	97	3

The existing market price of an equity share is ₹ 106 (F.V. ₹ 1), which is cum 10% bonus debenture of ₹ 6 each, per share. M/s. X Finance Company Ltd. had offered the buy-back of debentures at face value.

Find out the expected return and variability of returns of the equity shares.

And also advise-Whether to accept buy back after?

Answer

The Expected Return of the equity share may be found as follows:

Market Condition	Probability	Total Return	Cost (*)	Net Return
Good	0.25	₹ 124	₹ 100	₹ 24
Normal	0.50	₹ 112	₹ 100	₹ 12
Bad	0.25	₹ 100	₹ 100	₹ 0

Expected Return = $(24 \times 0.25) + (12 \times 0.50) + (0 \times 0.25) = 12 = \left(\frac{12}{100}\right) \times 100 = 12\%$

The variability of return can be calculated in terms of standard deviation.

$$V\ SD = 0.25\ (24 - 12)^2 + 0.50\ (12 - 12)^2 + 0.25\ (0 - 12)^2$$

$$= 0.25\ (12)^2 + 0.50\ (0)^2 + 0.25\ (-12)^2$$

$$= 36 + 0 + 36$$

$$SD = \sqrt{72}$$

SD = 8.485 or say 8.49

(*) The present market price of the share is ₹ 106 cum bonus 10% debenture of ₹ 6 each; hence the net cost is ₹ 100 (There is no cash loss or any waiting for refund of debenture amount).

M/s X Finance company has offered the buyback of debenture at face value. There is reasonable 10% rate of interest compared to expected return 12% from the market. Considering the dividend rate and market price the creditworthiness of the company seems to be very good. The decision regarding buy-back should be taken considering the maturity period and opportunity in the market. Normally, if the maturity period is low say up to 1 year better to wait otherwise to opt buy back option.

Question 13

Mr. A is interested to invest ₹ 1,00,000 in the securities market. He selected two securities B and D for this purpose. The risk return profile of these securities are as follows :

Security	***Risk (σ)***	***Expected Return (ER)***
B	*10%*	*12%*
D	*18%*	*20%*

Co-efficient of correlation between B and D is 0.15.

You are required to calculate the portfolio return of the following portfolios of B and D to be considered by A for his investment.

(i) 100 percent investment in B only;

(ii) 50 percent of the fund in B and the rest 50 percent in D;

(iii) 75 percent of the fund in B and the rest 25 percent in D; and

(iv) 100 percent investment in D only.

Also indicate that which portfolio is best for him from risk as well as return point of view?

Answer

We have $E_p = W_1E_1 + W_3E_3 + \ldots\ldots\ldots\ W_nE_n$

and for standard deviation $\sigma^2_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \sigma_{ij}$

$$\sigma^2_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \rho_{ij}\ \sigma_i\ \sigma_j$$

Two asset portfolio

$\sigma^2_p = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + 2\ w_1w_2\sigma_1\sigma_2\rho_{12}$

Substituting the respective values we get,

(i) All funds invested in B

$Ep = 12\%$

$\sigma_p = 10\%$

(ii) 50% of funds in each of B & D

$Ep = 0.50X12\%+0.50X20\%=16\%$

$\sigma^2_p = (0.50)^2(10\%)^2 + (0.50)^2(18\%)^2 +2(0.50)(0.50)(0.15)(10\%)(18\%)$

$\sigma^2_p = 25 + 81 + 13.5 = 119.50$

$\sigma_p = 10.93\%$

(iii) 75% in B and 25% in D

$Ep = 0.75\%X12\%+0.25\%X20=14\%$

$\sigma^2_p = (0.75)^2(10\%)^2 + (0.25)^2(18\%)^2 +2(0.75)(0.25)(0.15)(10\%)(18\%)$

$\sigma^2_p = 56.25 + 20.25 + 10.125 = 86.625$

$\sigma_p = 9.31\%$

(iv) All funds in D

$Ep = 20\%$

$\sigma_p = 18.0\%$

Portfolio	(i)	(ii)	(iii)	(iv)
Return	12	16	14	20
σ	10	10.93	9.31	18

In the terms of return, we see that portfolio (iv) is the best portfolio. In terms of risk we see that portfolio (iii) is the best portfolio.

Question 14

Consider the following information on two stocks, A and B :

Year	*Return on A (%)*	*Return on B (%)*
2006	*10*	*12*
2007	*16*	*18*

You are required to determine:

(i) The expected return on a portfolio containing A and B in the proportion of 40% and 60% respectively.

(ii) The Standard Deviation of return from each of the two stocks.

(iii) The covariance of returns from the two stocks.

(iv) Correlation coefficient between the returns of the two stocks.

(v) The risk of a portfolio containing A and B in the proportion of 40% and 60%.

Answer

(i) Expected return of the portfolio A and B

E (A) = (10 + 16) / 2 = 13%

E (B) = (12 + 18) / 2 = 15%

$$Rp = \sum_{i=1}^{N} X_i R_i = 0.4(13) + 0.6(15) = 14.2\%$$

(ii) Stock A:

Variance = 0.5 (10 – 13)² + 0.5 (16 – 13) ² = 9

Standard deviation = $\sqrt{9}$ = 3%

Stock B:

Variance = 0.5 (12 – 15) ² + 0.5 (18 – 15) ² = 9

Standard deviation = 3%

(iii) Covariance of stocks A and B

Cov_{AB} = 0.5 (10 – 13) (12 – 15) + 0.5 (16 – 13) (18 – 15) = 9

(iv) Correlation of coefficient

$$r_{AB} = \frac{Cov_{AB}}{\sigma_A \sigma_B} = \frac{9}{3 \times 3} = 1$$

(v) Portfolio Risk

$$\sigma_P = \sqrt{X^2{}_A\sigma^2{}_A + X^2{}_B\sigma^2{}_B + 2X_AX_B(\sigma_A\sigma_B\sigma_{AB})}$$

$$= \sqrt{(0.4)^2(3)^2 + (0.6)^2(3)^2 + 2(0.4)(0.6)(3)(3)(1)}$$

$$= \sqrt{1.44 + 3.24 + 4.32} = 3\%$$

Question 15

Consider the following information on two stocks X and Y:

Year	*Return on X (%)*	*Return on Y (%)*
2008	*12*	*10*
2009	*18*	*16*

You are required to determine:

(i) The expected return on a portfolio containing X and Y in the proportion of 60% and 40% respectively.

(ii) The standard deviation of return from each of the two stocks.

(iii) The covariance of returns from the two stocks.

(iv) Correlation co-efficient between the returns of the two stocks.

(v) The risk of portfolio containing X and Y in the proportion of 60% and 40%.

Answer

(i) Expected return of the portfolio X and Y

E(X) = (12 + 18)/2 = 15%

E(Y) = (10 + 16)/2 = 13%

R_P = 0.6(15) + 0.4 (13) = 14.2%

(ii) Stock X

$$\text{Variance} = \frac{\sum_{t=1}^{n}(X_t - \bar{X})^2}{N}$$

Variance = $0.5(12 - 15)^2 + 0.5(18 - 15)^2 = 9$

Standard deviation = $\sqrt{9}$ = 3%

Stock Y

$$\text{Variance} = \frac{\sum_{t=1}^{n}(Y_t - \bar{Y})^2}{N}$$

Variance = $0.5(10 - 13)^2 + 0.5(16 - 13)^2 = 9$

Standard deviation = $\sqrt{9}$ = 3%

(iii) Covariance of Stocks X and Y

$$\text{Covariance} = \frac{\sum_{t=1}^{n}(X_t - \bar{X})(Y_t - \bar{Y})}{N}$$

$Cov_{XY} = 0.5(12 - 15)(10 - 13) + 0.5(18 - 15)(16 - 13) = 9$

(iv) Correlation of Coefficient

$$\gamma_{XY} = \frac{COV_{XY}}{\sigma_X \sigma_Y} = \frac{9}{3 \times 3} = 1$$

(v) Portfolio Risk

$$\sigma_P = \sqrt{(0.6)^2(3)^2 + (0.4)^2(3)^2 + 2(0.6)(0.4)(3)(3)(1)}$$

$$= \sqrt{3.24 + 1.44 + 4.32} = \sqrt{9} = 3\%$$

Question 16

Following is the data regarding six securities:

	A	*B*	*C*	*D*	*E*	*F*
Return (%)	*8*	*8*	*12*	*4*	*9*	*8*
Risk (Standard deviation)	*4*	*5*	*12*	*4*	*5*	*6*

(i) Assuming three will have to be selected, state which ones will be picked.

(ii) Assuming perfect correlation, show whether it is preferable to invest 75% in A and 25% in C or to invest 100% in E

Answer

(i) Security A has a return of 8% for a risk of 4, whereas B and F have a higher risk for the same return. Hence, among them A dominates.

For the same degree of risk 4, security D has only a return of 4%. Hence, D is also dominated by A.

Securities C and E remain in reckoning as they have a higher return though with higher

degree of risk.

Hence, the ones to be selected are A, C & E.

(ii) The average values for A and C for a proportion of 3 : 1 will be :

Risk $= \frac{(3\times4)+(1\times12)}{4} = 6\%$

Return $= \frac{(3\times8)+(1\times12)}{4} = 9\%$

Therefore:	75% A	E
	25% C	
Risk	6	5
Return	9%	9%

For the same 9% return the risk is lower in E. Hence, E will be preferable.

Question 17

The historical rates of return of two securities over the past ten years are given. Calculate the Covariance and the Correlation coefficient of the two securities:

Years:	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Security 1: (Return per cent)	*12*	*8*	*7*	*14*	*16*	*15*	*18*	*20*	*16*	*22*
Security 2: (Return per cent)	*20*	*22*	*24*	*18*	*15*	*20*	*24*	*25*	*22*	*20*

Answer

Calculation of Covariance

Year	R_1	*Deviation* $(R_1 - \overline{R_1})$	*Deviation* $(R_1 - \overline{R_1})^2$	R_2	*Deviation* $(R_2 - \overline{R_2})$	*Deviation* $(R_2 - \overline{R_2})^2$	*Product of deviations*
1	12	-2.8	7.84	20	-1	1	2.8
2	8	-6.8	46.24	22	1	1	-6.8
3	7	-7.8	60.84	24	3	9	-23.4
4	14	-0.8	0.64	18	-3	9	2.4
5	16	1.2	1.44	15	-6	36	-7.2

6	15	0.2	0.04	20	-1	1	-0.2
7	18	3.2	10.24	24	3	9	9.6
8	20	5.2	27.04	25	4	16	20.8
9	16	1.2	1.44	22	1	1	1.2
10	22	7.2	51.84	20	-1	1	-7.2
$R_1 = \frac{148}{10} = 14.8$			Σ=207.60		$R_2 = \frac{210}{10} = 21$	Σ=84.00	

$$\text{Covariance} = \frac{\sum_{i=1}^{N} [R_1 - \overline{R_1}][R_2 - \overline{R_2}]}{N} = -8/10 = -0.8$$

Standard Deviation of Security 1

$$\sigma_1 = \sqrt{\frac{(R_1 - \overline{R_1})^2}{N}}$$

$$\sigma_1 = \sqrt{\frac{207.60}{10}} = \sqrt{20.76}$$

$$\sigma_1 = 4.56$$

Standard Deviation of Security 2

$$\sigma_2 = \sqrt{\frac{(R_2 - \overline{R_2})^2}{N}}$$

$$\sigma_2 = \sqrt{\frac{84}{10}} = \sqrt{8.40}$$

$$\sigma_2 = 2.90$$

Alternatively, Standard Deviation of securities can also be calculated as follows:

Calculation of Standard Deviation

Year	R_1	R_1^2	R_2	R_2^2
1	12	144	20	400
2	8	64	22	484
3	7	49	24	576

4	14	196	18	324
5	16	256	15	225
6	15	225	20	400
7	18	324	24	576
8	20	400	25	625
9	16	256	22	484
10	22	484	20	400
	148	2398	210	4494

Standard deviation of security 1:

$$\sigma_1 = \sqrt{\frac{N\sum R_1^2 - (\sum R_1)^2}{N^2}}$$

$$= \sqrt{\frac{(10\times 2398) - (148)^2}{10\times 10}} = \sqrt{\frac{23980 - 21904}{100}}$$

$$= \sqrt{20.76} = 4.56$$

Standard deviation of security 2:

$$\sigma_2 = \sqrt{\frac{N\sum R_2^2 - (\sum R_2)^2}{N^2}}$$

$$= \sqrt{\frac{(10\times 4494) - (210)^2}{10\times 10}} = \sqrt{\frac{44940 - 44100}{100}}$$

$$= \sqrt{\frac{840}{100}} = \sqrt{8.4} = 2.90$$

Correlation Coefficient

$$r_{12} = \frac{Cov}{\sigma_1 \sigma_2} = \frac{-0.8}{4.56\times 2.90} = \frac{-0.8}{13.22} = -0.0605$$

Question 18

An investor has decided to invest to invest ₹ 1,00,000 in the shares of two companies, namely, ABC and XYZ. The projections of returns from the shares of the two companies along with their probabilities are as follows:

Probability	*ABC(%)*	*XYZ(%)*
.20	*12*	*16*
.25	*14*	*10*
.25	*-7*	*28*
.30	*28*	*-2*

You are required to

(i) Comment on return and risk of investment in individual shares.

(ii) Compare the risk and return of these two shares with a Portfolio of these shares in equal proportions.

(iii) Find out the proportion of each of the above shares to formulate a minimum risk portfolio.

Answer

(i)

Probability	ABC (%)	XYZ (%)	1X2 (%)	1X3 (%)
(1)	(2)	(3)	(4)	(5)
0.20	12	16	2.40	3.2
0.25	14	10	3.50	2.5
0.25	-7	28	-1.75	7.0
0.30	28	-2	8.40	-0.6
Average return			12.55	12.1

Hence the expected return from ABC = 12.55% and XYZ is 12.1%

Probability	(ABC-$\overline{ABC}$)	(ABC-$\overline{ABC}$)^2	1X3	(XYZ-$\overline{XYZ}$)	(XYZ-$\overline{XYZ}$)^2	(1)X(6)
(1)	(2)	(3)	(4)	(5)	(6)	
0.20	-0.55	0.3025	0.06	3.9	15.21	3.04
0.25	1.45	2.1025	0.53	-2.1	4.41	1.10
0.25	-19.55	382.2025	95.55	15.9	252.81	63.20
0.30	15.45	238.7025	71.61	-14.1	198.81	59.64
			167.75			126.98

σ^2_{ABC} = 167.75(%)^2 ; σ_{ABC} = 12.95%

σ^2_{XYZ} = 126.98(%)^2 ; σ_{XYZ} = 11.27%

(ii) In order to find risk of portfolio of two shares, the covariance between the two is necessary here.

Probability	(ABC- $\overline{ABC}$)	(XYZ- $\overline{XYZ}$)	2X3	1X4
(1)	(2)	(3)	(4)	(5)
0.20	-0.55	3.9	-2.145	-0.429
0.25	1.45	-2.1	-3.045	-0.761
0.25	-19.55	15.9	-310.845	-77.71
0.30	15.45	-14.1	-217.845	-65.35
				-144.25

σ^2_P = (0.5^2 x 167.75) + (0.5^2 x 126.98) + 2 x (-144.25) x 0.5 x 0.5

σ^2_P = 41.9375 + 31.745 – 72.125

σ^2_P = 1.5575 or 1.56(%)

$\sigma_P = \sqrt{1.56}$ = 1.25%

E (R_p) = (0.5 x 12.55) + (0.5 x 12.1) = 12.325%

Hence, the return is 12.325% with the risk of 1.25% for the portfolio. Thus the portfolio results in the reduction of risk by the combination of two shares.

(iii) For constructing the minimum risk portfolio the condition to be satisfied is

$$X_{ABC} = \frac{\sigma_X^2 - r_{AX}\sigma_A\sigma_X}{\sigma_A^2 + \sigma_X^2 - 2r_{AX}\sigma_A\sigma_X} \text{ or } = \frac{\sigma_X^2 - Cov._{AX}}{\sigma_A^2 + \sigma_X^2 - 2Cov._{AX}}$$

σ_X = Std. Deviation of XYZ

σ_A = Std. Deviation of ABC

r_{AX}= Coefficient of Correlation between XYZ and ABC

$Cov._{AX}$ = Covariance between XYZ and ABC.

Therefore,

$$\% \text{ ABC} = \frac{126.98-(-144.25)}{126.98+167.75-[2\times(-144.25)]} = \frac{271.23}{583.23} = 0.46 \text{ or } 46\%$$

% ABC = 46%, XYZ = 54%

(1 – 0.46) =0.54

Question 19

The distribution of return of security 'F' and the market portfolio 'P' is given below:

Probability	*Return %*	
	F	*P*
0.30	*30*	*-10*
0.40	*20*	*20*
0.30	*0*	*30*

You are required to calculate the expected return of security 'F' and the market portfolio 'P', the covariance between the market portfolio and security and beta for the security.

Answer

Security F

Prob(P)	R_f	PxR_f	Deviations of F $(R_f - ER_f)$	$(Deviation)^2$ of F	$(Deviations)^2$ P_X
0.3	30	9	13	169	50.7
0.4	20	8	3	9	3.6
0.3	0	0	-17	289	86.7
		ER_f=17			Var_f =141

STDEV $\sigma_f = \sqrt{141} = 11.87$

Market Portfolio, P

R_M %	P_M	Exp. Return $R_M \times P_M$	Dev. of P (R_M-ER_M)	(Dev. of P)^2	(DeV.)^2 P_M	(Deviation of F) x (Deviation of P)	Dev. of F x Dev. of P) x P
-10	0.3	-3	-24	576	172.8	-312	-93.6
20	0.4	8	6	36	14.4	18	7.2
30	0.3	9	16	256	76.8	-272	-81.6
		ER_M=14			Var $_M$=264		=Co Var P_M
					σ_M=16.25		=- 168

Beta= $\frac{\text{Co Var } P_M}{\sigma_M^2} = \frac{-168}{264} = -.636$

Question 20

Given below is information of market rates of Returns and Data from two Companies A and B:

	Year 2007	*Year 2008*	*Year 2009*
Market (%)	*12.0*	*11.0*	*9.0*
Company A (%)	*13.0*	*11.5*	*9.8*
Company B (%)	*11.0*	*10.5*	*9.5*

You are required to determine the beta coefficients of the Shares of Company A and Company B.

Answer

Company A:

Year	*Return % (Ra)*	*Market return % (Rm)*	*Deviation R(a)*	*Deviation Rm*	*D Ra × DRm*	*Rm²*
1	13.0	12.0	1.57	1.33	2.09	1.77
2	11.5	11.0	0.07	0.33	0.02	0.11
3	9.8	9.0	–1.63	–1.67	2.72	2.79
	34.3	32.0			4.83	4.67

Average Ra = 11.43

Average Rm = 10.67

Covariance = $\frac{\sum (R_m - \bar{R}_m)(R_a - \bar{R}_a)}{N}$

Covariance = $\frac{4.83}{3} = 1.61$

Variance (σ_m^2) = $\frac{\sum (R_m - \bar{R}_m)^2}{N}$

= $\frac{4.67}{3} = 1.557$

$\beta = \frac{1.61}{1.557} = 1.03$

Company B:

Year	*Return % (Rb)*	*Market return % (Rm)*	*Deviation R(b)*	*Deviation Rm*	*D Rb × D Rm*	*Rm²*
1	11.0	12.0	0.67	1.33	0.89	1.77
2	10.5	11.0	0.17	0.33	0.06	0.11
3	9.5	9.0	–0.83	–1.67	1.39	2.79
	31.0	32.0			2.34	4.67

Average Rb = 10.33

Average Rm = 10.67

$$\text{Covariance} = \frac{\sum (R_m - \bar{R}_m)(R_b - \bar{R}_b)}{N}$$

$$\text{Covariance} = \frac{2.34}{3} = 0.78$$

$$\text{Variance } (\sigma_m^2) = \frac{\sum (R_m - \bar{R}_m)^2}{N}$$

$$= \frac{4.67}{3} = 1.557$$

$$\beta = \frac{0.78}{1.557} = 0.50$$

Question 21

The returns on stock A and market portfolio for a period of 6 years are as follows:

Year	*Return on A (%)*	*Return on market portfolio (%)*
1	*12*	*8*
2	*15*	*12*
3	*11*	*11*
4	*2*	*-4*
5	*10*	*9.5*
6	*-12*	*-2*

You are required to determine:

(i) Characteristic line for stock A

(ii) The systematic and unsystematic risk of stock A.

Answer

Characteristic line is given by

$\alpha + \beta$ Rm

$$\beta i = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n(\bar{x})^2}$$

$$\alpha i = \bar{y} - \beta \bar{x}$$

Return on A (Y)	Return on market (X)	xy	x^2	$(x-\bar{x})$	$(x-\bar{x})^2$	$(y-\bar{y})$	$(y-\bar{y})^2$
12	8	96	64	2.25	5.06	5.67	32.15
15	12	180	144	6.25	39.06	8.67	75.17
11	11	121	121	5.25	27.56	4.67	21.81
2	-4	-8	16	-9.75	95.06	-4.33	18.75
10	9.5	95	90.25	3.75	14.06	3.67	13.47
-12	-2	24	4	-7.75	60.06	-18.33	335.99
38	34.5	508	439.25		240.86		497.34

$\bar{y} = 38/6 = 6.33$

$\bar{x} = 34.5/6 = 5.75$

$$\beta = \frac{\Sigma xy - n\bar{x}\bar{y}}{\Sigma x^2 - n(\bar{x})^2} = \frac{508 - 6(5.75)(6.33)}{439.25 - 6(5.75)^2} = \frac{508 - 218.385}{439.25 - 198.375}$$

$$= \frac{289.615}{240.875} = 1.202$$

$\alpha = \bar{y} - \beta \bar{x} = 6.33 - 1.202\ (5.75) = -0.58$

Hence the characteristic line is -0.58 + 1.202 (R_m)

Total Risk of Market = $\sigma_{m^2} = \frac{\Sigma(x-\bar{x})^2}{n} = \frac{240.86}{6} = 40.14(\%)$

Total Risk of Stock = $\frac{497.34}{6}$ = 82.89 (%)

Systematic Risk = $\beta i^2 \ \sigma_2$ = $(1.202)^2$ x 40.14 = 57.99(%)

Unsystematic Risk is = Total Risk – Systematic Risk

= 82.89 - 57.99 = 24.90(%)

Question 22

The rates of return on the security of Company X and market portfolio for 10 periods are given below:

Period	*Return of Security X (%)*	*Return on Market Portfolio (%)*	
1	*20*	*22*	
2	*22*	*20*	
3	*25*	*18*	
4	*21*	*16*	
5	*18*	*20*	
6	*–5*	*8*	
7	*17*	*–6*	
8	*19*	*5*	
9	*–7*	*6*	
10	*20*	*11*	

(i) What is the beta of Security X?

(ii) What is the characteristic line for Security X?

Answer

(i)

Period	R_X	R_M	$R_X - \bar{R}_X$	$R_M - \bar{R}_M$	$\left(R_X - \bar{R}_X\right)\left(R_M - \bar{R}_M\right)$	$\left(R_M - \bar{R}_M\right)^2$
1	20	22	5	10	50	100
2	22	20	7	8	56	64
3	25	18	10	6	60	36
4	21	16	6	4	24	16
5	18	20	3	8	24	64
6	-5	8	-20	-4	80	16

7	17	-6	2	-18	-36	324
8	19	5	4	-7	-28	49
9	-7	6	-22	-6	132	36
10	20	11	5	-1	-5	1
	150	120			357	706
	ΣR_X	ΣR_M			$\sum (R_X - \bar{R}_X)(R_M - \bar{R}_M)$	$\sum (R_M - \bar{R}_M)^2$

$\bar{R}_X = 15 \quad \bar{R}_M = 12$

$$\sigma^2_M = \frac{\sum\left(R_M - \bar{R}_M\right)^2}{n} = \frac{706}{10} = 70.60$$

$$Cov_{XM} = \frac{\sum\left(R_X - \bar{R}_X\right)\left(R_M - \bar{R}_M\right)}{n} = \frac{357}{10} = 35.70$$

$$Beta_x = \frac{Cov_{XM}}{\sigma^2_M} = \frac{35.70}{70.60} = 0.505$$

Alternative Solution

Period	X	Y	Y^2	XY
1	20	22	484	440
2	22	20	400	440
3	25	18	324	450
4	21	16	256	336
5	18	20	400	360
6	-5	8	64	-40
7	17	-6	36	-102
8	19	5	25	95
9	-7	6	36	-42
10	20	11	121	220
	150	120	2146	2157
	$\bar{X} = 15$	$\bar{Y} = 12$		

$$= \frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma X^2 - n(\bar{X})^2}$$

$$= \frac{2157 - 10 \times 15 \times 12}{2146 - 10 \times 12 \times 12} = \frac{357}{706} = 0.506$$

(ii) $\bar{R}_X = 15$ $\bar{R}_M = 12$

$y = \alpha + \beta x$

$15 = \alpha + 0.505 \times 12$

Alpha (α) $= 15 - (0.505 \times 12) = 8.94\%$

Characteristic line for security X = $\alpha + \beta \times R_M$

Where, R_M = Expected return on Market Index

$\therefore$ Characteristic line for security X = 8.94 + 0.505 R_M

Question 23

Following is the data regarding six securities:

	U	*V*	*W*	*X*	*Y*	*Z*
Return (%)	*10*	*10*	*15*	*5*	*11*	*10*
Risk (%) (Standard deviation)	*5*	*6*	*13*	*5*	*6*	*7*

(i) Which of three securities will be selected?

(ii) Assuming perfect correlation, analyse whether it is preferable to invest 80% in security U and 20% in security W or to invest 100% in Y.

Answer

(i) When we make risk-return analysis of different securities from U to Z, we can observe that security U gives a return of 10% at risk level of 5%. Simultaneously securities V and Z give the same return of 10% as of security U, but their risk levels are 6% and 7% respectively. Security X is giving only 5% return for the risk rate of 5%. Hence, security U dominates securities V, X and Z.

Securities W and Y offer more return but it carries higher level of risk.

Hence securities U, W and Y can be selected based on individual preferences.

(ii) In a situation where the perfect positive correlation exists between two securities, their risk and return can be averaged with the proportion.

Assuming the perfect correlation exists between the securities U and W, average risk and return of U and W together for proportion 4 : 1 is calculated as follows:

Risk = $(4 \times 5\% + 1 \times 13\%) \div 5 = 6.6\%$

Return = $(4 \times 10\% + 1 \times 15\%) \div 5 = 11\%$

Therefore:	80% U	100%Y
	20% V	_
Risk	6.6%	6%
Return	11%	11%

When we compare risk of 6.6% and return of 11% with security Y with 6% risk and 11% return, security Y is preferable over the portfolio of securities U and W in proportion of 4 : 1.

Question 24

Expected returns on two stocks for particular market returns are given in the following table:

Market Return	*Aggressive*	*Defensive*
7%	*4%*	*9%*
25%	*40%*	*18%*

You are required to calculate:

(a) The Betas of the two stocks.

(b) Expected return of each stock, if the market return is equally likely to be 7% or 25%.

(c) The Security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.

(d) The Alphas of the two stocks.

Answer

(a) The Betas of two stocks:

Aggressive stock - 40% - 4%/25% - 7% = 2

Defensive stock - 18% - 9%/25% - 7% = 0.50

Alternatively, it can also be solved by using the Characteristic Line Relationship as follows:

$R_s = \alpha + \beta R_m$

Where

α = Alpha

β = Beta

R_m= Market Return

For Aggressive Stock

$4\% = \alpha + \beta(7\%)$

$40\% = \alpha + \beta(25\%)$

36% = β(18%)

β = 2

For Defensive Stock

9% = α + β(7%)

18% = α + β(25%)

9% = β(18%)

β =0.50

(b) Expected returns of the two stocks:-

Aggressive stock - 0.5 x 4% + 0.5 x 40% = 22%

Defensive stock - 0.5 x 9% + 0.5 x 18% = 13.5%

(c) Expected return of market portfolio = 0.5 x 7% + 0.5% x 25% = 16%

∴ Market risk prem. = 16% - 7.5% = 8.5%

∴ SML is, required return = 7.5% + βi 8.5%

(d) $R_s = \alpha + \beta R_m$

For Aggressive Stock

22% = α_A + 2(16%)

α_A = -10%

For Defensive Stock

13.5% = α_D + 0.50(16%)

α_D = 5.5%

Question 25

A study by a Mutual fund has revealed the following data in respect of three securities:

Security	*σ (%)*	*Correlation with Index, Pm*
A	*20*	*0.60*
B	*18*	*0.95*
C	*12*	*0.75*

The standard deviation of market portfolio (BSE Sensex) is observed to be 15%.

(i) What is the sensitivity of returns of each stock with respect to the market?

(ii) What are the covariances among the various stocks?

(iii) What would be the risk of portfolio consisting of all the three stocks equally?

(iv) What is the beta of the portfolio consisting of equal investment in each stock?

(v) What is the total, systematic and unsystematic risk of the portfolio in (iv) ?

Answer

(i) Sensitivity of each stock with market is given by its beta.

Standard deviation of market Index = 15%

Variance of market Index = 0.0225

Beta of stocks = $\sigma_i r/\sigma_m$

A = 20 × 0.60/15 = 0.80

B = 18 × 0.95/15 = 1.14

C = 12 × 0.75/15 = 0.60

(ii) Covariance between any 2 stocks = $\beta_1\beta_2\sigma^2_m$

Covariance matrix

Stock/Beta	0.80	1.14	0.60
A	400.000	205.200	108.000
B	205.200	324.000	153.900
C	108.000	153.900	144.000

(iii) Total risk of the equally weighted portfolio (Variance) = $400(1/3)^2 + 324(1/3)^2 + 144(1/3)^2 + 2(205.20)(1/3)^2 + 2(108.0)(1/3)^2 + 2(153.900)(1/3)^2 = 200.244$

(iv) β of equally weighted portfolio $= \beta_p = \sum \beta_i/N = \frac{0.80+1.14+0.60}{3}$

$= 0.8467$

(v) Systematic Risk $\beta_P^2\sigma_m^2$ $= (0.8467)^2(15)^2 = 161.302$

Unsystematic Risk = Total Risk – Systematic Risk

= 200.244 – 161.302 = 38.942

Question 26

Mr. X owns a portfolio with the following characteristics:

	Security A	Security B	Risk Free security
Factor 1 sensitivity	0.80	1.50	0
Factor 2 sensitivity	0.60	1.20	0
Expected Return	15%	20%	10%

It is assumed that security returns are generated by a two factor model.

(i) If Mr. X has ₹ 1,00,000 to invest and sells short ₹ 50,000 of security B and purchases ₹ 1,50,000 of security A what is the sensitivity of Mr. X's portfolio to the two factors?

(ii) If Mr. X borrows ₹ 1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹ 1,00,000 in security A and B in the same proportion as described in part (i), what is the sensitivity of the portfolio to the two factors?

(iii) What is the expected return premium of factor 2?

Answer

(i) Mr. X's position in the two securities are +1.50 in security A and -0.5 in security B. Hence the portfolio sensitivities to the two factors:-

b prop. 1 =1.50 x 0.80 + (-0.50 x 1.50) = 0.45

b prop. 2 = 1.50 x 0.60 + (-0.50 x 1.20) = 0.30

(ii) Mr. X's current position:-

Security A ₹ 3,00,000 / ₹ 1,00,000 = 3

Security B -₹ 1,00,000 / ₹ 1,00,000 = -1

Risk free asset -₹ 100000 / ₹ 100000 = -1

b prop. 1 = 3.0 x 0.80 + (-1 x 1.50) + (- 1 x 0) = 0.90

b prop. 2 = 3.0 x 0.60 + (-1 x 1.20) + (-1 x 0) = 0.60

(iii) Expected Return = Risk Free Rate of Return + Risk Premium

Let λ_1 and λ_2 are the Value Factor 1 and Factor 2 respectively.

Accordingly

$15 = 10 + 0.80\ \lambda_1 + 0.60\ \lambda_2$

$20 = 10 + 1.50\ \lambda_1 + 1.20\ \lambda_2$

On solving equation, the value of $\lambda_1 = 0$, and Securities A & B shall be as follows:

Security A

Total Return = 15%

Risk Free Return = 10%

Risk Premium = 5%

Security B

Total Return = 20%

Risk Free Return = 10%

Risk Premium = 10%

Question 27

Mr. Tempest has the following portfolio of four shares:

Name	Beta	Investment ₹ Lac.
Oxy Rin Ltd.	*0.45*	*0.80*
Boxed Ltd.	*0.35*	*1.50*
Square Ltd.	*1.15*	*2.25*
Ellipse Ltd.	*1.85*	*4.50*

The risk free rate of return is 7% and the market rate of return is 14%.

Required.

(i) Determine the portfolio return. (ii) Calculate the portfolio Beta.

Answer

Market Risk Premium (A) = 14% – 7% = 7%

Share	*Beta*	*Risk Premium (Beta x A) %*	*Risk Free Return %*	*Return %*	*Return ₹*
Oxy Rin Ltd.	0.45	3.15	7	10.15	8,120
Boxed Ltd.	0.35	2.45	7	9.45	14,175
Square Ltd.	1.15	8.05	7	15.05	33,863
Ellipse Ltd.	1.85	12.95	7	19.95	89,775
Total Return					1,45,933

Total Investment ₹ 9,05,000

(i) Portfolio Return = $\frac{₹\,1,45,933}{₹\,9,05,000} \times 100 = 16.13\%$

(ii) Portfolio Beta

Portfolio Return = Risk Free Rate + Risk Premium x β = 16.13%

7% + 7β = 16.13%

β = 1.30

Alternative Approach

First we shall compute Portfolio Beta using the weighted average method as follows:

$$Beta_P = 0.45X\frac{0.80}{9.05} + 0.35X\frac{1.50}{9.05} + 1.15X\frac{2.25}{9.05} + 1.85X\frac{4.50}{9.05}$$

= 0.45x0.0884+ 0.35X0.1657+ 1.15X0.2486+ 1.85X0.4972 = 0.0398+ 0.058 + 0.2859 + 0.9198 = 1.3035

Accordingly,

(i) Portfolio Return using CAPM formula will be as follows:

$R_P = R_F + Beta_P(R_M - R_F)$

= 7% + 1.3035(14% - 7%) = 7% + 1.3035(7%)

= 7% + 9.1245% = 16.1245%

(ii) Portfolio Beta

As calculated above 1.3035

Question 28

Amal Ltd. has been maintaining a growth rate of 12% in dividends. The company has paid dividend @ ₹ 3 per share. The rate of return on market portfolio is 15% and the risk-free rate of return in the market has been observed as10%. The beta co-efficient of the company's share is 1.2.

You are required to calculate the expected rate of return on the company's shares as per CAPM model and the equilibirium price per share by dividend growth model.

Answer

Capital Asset Pricing Model (CAPM) formula for calculation of expected rate of return is

$E_R = R_f + \beta (R_m - R_f)$

E_R = Expected Return

β = Beta of Security

R_m = Market Return

R_f = Risk free Rate

= 10 + [1.2 (15 – 10)]

= 10 + 1.2 (5)

= 10 + 6 = 16% or 0.16

Applying dividend growth mode for the calculation of per share equilibrium price:-

$$E_R = \frac{D_1}{P_0} + g$$

$$\text{or } 0.16 = \frac{3(1.12)}{P_0} + 0.12 \qquad \text{or} \qquad 0.16 - 0.12 = \frac{3.36}{P_0}$$

or $0.04 P_0 = 3.36$ or $P_0 = \frac{3.36}{0.04} = ₹ 84$

Therefore, equilibrium price per share will be ₹ 84.

Question 29

The following information is available in respect of Security X

Equilibrium Return	*15%*
Market Return	*15%*
7% Treasury Bond Trading at	*$140*
Covariance of Market Return and Security Return	*225%*
Coefficient of Correlation	*0.75*

You are required to determine the Standard Deviation of Market Return and Security Return.

Answer

First we shall compute the β of Security X.

$$\text{Risk Free Rate} = \frac{\text{Coupon Payment}}{\text{Current Market Price}} = \frac{7}{140} = 5\%$$

Assuming equilibrium return to be equal to CAPM return then:

$15\% = R_f + \beta_X(R_m - R_f)$

$15\% = 5\% + \beta_X(15\% - 5\%)$

$\beta_X = 1$

or it can also be computed as follows:

$$\frac{R_m}{R_s} = \frac{15\%}{15\%} = 1$$

(i) Standard Deviation of Market Return

$$\beta_m = \frac{Cov_{X,m}}{\sigma_m^2} = \frac{225\%}{\sigma_m^2} = 1$$

$\sigma^2_m = 225$

$\sigma_m = \sqrt{225} = 15\%$

(ii) Standard Deviation of Security Return

$$\beta_X = \frac{\sigma_X}{\sigma_m} \times \rho_{Xm} = \frac{\sigma_X}{15} \times 0.75 = 1$$

$$\sigma_X = \frac{15}{0.75} = 20\%$$

Question 30

Assuming that shares of ABC Ltd. and XYZ Ltd. are correctly priced according to Capital Asset Pricing Model. The expected return from and Beta of these shares are as follows:

Share	*Beta*	*Expected return*
ABC	*1.2*	*19.8%*
XYZ	*0.9*	*17.1%*

You are required to derive Security Market Line.

Answer

CAPM = $R_f + \beta (R_m - R_f)$

According

$R_{ABC} = R_f + 1.2 (R_m - R_f) = 19.8$

$R_{XYZ} = R_f + 0.9 (R_m - R_f) = 17.1$

$19.8 = R_f + 1.2 (R_m - R_f)$ ------(1)

$17.1 = R_f + 0.9 (R_m - R_f)$ ------(2)

Deduct (2) from (1)

$2.7 = 0.3 (R_m - R_f)$

$R_m - R_f = 9$

$R_f = R_m - 9$

Substituting in equation (1)

$19.8 = (R_m - 9) + 1.2 (R_m - R_m + 9)$

$19.8 = R_m - 9 + 10.8$

$19.8 = R_m + 1.8$

Then $R_m = 18\%$ and $R_f = 9\%$

Security Market Line = $R_f + \beta$ (Market Risk Premium)

$= 9\% + \beta \times 9\%$

Question 31

A Ltd. has an expected return of 22% and Standard deviation of 40%. B Ltd. has an expected return of 24% and Standard deviation of 38%. A Ltd. has a beta of 0.86 and B Ltd. a beta of 1.24. The correlation coefficient between the return of A Ltd. and B Ltd. is 0.72. The Standard deviation of the market return is 20%. Suggest:

(i) Is investing in B Ltd. better than investing in A Ltd.?

(ii) If you invest 30% in B Ltd. and 70% in A Ltd., what is your expected rate of return and portfolio Standard deviation?

(iii) What is the market portfolios expected rate of return and how much is the risk-free rate?

(iv) What is the beta of Portfolio if A Ltd.'s weight is 70% and B Ltd.'s weight is 30%?

Answer

(i) A Ltd. has lower return and higher risk than B Ltd. investing in B Ltd. is better than in A Ltd. because the returns are higher and the risk, lower. However, investing in both will yield diversification advantage.

(ii) $r_{AB} = .22 \times 0.7 + .24 \times 0.3 = 22.6\%$

$\sigma^2_{AB} = 0.40^2 \text{ X } 0.7^2 + 0.38^2 \text{ X } 0.3^2 + 2\text{X } 0.7 \text{ X } 0.3 \text{ X } 0.72 \text{ X } 0.40 \text{ X } 0.38 = 0.1374$

$\sigma_{AB} = \sqrt{\sigma^2_{AB}} = \sqrt{.1374} = .37 = 37\%$ *

* Answer = 37.06% is also correct and variation may occur due to approximation.

(iii) This risk-free rate will be the same for A and B Ltd. Their rates of return are given as follows:

$r_A = 22 = r_f + (r_m - r_f)\ 0.86$

$r_B = 24 = r_f + (r_m - r_f)\ 1.24$

$r_A - r_B = -2 = (r_m - r_f)\ (-0.38)$

$r_m - r_f = -2/-0.38 = 5.26\%$

$r_A = 22 = r_f + (5.26)\ 0.86$

$r_f = 17.5\%$*

$r_B = 24 = r_f + (5.26)\ 1.24$

$r_f = 17.5\%$*

$r_m - 17.5 = 5.26$

$r_m = 22.76\%$**

*Answer = 17.47% might occur due to variation in approximation.

**Answer may show small variation due to approximation. Exact answer is 22.73%.

(iv) $\beta_{AB} = \beta_A \times W_A + \beta_B \times W_B$

$= 0.86 \times 0.7 + 1.24 \times 0.3 = 0.974$

Question 32

XYZ Ltd. has substantial cash flow and until the surplus funds are utilised to meet the future capital expenditure, likely to happen after several months, are invested in a portfolio of short-term equity investments, details for which are given below:

Investment	*No. of shares*	*Beta*	*Market price per share* ₹	*Expected dividend yield*
I	*60,000*	*1.16*	*4.29*	*19.50%*
II	*80,000*	*2.28*	*2.92*	*24.00%*
III	*1,00,000*	*0.90*	*2.17*	*17.50%*
IV	*1,25,000*	*1.50*	*3.14*	*26.00%*

The current market return is 19% and the risk free rate is 11%.

Required to:

(i) Calculate the risk of XYZ's short-term investment portfolio relative to that of the market;

(ii) Whether XYZ should change the composition of its portfolio.

Answer

(i) Computation of Beta of Portfolio

Investment	*No. of shares*	*Market Price*	*Market Value*	*Dividend Yield*	*Dividend*	*Composition*	*β*	*Weighted β*
I.	60,000	4.29	2,57,400	19.50%	50,193	0.2339	1.16	0.27
II.	80,000	2.92	2,33,600	24.00%	56,064	0.2123	2.28	0.48
III.	1,00,000	2.17	2,17,000	17.50%	37,975	0.1972	0.90	0.18
IV.	1,25,000	3.14	3,92,500	26.00%	1,02,050	0.3566	1.50	0.53
			11,00,500		2,46,282	1.0000		1.46

Return of the Portfolio $\frac{2,46,282}{11,00,500} = 0.2238$

Beta of Port Folio 1.46

Market Risk implicit

$0.2238 = 0.11 + \beta \times (0.19 - 0.11)$

Or, $0.08\ \beta + 0.11 = 0.2238$

$$\beta = \frac{0.2238 - 0.11}{0.08} = 1.42$$

Market β implicit is 1.42 while the port folio β is 1.46. Thus the portfolio is marginally risky compared to the market.

(ii) The decision regarding change of composition may be taken by comparing the dividend yield (given) and the expected return as per CAPM as follows:

Expected return R_s as per CAPM is:

$$R_s = I_{RF} + (R_M - I_{RF})\ \beta$$

For investment I $R_s = I_{RF} + (R_M - I_{RF})\ \beta$

$= .11 + (.19 - .11)\ 1.16$

$= 20.28\%$

For investment II, $R_s = .11 + (.19 - .11)\ 2.28 = 29.24\%$

For investment III, $R_s = .11 + (.19 - .11)\ .90$

$= 18.20\%$

For investment IV, $R_s = .11 + (.19 - .11)\ 1.50$

$= 23\%$

Comparison of dividend yield with the expected return R_s shows that the dividend yields of investment I, II and III are less than the corresponding R_s,. So, these investments are over-priced and should be sold by the investor. However, in case of investment IV, the dividend yield is more than the corresponding R_s, so, XYZ Ltd. should increase its proportion.

Question 33

A company has a choice of investments between several different equity oriented mutual funds. The company has an amount of ₹1 crore to invest. The details of the mutual funds are as follows:

Mutual Fund	*Beta*
A	*1.6*
B	*1.0*
C	*0.9*
D	*2.0*
E	*0.6*

Required:

(i) If the company invests 20% of its investment in the first two mutual funds and an equal amount in the mutual funds C, D and E, what is the beta of the portfolio?

(ii) If the company invests 15% of its investment in C, 15% in A, 10% in E and the balance in equal amount in the other two mutual funds, what is the beta of the portfolio?

(iii) If the expected return of market portfolio is 12% at a beta factor of 1.0, what will be the portfolios expected return in both the situations given above?

Answer

With 20% investment in each MF Portfolio Beta is the weighted average of the Betas of various securities calculated as below:

(i)

Investment	*Beta (β)*	*Investment (₹ Lacs)*	*Weighted Investment*
A	1.6	20	32
B	1.0	20	20
C	0.9	20	18
D	2.0	20	40
E	0.6	20	12
		100	122
	Weighted *Beta (β)* = 1.22		

(ii) With varied percentages of investments portfolio beta is calculated as follows:

Investment	*Beta (β)*	*Investment (₹ Lacs)*	*Weighted Investment*
A	1.6	15	24
B	1.0	30	30
C	0.9	15	13.5
D	2.0	30	60
E	0.6	10	6
		100	133.5
	Weighted *Beta (β)* = 1.335		

(iii) Expected return of the portfolio with pattern of investment as in case (i)

= 12% × 1.22 i.e. 14.64%

Expected Return with pattern of investment as in case (ii) = 12% × 1.335 i.e., 16.02%.

Question 34

Suppose that economy A is growing rapidly and you are managing a global equity fund and so far you have invested only in developed-country stocks only. Now you have decided to add stocks of economy A to your portfolio. The table below shows the expected rates of return, standard deviations, and correlation coefficients (all estimates are for aggregate stock market of developed countries and stock market of Economy A).

	Developed Country Stocks	***Stocks of Economy A***
Expected rate of return (annualized percentage)	*10*	*15*
Risk [Annualized Standard Deviation (%)]	*16*	*30*
Correlation Coefficient (ρ)	*0.30*	

Assuming the risk-free interest rate to be 3%, you are required to determine:

(a) What percentage of your portfolio should you allocate to stocks of Economy A if you want to increase the expected rate of return on your portfolio by 0.5%?

(b) What will be the standard deviation of your portfolio assuming that stocks of Economy A are included in the portfolio as calculated above?

(c) Also show how well the Fund will be compensated for the risk undertaken due to inclusion of stocks of Economy A in the portfolio?

Answer

(a) Let the weight of stocks of Economy A is expressed as w, then

$(1- w)\times 10.0 + w \times 15.0 = 10.5$

i.e. $w = 0.1$ or 10%.

(b) Variance of portfolio shall be:

$(0.9)^2 (0.16)^2 + (0.1)^2 (0.30)^2 + 2(0.9)(0.1)(0.16)(0.30)(0.30) = 0.02423$

Standard deviation is $(0.02423)^{½} = 0.15565$ or 15.6%.

(c) The Sharpe ratio will improve by approximately 0.04, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return - Risk Free Rate of Return}}{\text{Standard Deviation}}$$

Investment only in developed countries: $\frac{10-3}{16} = 0.437$

With inclusion of stocks of Economy A: $\frac{10.5-3}{15.6} = 0.481$

Question 35

Mr. FedUp wants to invest an amount of ₹ 520 lakhs and had approached his Portfolio Manager. The Portfolio Manager had advised Mr. FedUp to invest in the following manner:

Security	*Moderate*	*Better*	*Good*	*Very Good*	*Best*
Amount (in ₹Lakhs)	*60*	*80*	*100*	*120*	*160*
Beta	*0.5*	*1.00*	*0.80*	*1.20*	*1.50*

You are required to advise Mr. FedUp in regard to the following, using Capital Asset Pricing Methodology:

(i) Expected return on the portfolio, if the Government Securities are at 8% and the NIFTY is yielding 10%.

(ii) Advisability of replacing Security 'Better' with NIFTY.

Answer

(i) Computation of Expected Return from Portfolio

Security	Beta (β)	Expected Return (r) as per CAPM	Amount (₹ Lakhs)	Weights (w)	wr
Moderate	0.50	8%+0.50(10% - 8%) = 9%	60	0.115	1.035
Better	1.00	8%+1.00(10% - 8%) = 10%	80	0.154	1.540
Good	0.80	8%+0.80(10% - 8%) = 9.60%	100	0.192	1.843
Very Good	1.20	8%+1.20(10% - 8%) = 10.40%	120	0.231	2.402
Best	1.50	8%+1.50(10% - 8%) = 11%	160	0.308	3.388
Total			520	1	10.208

Thus Expected Return from Portfolio 10.208% say 10.21%.

Alternatively, it can be computed as follows:

$$\text{Average } \beta = 0.50 \times \frac{60}{520} + 1.00 \times \frac{80}{520} + 0.80 \times \frac{100}{520} + 1.20 \times \frac{120}{520} + 1.50 \times \frac{160}{520} = 1.104$$

As per CAPM

= 0.08 + 1.104(0.10 – 0.08) = 0.10208 i.e. 10.208%

(ii) As computed above the expected return from Better is 10% same as from Nifty, hence there will be no difference even if the replacement of security is made. The main logic behind this neutrality is that the beta of security 'Better' is 1 which clearly indicates that this security shall yield same return as market return.

Question 36

Your client is holding the following securities:

Particulars of Securities	*Cost*	*Dividends/Interest*	*Market price*	*Beta*
	₹	₹	₹	
Equity Shares:				
Gold Ltd.	*10,000*	*1,725*	*9,800*	*0.6*
Silver Ltd.	*15,000*	*1,000*	*16,200*	*0.8*
Bronze Ltd.	*14,000*	*700*	*20,000*	*0.6*
GOI Bonds	*36,000*	*3,600*	*34,500*	*0.01*

Average return of the portfolio is 15.7%, calculate:

(i) Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).

(ii) Risk free rate of return.

Answer

Particulars of Securities	*Cost ₹*	*Dividend*	*Capital gain*
Gold Ltd.	10,000	1,725	–200
Silver Ltd.	15,000	1,000	1,200
Bronz Ltd.	14,000	700	6,000
GOI Bonds	36,000	3,600	–1,500
Total	75,000	7,025	5,500

Expected rate of return on market portfolio

$$\frac{\text{Dividend Earned + Capital appreciation}}{\text{Initial investment}} \times 100$$

$$= \frac{₹\ 7{,}025 + ₹\ 5{,}500}{₹\ 75{,}000} \times 100 = 16.7\%$$

Risk free return

$$\text{Average of Betas} = \frac{0.6 + 0.8 + 0.6 + 0.01}{4}$$

Average of Betas* = 0.50

Average return = Risk free return + Average Betas (Expected return – Risk free return)

15.7 = Risk free return + 0.50 (16.7 – Risk free return)

Risk free return = 14.7%

* Alternatively it can also be calculated through Weighted Average Beta.

Expected Rate of Return for each security is

Rate of Return = Rf + B (Rm – Rf)

Gold Ltd. = 14.7 + 0.6 (16.7 – 14.7) = 15.90%

Silver Ltd. = 14.7 + 0.8 (16.7 – 14.7) = 16.30%

Bronz Ltd. = 14.7 + 0.6 (16.7 – 14.7) = 15.90%

GOI Bonds = 14.7 + 0.01 (16.7 – 14.7) = 14.72%

* Alternatively it can also be computed by using Weighted Average Method.

Question 37

A holds the following portfolio:

Share/Bond	*Beta*	*Initial Price*	*Dividends*	*Market Price at end of year*
		₹	₹	₹
Epsilon Ltd.	*0.8*	*25*	*2*	*50*
Sigma Ltd.	*0.7*	*35*	*2*	*60*
Omega Ltd.	*0.5*	*45*	*2*	*135*
GOI Bonds	*0.01*	*1,000*	*140*	*1,005*

Calculate:

(i) The expected rate of return on his portfolio using Capital Asset Pricing Method (CAPM)

(ii) The average return of his portfolio.

Risk-free return is 14%.

Answer

(i) Expected rate of return

	Total Investments	*Dividends*	*Capital Gains*
Epsilon Ltd.	25	2	25
Sigma Ltd.	35	2	25
Omega Ltd.	45	2	90
GOI Bonds	1,000	140	5
	1,105	146	145

Expected Return on market portfolio= $\frac{146+145}{1105}=26.33\%$

CAPM E(Rp) = RF + β [E(RM) – RF]

Epsilon Ltd	14+0.8 [26.33-14] =	14+9.86	=	23.86%
Sigma Ltd.	14+0.7 [26.33-14] =	14+8.63	=	22.63%
Omega Ltd.	14+0.5 [26.33-14] =	14+6.17	=	20.17%
GOI Bonds	14+0.01 [26.33-14] =	14+0.12	=	14.12%

(ii) Average Return of Portfolio

$\frac{23.86+22.63+20.17+14.12}{4}=\frac{80.78}{4}=20.20\%$

Alternatively $\frac{0.8+0.7+0.5+0.01}{4}=\frac{2.01}{4}=0.5025$

14+0.5025(26.33- 14)

14+ 6.20 = 20.20%

Question 38

Your client is holding the following securities:

Particulars of Securities	*Cost* ₹	*Dividends* ₹	*Market Price* ₹	*BETA*
Equity Shares:				
Co. X	*8,000*	*800*	*8,200*	*0.8*
Co. Y	*10,000*	*800*	*10,500*	*0.7*
Co. Z	*16,000*	*800*	*22,000*	*0.5*
PSU Bonds	*34,000*	*3,400*	*32,300*	*0.2*

Assuming a Risk-free rate of 15%, calculate:

- *Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).*
- *Average return of the portfolio.*

Answer

Calculation of expected return on market portfolio (R_m)

Investment	*Cost (₹)*	*Dividends (₹)*	*Capital Gains (₹)*
Shares X	8,000	800	200
Shares Y	10,000	800	500

Shares Z	16,000	800	6,000
PSU Bonds	34,000	3,400	–1,700
	68,000	5,800	5,000

$$R_m = \frac{5,800 + 5,000}{68,000} \times 100 = 15.88\%$$

Calculation of expected rate of return on individual security:

Security

Shares X	15 + 0.8 (15.88 – 15.0)	= 15.70%
Shares Y	15 + 0.7 (15.88 – 15.0)	= 15.62%
Shares Z	15 + 0.5 (15.88 – 15.0)	= 15.44%
PSU Bonds	15 + 0.2 (15.88 – 15.0)	= 15.18%

Calculation of the Average Return of the Portfolio:

$$= \frac{15.70 + 15.62 + 15.44 + 15.18}{4} = 15.49\%.$$

Question 39

An investor is holding 1,000 shares of Fatlass Company. Presently the rate of dividend being paid by the company is ₹ 2 per share and the share is being sold at ₹ 25 per share in the market. However, several factors are likely to change during the course of the year as indicated below:

	Existing	*Revised*
Risk free rate	*12%*	*10%*
Market risk premium	*6%*	*4%*
Beta value	*1.4*	*1.25*
Expected growth rate	*5%*	*9%*

In view of the above factors whether the investor should buy, hold or sell the shares? And why?

Answer

On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

$= R_f + \text{Beta} (R_m – R_f)$

= 12% + 1.4 (6%) = 20.4%

Revised rate of return

= 10% + 1.25 (4%) = 15%

Price of share (original)

$$P_o = \frac{D(1+g)}{K_e - g} = \frac{2(1.05)}{.204 - .05} = \frac{2.10}{.154} = Rs.13.63$$

Price of share (Revised)

$$P_o = \frac{2(1.09)}{.15 - .09} = \frac{2.18}{.06} = Rs.36.33$$

In case of existing market price of ₹ 25 per share, rate of return (20.4%) and possible equilibrium price of share at ₹ 13.63, this share needs to be sold because the share is overpriced (₹ 25 – 13.63) by ₹ 11.37. However, under the changed scenario where growth of dividend has been revised at 9% and the return though decreased at 15% but the possible price of share is to be at ₹ 36.33 and therefore, in order to expect price appreciation to ₹ 36.33 the investor should hold the shares, if other things remain the same.

Question 40

An investor is holding 5,000 shares of X Ltd. Current year dividend rate is ₹ 3/ share. Market price of the share is ₹ 40 each. The investor is concerned about several factors which are likely to change during the next financial year as indicated below:

	Current Year	***Next Year***
Dividend paid /anticipated per share (₹)	*3*	*2.5*
Risk free rate	*12%*	*10%*
Market Risk Premium	*5%*	*4%*
Beta Value	*1.3*	*1.4*
Expected growth	*9%*	*7%*

In view of the above, advise whether the investor should buy, hold or sell the shares.

Answer

On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

= R_f + Beta (R_m – R_f)

= 12% + 1.3 (5%) = 18.5%

Revised rate of return

= 10% + 1.4 (4%) = 15.60%

Price of share (original)

$$P_o = \frac{D(1+g)}{K_e - g} = \frac{3(1.09)}{0.185 - 0.09} = \frac{3.27}{0.095} = ₹\ 34.42$$

Price of share (Revised)

$$P_o = \frac{2.50(1.07)}{0.156 - 0.07} = \frac{2.675}{0.086} = ₹\ 31.10$$

Market price of share of ₹ 40 is higher in comparison to current equilibrium price of ₹ 34.42 and revised equity price of ₹ 31.10. Under this situation investor should sell the share.

Question 41

An investor has two portfolios known to be on minimum variance set for a population of three securities A, B and C having below mentioned weights:

	WA	*WB*	*WC*
Portfolio X	*0.30*	*0.40*	*0.30*
Portfolio Y	*0.20*	*0.50*	*0.30*

It is supposed that there are no restrictions on short sales.

(i) What would be the weight for each stock for a portfolio constructed by investing ₹ 5,000 in portfolio X and ₹ 3,000 in portfolio Y?.

(ii) Suppose the investor invests ₹ 4,000 out of ₹ 8,000 in security A. How he will allocate the balance between security B and C to ensure that his portfolio is on minimum variance set?

Answer

(i) Investment committed to each security would be:-

	A (₹)	B (₹)	C (₹)	Total (₹)
Portfolio X	1,500	2,000	1,500	5,000
Portfolio Y	600	1,500	900	3,000
Combined Portfolio	2,100	3,500	2,400	8,000
∴ Stock weights	0.26	0.44	0.30	

(ii) The equation of critical line takes the following form:-

WB = a + bWA

Substituting the values of WA & WB from portfolio X and Y in above equation, we get

0.40 = a + 0.30b, and

0.50 = a + 0.20b

Solving above equation we obtain the slope and intercept, a = 0.70 and b= -1 and thus, the critical line is

WB = 0.70 – WA

If half of the funds is invested in security A then,

WB = 0.70 – 0.50 = 0.20

Since WA + WB + WC = 1

WC = 1 - 0.50 – 0.20 = 0.30

∴ Allocation of funds to security B = 0.20 x 8,000 = ₹ 1,600, and

Security C = 0.30 x 8,000 = ₹ 2,400

Question 42

X Co., Ltd., invested on 1.4.2009 in certain equity shares as below:

Name of Co.	*No. of shares*	*Cost (₹)*
M Ltd.	*1,000 (₹ 100 each)*	*2,00,000*
N Ltd.	*500 (₹ 10 each)*	*1,50,000*

In September, 2009, 10% dividend was paid out by M Ltd. and in October, 2009, 30% dividend paid out by N Ltd. On 31.3.2010 market quotations showed a value of ₹ 220 and ₹ 290 per share for M Ltd. and N Ltd. respectively.

On 1.4.2010, investment advisors indicate (a) that the dividends from M Ltd. and N Ltd. for the year ending 31.3.2011 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.3.2011 are as below:

Probability factor	*Price/share of M Ltd.*	*Price/share of N Ltd.*
0.2	*220*	*290*
0.5	*250*	*310*
0.3	*280*	*330*

You are required to:

(i) Calculate the average return from the portfolio for the year ended 31.3.2010;

(ii) Calculate the expected average return from the portfolio for the year 2010-11; and

(iii) Advise X Co. Ltd., of the comparative risk in the two investments by calculating the standard deviation in each case.

Answer

Calculation of return on portfolio for 2009-10	(Calculation in ₹ / share)		
	M	N	
Dividend received during the year	10	3	
Capital gain/loss by 31.03.10			
Market value by 31.03.10	220	290	
Cost of investment	200	300	
Gain/loss	20	(-)10	
Yield	30	(-)7	
Cost	200	300	
% return	15%	(-)2.33%	
Weight in the portfolio	57	43	
Weighted average return			7.55%
Calculation of estimated return for 2010-11			
Expected dividend	20	3.5	
Capital gain by 31.03.11			
(220x0.2)+ (250x0.5)+(280x0.3) – 220=(253-220)	33	-	
(290x0.2)+(310x0.5)+(330x0.3) – 290= (312 – 290)	-	22	
Yield	53	25.5	
*Market Value 01.04.10	220	290	
% return	24.09%	8.79%	
*Weight in portfolio (1,000x220): (500x290)	60.3	39.7	
Weighted average (Expected) return			18.02%
(*The market value on 31.03.10 is used as the base for calculating yield for 10-11)			

Calculation of Standard Deviation

M Ltd.

Exp. market value	*Exp. gain*	*Exp. div.*	*Exp Yield (1)*	*Prob. Factor (2)*	(1) X(2)	*Dev. (P_M-$\overline{P_M}$)*	*Square of dev. (3)*	(2) X (3)
220	0	20	20	0.2	4	-33	1089	217.80
250	30	20	50	0.5	25	-3	9	4.50
280	60	20	80	0.3	24	27	729	218.70
					53			σ^2_M = 441.00

Standard Deviation (σ_M) 21

N Ltd.

Exp. market value	*Exp. gain*	*Exp. div.*	*Exp Yield (1)*	*Prob. Factor (2)*	(1) X(2)	*Dev. (P_N-$\overline{P_N}$)*	*Square of dev. (3)*	(2) X (3)
290	0	3.5	3.5	0.2	0.7	-22	484	96.80
310	20	3.5	23.5	0.5	11.75	-2	4	2.00
330	40	3.5	43.5	0.3	13.05	18	324	97.20
					25.5			σ^2_N = 196.00

Standard Deviation (σ_N) 14

Share of company M Ltd. is more risky as the S.D. is more than company N Ltd.

Question 43

An investor holds two stocks A and B. An analyst prepared ex-ante probability distribution for the possible economic scenarios and the conditional returns for two stocks and the market index as shown below:

Economic scenario	Probability	Conditional Returns %		
		A	B	Market
Growth	0.40	25	20	18
Stagnation	0.30	10	15	13
Recession	0.30	-5	-8	-3

The risk free rate during the next year is expected to be around 11%. Determine whether the investor should liquidate his holdings in stocks A and B or on the contrary make fresh investments in them. CAPM assumptions are holding true.

Answer

Expected Return on stock A = E (A) = $\sum_{i=G,S,R} P_i A_i$

(G,S & R, denotes Growth, Stagnation and Recession)

(0.40)(25) + 0.30(10)+ 0.30(-5) = 11.5%

Expected Return on 'B'

(0.40×20) + (0.30×15) +0.30× (-8)=10.1%

Expected Return on Market index

(0.40 × 18) + (0.30 × 13) + 0.30 × (-3) =10.2%

Variance of Market index

$(18 - 10.2)^2 (0.40) + (13 - 10.2)^2 (0.30) + (-3 - 10.2)^2 (0.30)$

= 24.34 + 2.35 + 52.27 = 78.96%

Covariance of stock A and Market Index M

Cov. (AM) = $\sum_{i=G,S,R} ([A_i - E(A)][M_i - E(M)]P$

(25 -11.5) (18 - 10.2)(0.40) + (10 - 11.5) (13 - 10.2) (0.30) + (-5-11.5) (-3-10.2)(0.30)

= 42.12 + (-1.26) + 65.34=106.20

Covariance of stock B and Market index M

(20-10.1) (18-10.2)(0.40)+(15-10.1)(13-10.2)(0.30) + (-8-10.1)(-3-10.2)(0.30)= 30.89 + 4.12 + 71.67=106.68

Beta for stock A = $\frac{CoV(AM)}{VAR(M)} = \frac{106.20}{78.96} = 1.345$

Beta for Stock B = $\frac{CoV(BM)}{VarM} = \frac{106.68}{78.96} = 1.351$

Required Return for A

$R(A) = R_f + \beta (M-R_f)$

11% + 1.345(10.2 - 11) % = 9.924%

Required Return for B

11% + 1.351 (10.2 – 11) % = 9.92%

Alpha for Stock A

E (A) – R (A) i.e. 11.5 % – 9.924% = 1.576%

Alpha for Stock B

E (B) – R (B) i.e. 10.1% - 9.92% = 0.18%

Since stock A and B both have positive Alpha, therefore, they are UNDERPRICED. The investor should make fresh investment in them.

Question 44

Following are the details of a portfolio consisting of three shares:

Share	*Portfolio weight*	*Beta*	*Expected return in %*	*Total variance*
A	*0.20*	*0.40*	*14*	*0.015*
B	*0.50*	*0.50*	*15*	*0.025*
C	*0.30*	*1.10*	*21*	*0.100*

Standard Deviation of Market Portfolio Returns = 10%

You are given the following additional data:

Covariance (A, B) = 0.030

Covariance (A, C) = 0.020

Covariance (B, C) = 0.040

Calculate the following:

(i) The Portfolio Beta

(ii) Residual variance of each of the three shares

(iii) Portfolio variance using Sharpe Index Model

(iv) Portfolio variance (on the basis of modern portfolio theory given by Markowitz)

Answer

(i) Portfolio Beta

0.20 x 0.40 + 0.50 x 0.50 + 0.30 x 1.10 = 0.66

(ii) Residual Variance

To determine Residual Variance first of all we shall compute the Systematic Risk as follows:

$\beta_A^2 \times \sigma_M^2 = (0.40)^2(0.01) = 0.0016$

$\beta_B^2 \times \sigma_M^2 = (0.50)^2(0.01) = 0.0025$

$\beta_C^2 \times \sigma_M^2 = (1.10)^2(0.01) = 0.0121$

Residual Variance

A	0.015 – 0.0016 = 0.0134
B	0.025 – 0.0025 = 0.0225
C	0.100 – 0.0121 = 0.0879

(iii) Portfolio variance using Sharpe Index Model

Systematic Variance of Portfolio = $(0.10)^2 \times (0.66)^2 = 0.004356$

Unsystematic Variance of Portfolio = $0.0134 \times (0.20)^2 + 0.0225 \times (0.50)^2 + 0.0879 \times (0.30)^2 = 0.014072$

Total Variance = 0.004356 + 0.014072 = 0.018428

(iv) Portfolio variance on the basis of Markowitz Theory

$= (w_A \times w_A \times \sigma_A^2) + (w_A \times w_B \times Cov_{AB}) + (w_A \times w_C \times Cov_{AC}) + (w_B \times w_A \times Cov_{AB}) + (w_B \times w_B \times \sigma_B^2)$

$+ (w_B \times w_C \times Cov_{BC}) + (w_C \times w_A \times Cov_{CA}) + (w_C \times w_B \times Cov_{CB}) + (w_C \times w_C \times \sigma_c^2)$

= (0.20 x 0.20 x 0.015) + (0.20 x 0.50 x 0.030) + (0.20 x 0.30 x 0.020) + (0.20 x 0.50 x 0.030) + (0.50 x 0.50 x 0.025) + (0.50 x 0.30 x 0.040) + (0.30 x 0.20 x 0.020) + (0.30 x 0.50 x 0.040) + (0.30 x 0.30 x 0.10)

= 0.0006 + 0.0030 + 0.0012 + 0.0030 + 0.00625 + 0.0060 + 0.0012 + 0.0060 + 0.0090

= 0.0363

Question 45

Ramesh wants to invest in stock market. He has got the following information about individual securities:

Security	*Expected Return*	*Beta*	σ^2_{ci}
A	*15*	*1.5*	*40*
B	*12*	*2*	*20*
C	*10*	*2.5*	*30*
D	*09*	*1*	*10*
E	*08*	*1.2*	*20*
F	*14*	*1.5*	*30*

Market index variance is 10 percent and the risk free rate of return is 7%. What should be the optimum portfolio assuming no short sales?

Answer

Securities need to be ranked on the basis of excess return to beta ratio from highest to the lowest.

Security	R_i	β_i	$R_i - R_f$	$\frac{R_i - R_f}{\beta_i}$
A	15	1.5	8	5.33
B	12	2	5	2.5
C	10	2.5	3	1.2
D	9	1	2	2
E	8	1.2	1	0.83
F	14	1.5	7	4.67

Ranked Table:

Security	$R_i - R_f$	β_i	σ^2_{ei}	$\frac{(R_i - R_f) \times \beta}{\sigma^2_{ei}}$	$\sum_{e=i}^{N} \frac{(R_i - R_f) \times \beta}{\sigma^2_{ei}}$	$\frac{\beta_i^2}{\sigma^2_{ei}}$	$\sum_{e=i}^{N} \frac{\beta_i^2}{\sigma^2_{ei}}$	C_i
A	8	1.5	40	0.30	0.30	0.056	0.056	1.923
F	7	1.5	30	0.35	0.65	0.075	0.131	2.814
B	5	2	20	0.50	1.15	0.20	0.331	2.668
D	2	1	10	0.20	1.35	0.10	0.431	2.542
C	3	2.5	30	0.25	1.60	0.208	0.639	2.165
E	1	1.2	20	0.06	1.66	0.072	0.711	2.047

CA = 10 x 0.30 / [1 + (10 x 0.056)] = 1.923

CF = 10 x 0.65 / [1 + (10 x 0.131)] = 2.814

CB = 10 x 1.15 / [1 + (10 x 0.331)] = 2.668

CD = 10 x 1.35 / [1 + (10 x 0.431)] = 2.542

CC = 10 x 1.60 / [1 + (10 x 0.639)] = 2.165

CE = 10 x 1.66 / [1 + (10 x 0.7111)] = 2.047

Cut off point is 2.814

$$Z_i = \frac{\beta_i}{\sigma^2_{ei}} \left[\frac{(R_i - R_f)}{\beta_i} - C \right]$$

$$Z_A = \frac{1.5}{40} (5.33 - 2.814) = 0.09435$$

$$Z_F = \frac{1.5}{30} (4.67 - 2.814) = 0.0928$$

$$X_A = 0.09435 / [0.09435 + 0.0928] = 50.41\%$$

$$X_F = 0.0928 / [0.09435 + 0.0928] = 49.59\%$$

Funds to be invested in security A & F are 50.41% and 49.59% respectively.

Question 46

A Portfolio Manager (PM) has the following four stocks in his portfolio:

Security	*No. of Shares*	*Market Price per share (₹)*	β
VSL	*10,000*	*50*	*0.9*
CSL	*5,000*	*20*	*1.0*
SML	*8,000*	*25*	*1.5*
APL	*2,000*	*200*	*1.2*

Compute the following:

(i) Portfolio beta.

(ii) If the PM seeks to reduce the beta to 0.8, how much risk free investment should he bring in?

(iii) If the PM seeks to increase the beta to 1.2, how much risk free investment should he bring in?

Answer

Security	**No. of shares (1)**	**Market Price of Per Share (2)**	**(1) × (2)**	**% to total (w)**	**ß (x)**	**wx**
VSL	10000	50	500000	0.4167	0.9	0.375
CSL	5000	20	100000	0.0833	1	0.083
SML	8000	25	200000	0.1667	1.5	0.250
APL	2000	200	400000	0.3333	1.2	0.400
			1200000	1		1.108

Portfolio beta 1.108

(i) Required Beta 0.8

It should become (0.8 / 1.108) 72.2 % of present portfolio

If ₹ 12,00,000 is 72.20%, the total portfolio should be

₹ 12,00,000 × 100/72.20 or ₹ 16,62,050

Additional investment in zero risk should be (₹ 16,62,050 – ₹ 12,00,000) = ₹ 4,62,050

Revised Portfolio will be

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	ß (x)	wx
VSL	10000	50	500000	0.3008	0.9	0.271
CSL	5000	20	100000	0.0602	1	0.060
SML	8000	25	200000	0.1203	1.5	0.180
APL	2000	200	400000	0.2407	1.2	0.289
Risk free asset	46205	10	462050	0.2780	0	0
			1662050	1		0.800

(ii) To increase Beta to 1.2

Required beta 1.2

It should become 1.2 / 1.108 108.30% of present beta

If 1200000 is 108.30%, the total portfolio should be

1200000 × 100/108.30 or 1108033 say 1108030

Additional investment should be (-) 91967 i.e. Divest ₹ 91970 of Risk Free Asset

Revised Portfolio will be

Security	No. of shares (1)	Market Price of Per Share (2)	(1) × (2)	% to total (w)	ß (x)	wx
VSL	10000	50	500000	0.4513	0.9	0.406
CSL	5000	20	100000	0.0903	1	0.090
SML	8000	25	200000	0.1805	1.5	0.271
APL	2000	200	400000	0.3610	1.2	0.433
Risk free asset	-9197	10	-91970	-0.0830	0	0
			1108030	1		1.20

Portfolio beta 1.20

Question 47

A has portfolio having following features:

Security	*β*	*Random Error* σ_{ei}	*Weight*
L	*1.60*	*7*	*0.25*
M	*1.15*	*11*	*0.30*
N	*1.40*	*3*	*0.25*
K	*1.00*	*9*	*0.20*

You are required to find out the risk of the portfolio if the standard deviation of the market index (σ_m) is 18%.

Answer

$$\beta_p = \sum_{i=1}^{4} x_i\beta_i$$

= 1.60 x 0.25 + 1.15 x 0.30 + 1.40 x 0.25 + 1.00 x 0.20

= 0.4 + 0.345 + 0.35 + 0.20 = 1.295

The Standard Deviation (Risk) of the portfolio is

= $[(1.295)^2(18)^2+(0.25)^2(7)^2+(0.30)^2(11)^2+(0.25)^2(3)^2+(0.20)^2(9)^2)]$

= $[543.36 + 3.0625 + 10.89 + 0.5625 + 3.24] = [561.115]^{½}$ = 23.69%

Alternative Answer

The variance of Security's Return

$\sigma^2 = \beta_i^2\ \sigma^2_m + \sigma^2_{\varepsilon i}$

Accordingly, variance of various securities

		σ^2	Weight(w)	σ^2Xw
L	$(1.60)^2\ (18)^2 + 7^2$ =	878.44	0.25	219.61
M	$(1.15)^2\ (18)^2 + 11^2$ =	549.49	0.30	164.85
N	$(1.40)^2\ (18)^2 + 3^2$ =	644.04	0.25	161.01
K	$(1.00)^2\ (18)^2 + 9^2$ =	405.00	0.20	81
		Variance		626.47

SD = $\sqrt{626.47}$ = 25.03

Question 48

Mr. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

Factor	*Beta*	*Expected value in%*	*Actual value in %*
GNP	*1.20*	*7.70*	*7.70*
Inflation	*1.75*	*5.50*	*7.00*
Interest rate	*1.30*	*7.75*	*9.00*
Stock market index	*1.70*	*10.00*	*12.00*
Industrial production	*1.00*	*7.00*	*7.50*

If the risk free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory?

Answer

Return of the stock under APT

Factor	***Actual value in %***	***Expected value in %***	***Difference***	***Beta***	***Diff. x Beta***
GNP	7.70	7.70	0.00	1.20	0.00
Inflation	7.00	5.50	1.50	1.75	2.63
Interest rate	9.00	7.75	1.25	1.30	1.63
Stock index	12.00	10.00	2.00	1.70	3.40
Ind. Production	7.50	7.00	0.50	1.00	0.50
					8.16
Risk free rate in %					9.25
Return under APT					17.41

Question 49

The total market value of the equity share of O.R.E. Company is ₹ 60,00,000 and the total value of the debt is ₹ 40,00,000. The treasurer estimate that the beta of the stock is currently 1.5 and that the expected risk premium on the market is 10 per cent. The treasury bill rate is 8 per cent.

Required:

(1) What is the beta of the Company's existing portfolio of assets?

(2) Estimate the Company's Cost of capital and the discount rate for an expansion of the company's present business.

Answer

(1) $\beta_{company} = \beta_{equity} \times \frac{V_E}{V_0} + B_{debt} \times \frac{V_D}{V_0}$

Note: Since β_{debt} is not given it is assumed that company debt capital is virtually riskless.

If company's debt capital is riskless than above relationship become:

$$\text{Here } \beta_{equity} = 1.5;\ \beta_{company} = \beta_{equity} \frac{V_E}{V_0}$$

As $\beta_{debt} = 0$

V_E = ₹ 60 lakhs.

V_D = ₹ 40 lakhs.

V_0 = ₹ 100 lakhs.

$$\beta_{company} = 1.5 \times \frac{₹\ 60\ lakhs}{₹\ 100\ lakhs}$$

$$= 0.9$$

(2) Company's cost of equity = $R_f + \beta_A \times$ Risk premium

Where R_f = Risk free rate of return

β_A = Beta of company assets

Therefore, company's cost of equity = 8% + 0.9 × 10 = 17% and overall cost of capital shall be

$$= 17\% \times \frac{60,00,000}{100,00,000} + 8\% \times \frac{40,00,000}{100,00,000}$$

= 10.20% + 3.20% = 13.40%

Alternatively it can also be computed as follows:

Cost of Equity = 8% + 1.5 x 10 = 23%

Cost of Debt = 8%

$$\text{WACC (Cost of Capital)} = 23\% \times \frac{60,00,000}{1,00,00,000} + 8\% \times \frac{40,00,000}{1,00,00,000} = 17\%$$

In case of expansion of the company's present business, the same rate of return i.e. 13.40% will be used. However, in case of diversification into new business the risk profile of new business is likely to be different. Therefore, different discount factor has to be worked out for such business.

Question 50

Mr. Nirmal Kumar has categorized all the available stock in the market into the following types:

(i) Small cap growth stocks

(ii) Small cap value stocks

(iii) Large cap growth stocks

(iv) Large cap value stocks

Mr. Nirmal Kumar also estimated the weights of the above categories of stocks in the market index. Further, more the sensitivity of returns on these categories of stocks to the three important factor are estimated to be:

Category of Stocks	*Weight in the Market Index*	*Factor I (Beta)*	*Factor II (Book Price)*	*Factor III (Inflation)*
Small cap growth	*25%*	*0.80*	*1.39*	*1.35*
Small cap value	*10%*	*0.90*	*0.75*	*1.25*
Large cap growth	*50%*	*1.165*	*2.75*	*8.65*
Large cap value	*15%*	*0.85*	*2.05*	*6.75*
Risk Premium		*6.85%*	*-3.5%*	*0.65%*

The rate of return on treasury bonds is 4.5%

Required:

(a) Using Arbitrage Pricing Theory, determine the expected return on the market index.

(b) Using Capital Asset Pricing Model (CAPM), determine the expected return on the market index.

(c) Mr. Nirmal Kumar wants to construct a portfolio constituting only the 'small cap value' and 'large cap growth' stocks. If the target beta for the desired portfolio is 1, determine the composition of his portfolio.

Answer

(a) Method I

Portfolio's return

Small cap growth = 4.5 + 0.80 x 6.85 + 1.39 x (-3.5) + 1.35 x 0.65 = 5.9925%

Small cap value = 4.5 + 0.90 x 6.85 + 0.75 x (-3.5) + 1.25 x 0.65 = 8.8525%

Large cap growth = 4.5 + 1.165 x 6.85 + 2.75 x (-3.5) + 8.65 x 0.65 = 8.478%

Large cap value = 4.5 + 0.85 x 6.85 + 2.05 x (-3.5) + 6.75 x 0.65 = 7.535%

Expected return on market index

0.25 x 5.9925 + 0.10 x 8.8525 + 0.50 x 8.478 + 0.15 x 7.535 = 7.7526%

Method II

Expected return on the market index

= 4.5% + [0.1x0.9 + 0.25x0.8 + 0.15x0.85 + 0.50x1.165] x 6.85 + [(0.75 x 0.10 + 1.39 x 0.25 + 2.05 x 0.15 + 2.75 x 0.5)] x (-3.5) + [{1.25 x 0.10 + 1.35 x 0.25 + 6.75 x 0.15 + 8.65 x 0.50)] x 0.65

= 4.5 + 6.85 + (-7.3675) + 3.77 = 7.7525%.

(b) Using CAPM,

Small cap growth = 4.5 + 6.85 x 0.80 = 9.98%

Small cap value = 4.5 + 6.85 x 0.90 = 10.665%

Large cap growth = 4.5 + 6.85 x 1.165 = 12.48%

Large cap value = 4.5 + 6.85 x 0.85 = 10.3225%

Expected return on market index

= 0.25 x 9.98 + 0.10 x 10.665 + 0.50 x 12.45 + 0.15 x 10.3225 = 11.33%

(c) Let us assume that Mr. Nirmal will invest X_1% in small cap value stock and X_2% in large cap growth stock

$X_1 + X_2 = 1$

$0.90 X_1 + 1.165 X_2 = 1$

$0.90 X_1 + 1.165(1 – X_1) = 1$

$0.90 X_1 + 1.165 – 1.165 X_1 = 1$

$0.165 = 0.265 X_1$

$\frac{0.165}{0.265} = X_1$

$0.623 = X_1$, $X_2 = 0.377$

62.3% in small cap value

37.7% in large cap growth.

Question 51

The following are the data on five mutual funds:

Fund	*Return*	*Standard Deviation*	*Beta*
A	*15*	*7*	*1.25*
B	*18*	*10*	*0.75*
C	*14*	*5*	*1.40*

D	*12*	*6*	*0.98*
E	*16*	*9*	*1.50*

You are required to compute Reward to Volatility Ratio and rank these portfolio using:

- *Sharpe method and*
- *Treynor's method*

assuming the risk free rate is 6%.

Answer

Sharpe Ratio $S = (R_p - R_f)/\sigma_p$

Treynor Ratio $T = (R_p - R_f)/\beta_p$

Where,

R_p = Return on Fund

R_f = Risk-free rate

σ_p = Standard deviation of Fund

β_p = Beta of Fund

Reward to Variability (Sharpe Ratio)

Mutual Fund	R_p	R_f	$R_p - R_f$	σ_p	Reward to Variability	Ranking
A	15	6	9	7	1.285	2
B	18	6	12	10	1.20	3
C	14	6	8	5	1.60	1
D	12	6	6	6	1.00	5
E	16	6	10	9	1.11	4

Reward to Volatility (Treynor Ratio)

Mutual Fund	R_p	R_f	$R_p - R_f$	β_p	Reward to Volatility	Ranking
A	15	6	9	1.25	7.2	2
B	18	6	12	0.75	16	1
C	14	6	8	1.40	5.71	5
D	12	6	6	0.98	6.12	4
E	16	6	10	1.50	6.67	3

8

Financial Services in India

BASIC CONCEPTS

1. Introduction

Financial Services has a broad definition and it can be defined as the products and services offered by institutions like banks of various kinds for the facilitation of various financial transactions and other related activities in the world of finance like Investment Banking, Credit Rating, Consumer Finance, Housing Finance, Asset Restructuring, Mutual Fund Management Company, Depository Services, Debit Card etc.

2. Investment Banking

This term is mainly used to describe the business of raising capital for companies. Major players in global scenario include Goldman Sach, Merrill Lynch, and Morgan Stanley etc.

The main difference between traditional commercial banking system and investment banking system is that while commercial bank takes deposits for current and savings accounts from customers while an investment bank does not.

3. Credit Rating

Credit Rating means an assessment made from credit-risk evaluation, translated into current opinion as on a specific date on the quality of specific debt security issued. Credit Rating is a long process involving a series of chronological steps. In India Credit Rating Agencies started to be set up in 1990s. Major agencies are CRISIL, ICRA, and CARE etc.

Different agencies use different scores for rating. Although Credit Rating is very advantageous for users as well as investors, but it also suffers from some serious limitations like credit quality may not be constant, information usually provided by the company to be assessed, etc.

4. Consumer Finance

Consequent upon the globalisation of Indian economy, a spurt increase in employment opportunities has been resulted. This has lead to steady increase in demand of durable consumer goods such as electronic and automobile goods.

Consumers can now easily purchase the goods by way of consumer finance.

Basically consumer finance is concerned with providing short term/medium term loans to finance purchase of goods or services for personal use by consumers.

Consumer Finance is provided by Non-Banking Financial Companies (NBFCs) which are governed by RBI's regulations and other banking regulations.

5. Housing Finance

With the globalisation of economy level of housing sector activity has also increased. Main purpose is to cover loans to promoters as well as to users. Equated monthly installments (EMI) are an important concept in Housing Finance.

6. Asset Restructuring/Mutual Fund Management Company

These types of companies make investment decisions according to the investment policy indicated in the mutual funds scheme.

7. Depository Services

Depository Services may be defined as an organisation where the securities of a shareholder are held in the form of electronic accounts, in the same way as a bank holds money.

There are only two depositories in India:

- National Securities Depository Limited (NSDL): It was registered by SEBI on June 7, 1996 as India's first depository to facilitate trading and settlement of securities in the dematerialized form.
- Central Depository Service (India) limited (CSDL): It commenced its operations in February 1999. It was promoted by Stock Exchange, Mumbai in association with Bank of Baroda, Bank of India, State Bank of India and HDFC Bank.

8. Debit Cards

Although debit cards appear like credit cards but they operate like cash or personal cheques. The main difference between credit card and debit card is that, while credit card means to "pay later", a debit card means to "pay now". The money is instantly deducted from the user's account on the use of debit card.

9. Online Share Trading

Online Share Trading is basically Internet based trading and services. By using internet trading, any client sitting anywhere in the country would be able to trade through brokers' Internet Trading System. Online trading offers many advantages. NSE became the first exchange to grant approval to its members for providing Internet based trading services.

Question 1

What is Credit rating?

Answer

Credit rating: Credit rating is a symbolic indication of the current opinion regarding the relative capability of a corporate entity to service its debt obligations in time with reference to the instrument being rated. It enables the investor to differentiate between instruments on the basis of their underlying credit quality. To facilitate simple and easy understanding, credit rating is expressed in alphabetical or alphanumerical symbols.

Thus Credit Rating is:

(1) An expression of opinion of a rating agency.

(2) The opinion is in regard to a debt instrument.

(3) The opinion is as on a specific date.

(4) The opinion is dependent on risk evaluation.

(5) The opinion depends on the probability of interest and principal obligations being met timely.

Credit rating aims to

(i) provide superior information to the investors at a low cost;

(ii) provide a sound basis for proper risk-return structure;

(iii) subject borrowers to a healthy discipline and

(iv) assist in the framing of public policy guidelines on institutional investment.

In India the rating coverage is of fairly recent origin, beginning 1988 when the first rating agency CRISIL was established. At present there are few other rating agencies like:

(i) Credit Rating Information Services of India Ltd. (CRISIL).

(ii) Investment Information and Credit Rating Agency of India (ICRA).

(iii) Credit Analysis and Research Limited (CARE).

(iv) Duff & Phelps Credit Rating India Pvt. Ltd. (DCR I)

(v) ONICRA Credit Rating Agency of India Ltd.

(vi) Fitch Ratings India (P) Ltd.

Question 2

What are the limitations of Credit Rating?

Answer

Credit rating is a very important indicator for prudence but it suffers from certain limitations. Some of the limitations are:

(i) **Conflict of Interest –** The rating agency collects fees from the entity it rates leading to a conflict of interest. Since the rating market is very competitive, there is a distant possibility of such conflict entering into the rating system.

(ii) **Industry Specific rather than Company Specific –** Downgrades are linked to industry rather than company performance. Agencies give importance to macro aspects and not to micro ones; overreact to existing conditions which come from optimistic / pessimistic views arising out of up / down turns. At times, value judgments are not ruled out.

(iii) **Rating Changes –** Ratings given to instruments can change over a period of time. They have to be kept under constant watch. Downgrading of an instrument may not be timely enough to keep investors educated over such matters.

(iv) **Corporate Governance Issues –** Special attention is paid to:

(a) Rating agencies getting more of their revenues from a single service or group.

(b) Rating agencies enjoying a dominant market position. They may engage in aggressive competitive practices by refusing to rate a collateralized / securitized instrument or compel an issuer to pay for services rendered.

(c) Greater transparency in the rating process viz. in the disclosure of assumptions leading to a specific public rating.

(v) **Basis of Rating –** Ratings are based on 'point of time' concept rather than on 'period of time' concept and thus do not provide a dynamic assessment. Investors relying on the credit rating of a debt instrument may not be aware that the rating pertaining to that instrument might be outdated and obsolete.

(vi) **Cost Benefit Analysis –** Since rating is mandatory, it becomes essential for entities to get themselves rated without carrying out cost benefit analysis. . Rating should be left optional and the corporate should be free to decide that in the event of self rating, nothing has been left out.

Question 3

List and briefly explain the main functions of an investment bank.

Answer

The following are, briefly, a summary of investment banking functions:

- **Underwriting:** The underwriting function within corporate finance involves shepherding the process of raising capital for a company. In the investment banking world, capital can be raised by selling either stocks or bonds to the investors.
- **Managing an IPO (Initial Public Offering):** This includes hiring managers to the issue, due diligence and marketing the issue.
- **Issue of debt:** When a company requires capital, it sometimes chooses to issue public debt instead of equity.

- **Follow-on hiring of stock:** A company that is already publicly traded will sometimes sell stock to the public again. This type of offering is called a follow-on offering, or a secondary offering.
- **Mergers and Acquisitions:** Acting as intermediary between Acquirer and target company
- **Sales and Trading:** This includes calling high networth individuals and institutions to suggest trading ideas (on a caveat emptor basis), taking orders and facilitating the buying and selling of stock, bonds or other securities such as currencies.
- **Research Analysis:** Research analysts study stocks and bonds and make recommendations on whether to buy, sell, or hold those securities.
- **Private Placement:** A private placement differs little from a public offering aside from the fact that a private placement involves a firm selling stock or equity to private investors rather than to public investors.
- **Financial Restructuring:** When a company cannot pay its cash obligations - it goes bankrupt. In this situation, a company can, of course, choose to simply shut down operations and walk away or, it can also restructure and remain in business.

Question 4

Distinguish between Investment Bank and Commercial Bank.

Answer

The fundamental differences between an investment bank and a commercial bank can be outlined as follows:

Investment Banks	Commercial Banks
1. Investment Banks help their clients in raising capital by acting as an intermediary between the buyers and the sellers of securities (stocks or bonds)	1. Commercial Banks are engaged in the business of accepting deposits from customers and lending money to individuals and corporate
2. Investment Banks do not take deposits from customers	2. Commercial banks can legally take deposits from customers.
3. The Investment Banks do not own the securities and only act as an intermediary for smooth transaction of buying and selling securities.	3. Commercial Banks own the loans granted to their customers.
4. Investment Banks earn underwriting commission	4. Commercial banks earn interest on loans granted to their customers.

Question 5

(i) What is the meaning of NBFC?

(ii) What are the different categories of NBFCs?

(iii) Explain briefly the regulation of NBFCs under RBI Act.

(iv) What are the differences between a bank and an NBFC?

Answer

(i) Meaning of NBFC (Non Banking Financial Companies): NBFC stands for Non-Banking financial institutions, and these are regulated by the Reserve Bank of India under RBI Act, 1934. A Non-Banking Financial Company (NBFC) is a company registered under the Companies Act, 1956 and is engaged in the business of loans and advances, acquisition of shares/stock/bonds/debentures/securities issued by Government or local authority or other securities of like marketable nature, leasing, hire-purchase, insurance business, chit business but does not include any institution whose principal business is that of agriculture activity, industrial activity, sale/purchase/construction of immovable property/. NBFC's principal business is receiving of deposits under any scheme or arrangement or in any other manner or lending on any other manner. They normally provide supplementary finance to the corporate sector.

(ii) Different categories of NBFC are

1. Loan Companies.
2. Investment Companies.
3. Asset Finance Companies.

(iii) Regulation of NBFCs-RBI Act

RBI regulates the NBFC through the following measures:

(a) Mandatory Registration.

(b) Minimum owned funds.

(c) Only RBI authorized NBFCs can accept public deposits.

(d) RBI prescribes the ceiling of interest rate and public deposits.

(e) RBI prescribes the period of deposit.

(f) RBI prescribes the prudential norms regarding utilization of funds.

(g) RBI directs their investment policies.

(h) RBI inspectors conduct inspections of such companies.

(i) RBI prescribes the points which should be examined and reported by the auditors of such companies.

(j) RBI prescribes the norms for preparation of Accounts particularly provisioning of possible losses.

(k) If any of interest or principal or both is/ are due from any customer for more than 6 months, the amount is receivable (interest or principal or both) is termed as non-performing asset.

(iv) NBFCs function similarly as banks; however there are a few differences:

(i) an NBFC cannot accept demand deposits;

(ii) an NBFC is not a part of the payment and settlement system and as such an NBFC cannot issue cheques drawn on itself; and

(iii) deposit insurance facility of Deposit Insurance and Credit Guarantee Corporation is not available for NBFC depositors unlike in case of banks.

Question 6

Explain CAMEL model in credit rating.

Answer

CAMEL Model in Credit Rating: Camel stands for Capital, Assets, Management, Earnings and Liquidity. The CAMEL model adopted by the rating agencies deserves special attention; it focuses on the following aspects-

(i) *Capital*- Composition of external funds raised and retained earnings, fixed dividends component for preference shares and fluctuating dividends component for equity shares and adequacy of long term funds adjusted to gearing levels, ability of issuer to raise further borrowings.

(ii) *Assets*- Revenue generating capacity of existing/proposed assets, fair values, technological/physical obsolescence, linkage of asset values to turnover, consistency,

appropriation of methods of depreciation and adequacy of charge to revenues, size, ageing and recoverability of monetary assets like receivables and its linkage with turnover.

(iii) *Management*- Extent of involvement of management personnel, team-work, authority, timeliness, effectiveness and appropriateness of decision making along with directing management to achieve corporate goals.

(iv) *Earnings*- Absolute levels, trends, stability, adaptability to cyclical fluctuations, ability of the entity to service existing and additional debts proposed.

(v) *Liquidity*- Effectiveness of working capital management, corporate policies for stock and creditors, management and the ability of the corporate to meet their commitment in the short run.

These five aspects form the five core bases for estimating credit worthiness of an issuer which leads to the rating of an instrument. Rating agencies determine the pre-dominance of positive/negative aspects under each of these five categories and these are factored in for making the overall rating decision.

Question 7

A Ltd. has a total sales of ₹ 3.2 crores and its average collection period is 90 days. The past experience indicates that bad-debt losses are 1.5% on Sales. The expenditure incurred by the firm in administering its receivable collection efforts are ₹ 5,00,000. A factor is prepared to buy the firm's receivables by charging 2% Commission. The factor will pay advance on receivables to the firm at an interest rate of 18% p.a. after withholding 10% as reserve.

Calculate the effective cost of factoring to the Firm.

Answer

Particulars	***₹***
Average level of Receivables = 3,20,00,000 × 90/360	80,00,000
Factoring commission = 80,00,000 × 2/100	1,60,000
Factoring reserve = 80,00,000 × 10/100	8,00,000
Amount available for advance = ₹ 80,00,000 – (1,60,000 + 8,00,000)	70,40,000
Factor will deduct his interest @ 18%:- $= \frac{₹\ 70,40,000 \times 18 \times 90}{100 \times 360}$	₹ 3,16,800
Advance to be paid = (₹ 70,40,000 – ₹ 3,16,800)	67,23,200

Annual Cost of Factoring to the Firm:	***₹***
Factoring commission (₹ 1,60,000 × 360/90)	6,40,000
Interest charges (₹ 3,16,800 × 360/90)	12,67,200
Total	19,07,200
Firm's Savings on taking Factoring Service:	₹
Cost of credit administration saved	5,00,000
Cost of Bad Debts (₹ 3,20,00,000 × 1.5/100) avoided	4,80,000
Total	9,80,000
Net cost to the Firm (₹ 19,07,200 – ₹ 9,80,000)	9,27,200
Effective rate of interest to the firm = $\frac{₹\ 9,27,200 \times 100}{67,23,200}$	13.79%

Note: The number of days in a year has been assumed to be 360 days.

Question 8

A company is considering engaging a factor, the following information is available:

(i) The current average collection period for the Company's debtors is 80 days and ½% of debtors default. The factor has agreed to pay money due after 60 days and will take the responsibility of any loss on account of bad debts.

(ii) The annual charge for the factoring is 2% of turnover payable annually in arrears. Administration cost saving is likely to be ₹ 1,00,000 per annum.

(iii) Annual sales, all on credit, are ₹ 1,00,00,000. Variable cost is 80% of sales price. The Company's cost of borrowing is 15% per annum. Assume the year is consisting of 365 days.

Should the Company enter into a factoring agreement?

Answer

The annual change in cash flows through entering into a factoring agreement is:

Savings	***(Amount in ₹)***	***(Amount in ₹)***
Administration cost saved		1,00,000
Existing average debtors [₹ 1,00,00,000/365) x 80 days]	21,91,781	
Average New Debtors [(₹ 1,00,00,000/365) x 60 days]	16,43,836	

Reduction in debtors	5,47,945	
Cost there of @80%	4,38,356	
Add: Interest saving @15% p.a. on. ₹ 4,38,356		65,753
Add: Bad Debts saved @.005 of ₹ 1,00,00,000		50,000
	Total	2,15,753
Less: Annual charges @2% of ₹ 1,00,00,000		2,00,000
Net annual benefits of factoring		15,753

Therefore, the factoring agreement is worthwhile and should be undertaken.

Question 9

MSN Ltd. has total sales of ₹ 4.50 crores and its average collection period is 120 days. The past experience indicates that bad debt losses are 2 percent on sales. The expenditure incurred by the company in administering its receivable collection efforts are ₹ 6,00,000. A Factor is prepared to buy the company's receivables by charging 2 percent commission. The factor will pay advance on receivables to the company at an interest rate of 18 percent per annum after withholding 10 percent as reserve.

You are required to calculate effective cost of factoring to the company.

Answer

MSN Ltd.

Particulars		**₹**
Average level of Receivables	₹ 4,50,00,000 × 120 / 360	1,50,00,000
Factoring commission	₹ 1,50,00,000 × 2%	3,00,000
Factoring Reserve	₹ 1,50,00,000 × 10%	15,00,000
Amount available for advance	₹ 1,50,00,000 – (3,00,000 + 15,00,000)	1,32,00,000
Factor will deduct interest @ 18%		
Interest (₹ 1,32,00,000 × 18 × 120) / 100 × 360		7,92,000
Advance to be paid = ₹ 1,32,00,000 – 7,92,000		1,24,08,000
Annual cost of factoring to the firm:		
Factoring commission (₹ 300000 × 360 / 120)		9,00,000
Interest Charges (₹ 792,000 × 360 / 120)		23,76,000
		32,76,000
Firms savings on taking factoring service:		
Cost of credit administration saved		6,00,000

Cost of bad debts	(₹ 4,50,00,000 × 2%)	9,00,000
Total savings		15,00,000

Net cost to the firm = ₹ 32,76,000 – ₹ 15,00,000 = ₹ 17,76,000

Effective cost of factoring to the firm = ₹ 17,76,000 × 100 / ₹ 1,24,08,000 = 14.31%

Note: The number of days in a year is assumed to be 360 days.

Question 10

The credit sales and receivables of M/s M Ltd. at the end of the year are estimated at ₹ 3,74,00,000 and ₹ 46,00,000 respectively.

The average variable overdraft interest rate is 5%. M Ltd. is considering a proposal for factoring its debts on a non-recourse basis at an annual fee of 3% on credit sales. As a result, M Ltd. will save ₹ 1,00,000 per year in administrative cost and ₹ 3,50,000 as bad debts. The factor will maintain a receivables collection period of 30 days and advance 80% of the face value thereof at an annual interest rate of 7%. Evaluate the viability of the proposal.

Note: 365 days are to be taken in a year for the purpose of calculation of receivables.

Answer

Particulars	**₹**
Estimated Receivables	46,00,000
Estimated Receivables under Factor $\left(3,74,00,000 \times \frac{30}{365}\right)$	30,73,973
Reduction in Receivables (₹ 46,00,000 – ₹ 30,73,973)	15,26,027

Total Savings (A)

Reduction in finance costs	₹ 15,26,027 @ 5%	76,301
Saving of Administration costs		1,00,000
Saving of Bad debts		3,50,000
Total		5,26,301

Total Cost of Factoring (B)

Interest on advances by Factor			
Advances 30,73,973 @ 80%	₹ 24,59,178		
Interest on ₹ 24,59,178 @ 7%		₹ 1,72,142	
Overdraft Interest rate 5%		(₹ 1,22,959)	49,183
Charges payable to Factor (₹ 3,74,00,000 @ 3%)			11,22,000
Total			11,71,183

Net Saving (A) – (B) (6,44,882)

Since Net Saving is negative the proposal is not viable and cannot be accepted

Question 11

M/s Atlantic Company Limited with a turnover of ₹ 4.80 crores is expecting growth of 25% for forthcoming year. Average credit period is 90 days. The past experience shows that bad debt losses are 1.75% on sales. The Company's administering cost for collecting receivable is ₹ 6,00,000/-.

It has decided to take factoring services of Pacific Factors on terms that factor will by receivable by charging 2% commission and 20% risk with recourse. The Factor will pay advance on receivables to the firm at 16% interest rate per annum after withholding 10% as reserve.

Calculate the effective cost of factoring to the firm. (Assume 360 days in a year).

Answer

Expected Turnover = ₹ 4.80 crore + 25% i.e. ₹ 1.20 crore = ₹ 6.00 crore

	₹ in Lacs	₹ in Lacs
Advance to be given:		
Debtors ₹6.00 crore x 90/360	150.00	
Less: 10% withholding	15.00	135.00
Less: Commission 2%		3.00
Net payment		132.00
Less: Interest @16% for 90 days on ₹132 lacs		5.28
		126.72
Calculation of Average Cost:		
Total Commission ₹6.00 crore x 2%		12.00
Total Interest ₹ 5.28 lacs x 360/90		21.12
		33.12
Less: Admin. Cost	6.00	
Saving in Bad Debts (₹600 lacs x 1.75% x 80%)	8.40	14.40
		18.72
Effective Cost of Factoring $\frac{₹18.72 \text{ lacs}}{₹126.72 \text{ lacs}} \times 100$		14.77%

Question 12

The credit sales and receivables of DEF Ltd. at the end of year are estimated at ₹ 561 lakhs and ₹ 69 lakhs respectively.

The average variable overdraft interest rate is 5% p.a.

DEF Ltd. is considering a factoring proposal for its receivables on a non-recourse basis at an annual fee of 1.25% of credit sales.

As a result, DEF Ltd. will save ₹ 1.5 lakhs p.a. in administrative cost and ₹ 5.25 lakhs p.a. as bad debts.

The factor will maintain a receivables collection period of 30 days and will provide 80% of receivables as advance at an interest rate of 7% p.a. You may take 365 days in a year for the purpose of calculation of receivables.

Required:

Evaluate the viability of factoring proposal.

Answer

Particulars	₹
Estimated Receivables	69,00,000
Estimated Receivables under Factor $\left(5,61,00,000 \times \frac{30}{365}\right)$	46,10,959
Reduction in Receivables (₹ 69,00,000 – ₹ 46,10,959)	22,89,041

Total Savings (A)

Reduction in finance costs ₹ 22,89,041 @ 5%	1,14,452
Saving of Administration costs	1,50,000
Saving of Bad debts	5,25,000
Total	7,89,452

Total Cost of Factoring (B)

Interest on advances by Factor		
Advances 46,10,959 @ 80%	₹ 36,88,767	
Interest on ₹ 36,88,767 @ 7%	₹ 2,58,214	
Overdraft Interest rate 5%	(₹ 1,84,438)	73,776
Charges payable to Factor (₹ 5,61,00,000 @ 1.25%)		7,01,250
Total		7,75,026

Net Saving (A) – (B) 14,426

Since Net Saving is positive the proposal is viable and can be accepted.

Question 13

Beans talk Ltd. manages its accounts receivable internally by its sales and credit department. The cost of sales ledger administration stands at ₹ 10 crores annually. The company has a credit policy of 2/10, net 30. Past experience of the company has been that on an average 40 percent of the customers avail of the discount by paying within10 days while the balance of the receivables are collected on average 90 days after the invoice date. Bad debts of the company are currently 1.5 percent of total sales. The projected sales for the next year are ₹ 1,000 crores.

Beans talk Ltd. finances its investment in debtors through a mix of bank credit and own long term funds in the ratio of 70:30. The current cost of bank credit and long term funds are 13 percent and 15 percent respectively.

With escalating cost associated with the in house management of debtors coupled with the need to unburden the management with the task so as to focus on sales promotion, the Company is examining the possibility of outsourcing its factoring service for managing its receivable and has two proposals on hand with a guaranteed payment within 30 days.

The main elements of the Proposal from Fine bank Factors Ltd. are:

- Advance ,88 percent and 84 percent for the re course and non re course arrangements.
- Discount charge in advance, 21 percent for with re course and 22 percent without recourse.
- Commission, 4.5 percent without recourse and 2.5 percent with recourse.

The main elements of the Proposal from Rough bank Factors Ltd. are:

- Advance, 84 percent with recourse and 80 percent without recourse respectively.
- Discount charge upfront without recourse 21 percent and with recourse 20 percent.
- Commission upfront, without recourse 3.6 percent and with recourse 1.8 percent.

The opinion of the Chief Marketing Manager is that in the context of the fact or in arrangement, his staff would be able exclusively focus on sales promotion which would result in additional sales of 10% of projected sales. Kindly advice as a financial consultant on the alternative proposals. What advice would you give? Why?

Answer

Financial Analysis of Receivable Management Alternatives

(A) In-House Management (₹ Crores)

Cash Discount (₹ 1000 crore x 40% x 2%)	8.00
Bad Debt (₹ 1000 crore x 1.50%)	15.00
Avoidable Administrative and Selling Cost	10.00

Cost of Investment in Receivable*	21.61
	54.61

* Cost of Investment in Receivable

Average Collection Period (0.40 x 10 + 0.60 x 90)	58 days
Investment in Debtors (₹ 1000crores x 58/365)	₹ 158.90 crores
Cost of Investment (0.70 x 13 + 0.30 x 15)	13.60%
Cost of Investment in Receivable (₹ 158.90 crores x 13.60%)	₹ 21.61 crores

(B) Fine bank Proposal

	With Recourse	Without Recourse
Factoring Commission		
(₹ 1100 crores x 2.5%) and (₹ 1100 crores x 4.5%)	27.50	49.50
Discount Charges		
(₹ 1100 crores – ₹ 27.50 crores) 0.88 x 21% x 30/365	16.29	-
(₹ 1100 crores – ₹ 49.50 crores) 0.84 x 22% x 30/365	-	15.96
Cost of Long Term Funds Invested in Debtors		
(₹ 1100 crores – ₹ 943.80 crores) 0.15 x 30/365	1.93	-
(₹ 1100 crores – ₹ 882.42 crores) 0.15 x 30/365	-	2.68
	45.72	68.14

(C) Rough bank Proposal

	With Recourse	Without Recourse
Factoring Commission		
(₹ 1100 crores x 1.8%) and (₹ 1100 crores x 3.6%)	19.80	39.60
Discount Charges		
(₹ 1100 crores – ₹ 19.80 crores) 0.84 x 20% x 30/365	14.92	-
(₹ 1100 crores – ₹ 39.60 crores) 0.80 x 21% x 30/365	-	14.64
Cost of Long Term Funds Invested in Debtors		
(₹ 1100 crores – ₹ 907.37 crores) 0.15 x 30/365	2.37	-
(₹ 1100 crores – ₹ 848.32 crores) 0.15 x 30/365	-	3.10
	37.09	57.34

Decision Analysis: With Recourse

	Fine bank	Rough bank
Benefits (₹ 54.61 crore – ₹ 15 crore†)	39.61	39.61
Costs	45.72	37.09
	(6.11)	2.52

† Bad Debts

Decision Analysis: Without Recourse

	Fine bank	Rough bank
Benefits	54.61	54.61
Costs	68.14	57.34
	(13.53)	(2.73)

Advice: The proposal of Roughbank **with recourse** should be accepted.

Question 14

PQR Ltd. has credit sales of ₹ 165 crores during the financial year 2014-15 and its average collection period is 65 days. The past experience suggests that bad debt losses are 4.28% of credit sales.

Administration cost incurred in collection of its receivables is ₹ 12,35,000 p.a. A factor is prepared to buy the company's receivables by charging 1.95% commission. The factor will pay advance on receivables to the company at an interest rate of 16% p.a. after withholding 15% as reserve.

Estimate the effective cost of factoring to the company assuming 360 days in a year.

Answer

Particulars	₹ crore
Average level of Receivables = 165 crore × 65/360	29.7916
Factoring commission = 29.7916 crore × 1.95/100	0.5809
Factoring reserve = 29.7916 crore × 15/100	4.4687
Amount available for advance = ₹ 29.7916 – (0.5809 + 4.4687)	24.742
Factor will deduct his interest @ 16%:-	
$24.742 \times \frac{16}{100} \times \frac{65}{360}$	₹ 0.7148
Advance to be paid = (₹ 24.742–₹ 0.7148)	24.0272

Annual Cost of Factoring to the Firm:	₹ crore
Factoring commission (₹ 0.5809 crore × 360/65)	3.2173
Interest charges (₹ 0.7148 crore × 360/65)	3.9589
Total	7.1762
Firm's Savings on taking Factoring Service:	₹
Cost of credit administration saved	0.1235
Cost of Bad Debts (₹ 165 crore× 4.28/100) avoided	7.0620
Total	7.1855
Net cost to the Firm (₹ 7.1762 – ₹ 7.1855)	-0.0093
Effective cost of factoring to the firm = $\frac{-0.0093 \times 100}{24.0272}$	-0.0387%

Question 15

Extracts from the forecasted financial statements of ABC Ltd. are given below.

	₹ '000	*₹ '000*
Turnover		*21,300*
Cost of sales		*16,400*
Gross Profit		***4,900***
Non-current assets		*3,000*
Current assets		
Inventory	*4,500*	
Trade receivables	*3,500*	*8,000*
Total Assets		***11,000***
Trade payables	*3,000*	
Overdraft	*3,000*	*6,000*
Equity Shares	*1,000*	
Reserves	*1,000*	*2,000*
Debentures		*3,000*
Total Liabilities		***11,000***

XYZ Fincorp, a factor has offered to manage the trade receivables of ABC Ltd. under a servicing and factor-financing agreement. XYZ expects to reduce the average trade receivables period of ABC from its current level to 35 days; to reduce bad debts from 0.9% of turnover to 0.6% of turnover; and to save of ABC ₹ 40,000 per year on account of administration costs.

The XYZ would also make an advance to ABC of 80% of the revised book value of trade receivables. The interest rate on the advance would be 2% higher than the ABC currently pays on its overdraft i.e. 7%. The XYZ would charge a fee of 0.75% of turnover on a with-recourse basis, or a fee of 1.25% of turnover on a non-recourse basis.

Assuming 365 days in a year and all sales and purchases are on credit, you are required to evaluate the proposal of XYZ Fincorp.

Answer

Working Notes:

(i) Present Trade receivables period = 365 x 3,500/21,300 = 60 days

(ii) Reduction in trade receivables under factoring arrangement

	₹
Current trade receivables	3,500,000
Revised trade receivables (₹ 21,300,000 x 35/365)	2,042,466
Reduction in trade receivables	1,457,534

Calculation of benefit of with-recourse offer

As the XYZ's offer is with recourse, ABC will gain the benefit of bad debts reducing from 0·9% of turnover to 0·6% of turnover.

	₹
Finance cost saving = 1,457,534 x 0·07	102,027
Administration cost saving	40,000
Bad debt saving = 21,300,000 x (0·009 – 0·006)	63,900
Total saving	205,927
Additional interest on advance (2,042,466 x 0·8 x 0·02)	32,680
Net benefit before factor fee (A)	173,247
With-recourse factor fee = 21,300,000 x 0·0075 (B)	159,750
Net benefit of with-recourse offer (A) – (B)	13,497

Calculation of benefit of non-recourse offer

As the offer is without recourse, the bad debts of ABC will reduce to zero, as these will be carried by the XYZ, and so the company will gain a further benefit of 0·6% of turnover.

	₹
Net benefit before with-recourse factor fee (A) as above	173,247
Non-recourse factor fee ₹ 21,300,000 x 0·0125 (D)	266,250

Net cost before adjusting for bad debts (E) = (D) – (A)	93,003
Remaining bad debts eliminated = 21,300,000 x 0·006 (F)	127,800
Net benefit of non-recourse offer (F) – (E)	34,797

The XYZ's offer is financially acceptable on a with-recourse basis, giving a net benefit of ₹ 13,497. On a non-recourse basis, the XYZ's offer is not financially acceptable, giving a net loss of ₹ 93,003, if the elimination of bad debts is ignored.

The difference between the two factor fees (₹ 106,500 or 0·5% of sales), which represents insurance against the risk of bad debts, is less than the remaining bad debts (₹ 127,800 or 0·6% of sales), which will be eliminated under non-recourse factoring.

When this elimination of bad debts is considered, the non-recourse offer from the factor is financially more attractive than the with-recourse offer.

Question 16

GKL Ltd. is considering installment sale of LCD TV as a sales promotion strategy.

In a deal of LCD TV, with selling price of ₹ 50,000, a customer can purchase it for cash down payment of ₹ 10,000 and balance amount by adopting any of the following options:

Tenure of Monthly installments	Equated Monthly installment
12	₹ 3800
24	₹ 2140

Required:

Estimate the flat and effective rate of interest for each alternative.

$PVIFA_{2.05\%, 12} = 10.5429$ $PVIFA_{2.10\%, 12} = 10.5107$

$PVIFA_{2.10\%, 24} = 18.7014$ $PVIFA_{2.12\%, 24} = 18.6593$

Answer

	12 Months	24 Months
1. Total Annual Charges for Loan	₹ 3,800 X 12 – ₹40,000 = ₹ 5,600	(₹ 2,140X24 – ₹ 40,000)/2 = ₹ 5,680
2. Flat Rate of Interest (F)	$\frac{₹5,600}{₹40,000} \times 100 = 14\%$	$\frac{₹\ 5,680}{₹\ 40,000} \times 100 = 14.20\%$
3. Effective Interest Rate	$\frac{n}{n+1} \times 2F = \frac{12}{13} \times 28 =$ 25.85%	$\frac{n}{n+1} \times 2F = \frac{24}{25} \times 28.40 =$ 27.26%

Alternatively

		12 Months	24 Months
(a)	Principal to be repaid	₹40,000	₹ 40,000
(b)	EMI	₹3,800	₹2,140
(c)	PVAF (a) ÷ (b)	10.5263	18.6916
(d)	Per month Interest Rate using Interpolation	$2.05+\frac{(10.5429-10.5263)}{10.5429-10.5107}\times(0.05)$ = 2.076%	$2.10+\frac{(18.7014-18.6916)}{18.7014-18.6593}\times(0.02)$ = 2.105%
(e)	Effective Interest Rate	$(1.02076)^{12} - 1$ = 1.2796 – 1 = 0.2796 i.e. 27.96%	$(1.02105)^{12} - 1$ = 1.2840 – 1 = 0.2840 i.e. 28.40%
Or		2.076 x 12 = 24.91%	2.105 x 12 = 25.26%

9
Mutual Funds

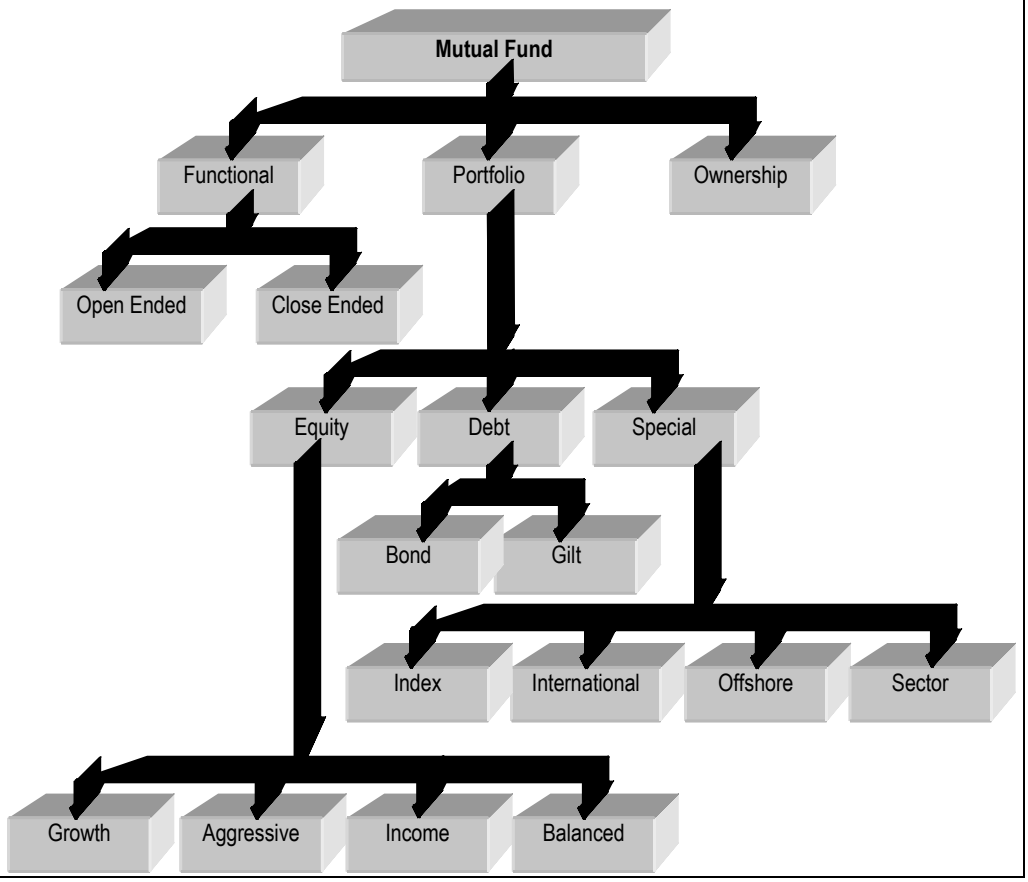
BASIC CONCEPTS

1. Introduction

Mutual Fund is a trust that pools the savings of a number of investors who share a common financial goal. Mutual Fund offers an opportunity to invest in a diversified professionally managed basket of securities at a relatively low cost.

2. Types of Mutual Funds

Mutual Funds can be classified on three bases like Functional, Portfolio and Ownership.



3. Advantages of Mutual Funds

- Professional Management,
- Diversification,
- Convenient Administration,
- Higher Returns,
- Low Cost Management,
- Liquidity,
- Transparency, and
- Highly Regulated.

4. Drawbacks of Mutual Funds

- No guarantee of returns,
- No guarantee of maximising of returns through diversification,
- Future cannot be predicted,
- Cost factor, and
- Unethical Practices

5. Evaluating Performance of Mutual Funds

As in Mutual Fund, an investor is a part of all its assets and liabilities, return is determined by inter-play of two elements Net Asset Value and Cost of Mutual Fund.

(a) **Net Asset Value (NAV) –** It is the amount which a unit holder would receive if the mutual funds were wound up. There is a Valuation Rule for valuation of assets which depends on the nature of assets. The asset values obtained on the basis of this rule is further adjusted on account of additions (in form of dividend and interest accrued and other receivables) and deductions (in form of expenses accrued and other short-term and long-term liabilities).

Net Asset of the Scheme = Market Value of Investments + Receivables+ Other accrued income + Other Assets – Accrued Expenses – Other Payables – Other Liabilities

$$NAV = \frac{\text{Net Assets of Scheme}}{\text{Number of Units}}$$

Cost of Mutual Funds – Broadly cost of Mutual Fund carries two components:

(i) Initial Expenses – Attributing to establishing a scheme under a scheme.

(ii) Ongoing Recurring Expenses – Mainly consists of Cost of employing experts, Administrative Costs and Advertisement Cost.

6. Computation of Returns

Mainly investors derive three types of income from owning mutual fund units:

- Cash Dividends,
- Capital Gain Disbursements, and
- Changes in the Fund's NAV.

The formula for computing annual return is as follows:

$$= \frac{D_1 + CG_1 + (NAV_1 - NAV_0)}{NAV_0} \times 100$$

Where,

D_1 = Dividend

CG_1 = Realised Capital Gain

$NAV_1 - NAV_0$ = Unrealised Capital Gain

NAV_0 = Base NAV

7. Criteria for Evaluating the Performance

Following three ratios are used to evaluate the performance of mutual funds:

(a) Sharpe Ratio – This ratio measures the return earned in excess of the risk-free rate (normally Treasury Instruments) on a portfolio to the portfolio's total risk as measured by the Standard Deviation in its return and over the measurement period. The formula to calculate the ratio is as follows:

$$S = \frac{\text{Return Portfolio} - \text{Return of Risk Free Investment}}{\text{Standard Deviation of Portfolio}}$$

(b) Treynor Ratio – This ratio is similar to Sharpe Ratio however, with a difference that it uses Beta instead of Standard Deviation. The formula to calculate this ratio is as follows:

$$T = \frac{\text{Return of Portfolio} - \text{Return of Risk Free Investment}}{\text{Beta of Portfolio}}$$

(c) Jensen's Alpha – This is basically the difference between a fund's actual return and those that could have been made on a benchmark portfolio with the same risk i.e. beta. It measures the ability of active management to increase return above those that are purely a reward for bearing a market risk.

Alpha = Return of Portfolio - Expected Return

8. Factors Influencing the Selection of Mutual Funds

- Past Performance
- Timing
- Size of Fund
- Age of Fund
- Largest Holding
- Fund Manager
- Expense Ratio
- PE Ratio
- Portfolio Turnover.

9. Money Market Mutual Funds (MMMFs)

These types of funds were introduced in 1992 with the objective of enabling to gain from money market instruments since it is practically impossible for individuals to invest in instruments like Commercial Papers (CPs), Certificate of Deposits (CDs) and Treasury Bills (TBs) as they require huge investments.

10. Exchange Traded Funds (ETFs)

It is a hybrid product that combines the features of an index fund. These funds are listed on the stock exchanges and their prices are linked to the underlying index.

ETFs can be bought and sold like any other stock on an exchange and prices are normally expected to be closer to the NAV at the end of the day. There is no paper work involved for investing in an ETF. These can be bought like any other stock by just placing an order with a broker.

Question 1

Write short notes on the role of Mutual Funds in the Financial Market.

Answer

Role of Mutual Funds in the Financial Market: Mutual funds have opened new vistas to investors and imparted much needed liquidity to the system. In this process, they have challenged the hitherto dominant role of the commercial banks in the financial market and national economy.

The role of mutual funds in the financial market is to provide access to the stock markets related investments to people with less money in their pocket. Mutual funds are trusts that pool together resources from small investors to invest in capital market instruments like shares, debentures, bonds, treasury bills, commercial paper, etc.

It is quite easy to construct a well diversified portfolio of stocks, if you have 1,00,000 rupees to invest . However, how can one diversify his portfolio and manage risk if he has just 1,000 rupees to invest. It is definitely not possible with direct investments. The only resort here is mutual funds that can provide access to the financial markets even to such small investors. Mutual funds also help small investors for step-by-step monthly saving/investing of smaller amounts.

Question 2

Explain how to establish a Mutual Fund.

Answer

Establishment of a Mutual Fund: A mutual fund is required to be registered with the Securities and Exchange Board of India (SEBI) before it can collect funds from the public. All mutual funds are governed by the same set of regulations and are subject to monitoring and inspections by the SEBI. The Mutual Fund has to be established through the medium of a sponsor. A sponsor means any body corporate who, acting alone or in combination with another body corporate, establishes a mutual fund after completing the formalities prescribed in the SEBI's Mutual Fund Regulations.

The role of sponsor is akin to that of a promoter of a company, who provides the initial capital and appoints the trustees. The sponsor should be a body corporate in the business of financial services for a period not less than 5 years, be financially sound and be a fit party to act as sponsor in the eyes of SEBI.

The Mutual Fund has to be established as either a trustee company or a Trust, under the Indian Trust Act and the instrument of trust shall be in the form of a deed. The deed shall be executed by the sponsor in favour of the trustees named in the instrument of trust. The trust deed shall be duly registered under the provisions of the Indian Registration Act, 1908. The trust deed shall contain clauses specified in the Third Schedule of the Regulations.

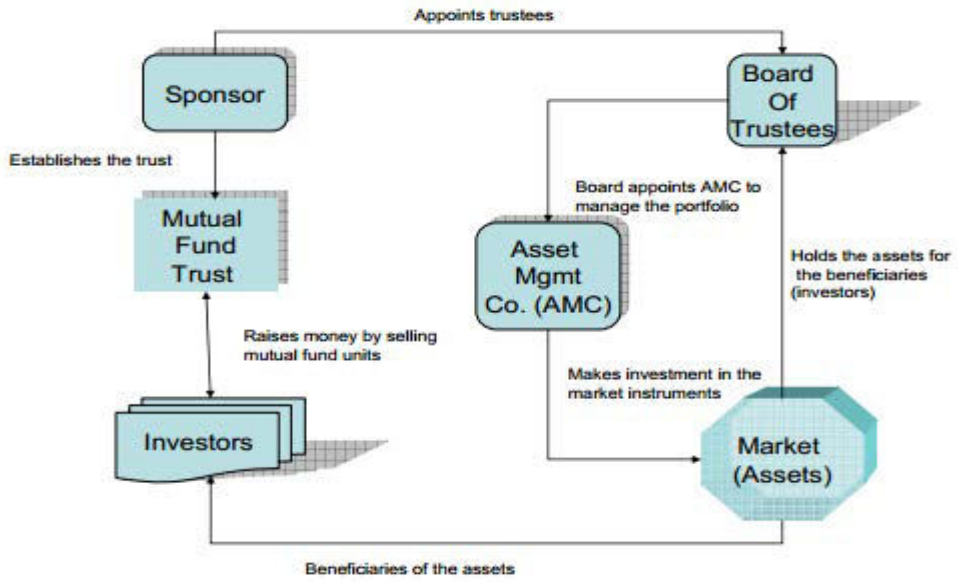
An Asset Management Company, who holds an approval from SEBI, is to be appointed to manage the affairs of the Mutual Fund and it should operate the schemes of such fund. The Asset Management Company is set up as a limited liability company, with a minimum net worth of ₹ 10 crores.

The sponsor should contribute at least 40% to the networth of the Asset Management Company. The Trustee should hold the property of the Mutual Fund in trust for the benefit of the unit holders.

SEBI regulations require that at least two-thirds of the directors of the Trustee Company or board of trustees must be independent, that is, they should not be associated with the sponsors. Also, 50 per cent of the directors of AMC must be independent. The appointment of the AMC can be terminated by majority of the trustees or by 75% of the unit holders of the concerned scheme.

The AMC may charge the mutual fund with Investment Management and Advisory fees subject to prescribed ceiling. Additionally, the AMC may get the expenses on operation of the mutual fund reimbursed from the concerned scheme.

The Mutual fund also appoints a custodian, holding valid certificate of registration issued by SEBI, to have custody of securities held by the mutual fund under different schemes. In case of dematerialized securities, this is done by Depository Participant. The custodian must be independent of the sponsor and the AMC.



Question 3

What are the advantages of investing in Mutual Funds?

Answer

The advantages of investing in a Mutual Fund are:

1. **Professional Management**: Investors avail the services of experienced and skilled professionals who are backed by a dedicated investment research team which analyses the performance and prospects of companies and selects suitable investments to achieve the objectives of the scheme.
2. **Diversification:** Mutual Funds invest in a number of companies across a broad cross-section of industries and sectors. Investors achieve this diversification through a Mutual Fund with far less money and risk than one can do on his own.
3. **Convenient Administration**: Investing in a Mutual Fund reduces paper work and helps investors to avoid many problems such as bad deliveries, delayed payments and

unnecessary follow up with brokers and companies.

4. **Return Potential:** Over a medium to long term, Mutual Fund has the potential to provide a higher return as they invest in a diversified basket of selected securities.
5. **Low Costs**: Mutual Funds are a relatively less expensive way to invest compared to directly investing in the capital markets because the benefits of scale in brokerage, custodial and other fees translate into lower costs for investors.
6. **Liquidity:** In open ended schemes investors can get their money back promptly at net asset value related prices from the Mutual Fund itself. With close-ended schemes, investors can sell their units on a stock exchange at the prevailing market price or avail of the facility of direct repurchase at NAV related prices which some close ended and interval schemes offer periodically.
7. **Transparency:** Investors get regular information on the value of their investment in addition to disclosure on the specific investments made by scheme, the proportion invested in each class of assets and the fund manager's investment strategy and outlook.
8. **Other Benefits:** Mutual Funds provide regular withdrawal and systematic investment plans according to the need of the investors. The investors can also switch from one scheme to another without any load.
9. **Highly Regulated:** Mutual Funds all over the world are highly regulated and in India all Mutual Funds are registered with SEBI and are strictly regulated as per the Mutual Fund Regulations which provide excellent investor protection.
10. **Economies of scale:** The way mutual funds are structured gives it a natural advantage. The "pooled" money from a number of investors ensures that mutual funds enjoy economies of scale; it is cheaper compared to investing directly in the capital markets which involves higher charges. This also allows retail investors access to high entry level markets like real estate, and also there is a greater control over costs.
11. **Flexibility:** There are a lot of features in a regular mutual fund scheme, which imparts flexibility to the scheme. An investor can opt for Systematic Investment Plan (SIP), Systematic Withdrawal Plan etc. to plan his cash flow requirements as per his convenience. The wide range of schemes being launched in India by different mutual funds also provides an added flexibility to the investor to plan his portfolio accordingly.

Question 4

What are the drawbacks of investments in Mutual Funds?

Answer

(a) There is no guarantee of return as some Mutual Funds may underperform and Mutual Fund Investment may depreciate in value which may even effect erosion / Depletion of principal amount

(b) Diversification may minimize risk but does not guarantee higher return.

(c) Mutual funds performance is judged on the basis of past performance record of various companies. But this cannot take care of or guarantee future performance.

(d) Mutual Fund cost is involved like entry load, exit load, fees paid to Asset Management Company etc.

(e) There may be unethical Practices e.g. diversion of Mutual Fund amounts by Mutual Fund /s to their sister concerns for making gains for them.

(f) MFs, systems do not maintain the kind of transparency, they should maintain

(g) Many MF scheme are, at times, subject to lock in period, therefore, deny the market drawn benefits

(h) At times, the investments are subject to different kind of hidden costs.

(i) Redressal of grievances, if any, is not easy

(j) When making decisions about your money, fund managers do not consider your personal tax situations. For example. When a fund manager sells a security, a capital gain tax is triggered, which affects how profitable the individual is from sale. It might have been more profitable for the individual to defer the capital gain liability.

(k) Liquidating a mutual fund portfolio may increase risk, increase fees and commissions, and create capital gains taxes.

Question 5

Explain briefly about net asset value (NAV) of a Mutual Fund Scheme.

Answer

Net Asset Value (NAV) is the total asset value (net of expenses) per unit of the fund calculated by the Asset Management Company (AMC) at the end of every business day. Net Asset Value on a particular date reflects the realizable value that the investor will get for each unit that he is holding if the scheme is liquidated on that date. The day of valuation of NAV is called the valuation day.

The performance of a particular scheme of a mutual fund is denoted by Net Asset Value (NAV). Net Asset Value may also be defined as the value at which new investors may apply to a mutual fund for joining a particular scheme.

It is the value of net assets of the fund. The investors' subscription is treated as the capital in the balance sheet of the fund, and the investments on their behalf are treated as assets. The NAV is calculated for every scheme of the MF individually. The value of portfolio is the aggregate value of different investments.

$$\text{The Net Asset Value (NAV)} = \frac{\text{Net Assets of the scheme}}{\text{Number of units outstanding}}$$

Net Assets of the scheme will normally be:

Market value of investments + Receivables + Accrued Income + Other Assets – Accrued Expenses – Payables – Other Liabilities

Since investments by a Mutual Fund are marked to market, the value of the investments for computing NAV will be at market value.

The Securities and Exchange Board of India (SEBI) has notified certain valuation norms calculating net asset value of Mutual fund schemes separately for traded and non-traded schemes. Also, according to Regulation 48 of SEBI (Mutual Funds) Regulations, mutual funds are required to compute Net Asset Value (NAV) of each scheme and to disclose them on a regular basis – daily or weekly (based on the type of scheme) and publish them in atleast two daily newspapers.

NAV play an important part in investors' decisions to enter or to exit a MF scheme. Analyst use the NAV to determine the yield on the schemes.

Question 6

What are the investors' rights & obligations under the Mutual Fund Regulations? Explain different methods for evaluating the performance of Mutual Fund.

Answer

Investors' Rights and Obligations under the Mutual Fund Regulations: Important aspect of the mutual fund regulations and operations is the investors' protection and disclosure norms. It serves the very purpose of mutual fund guidelines. Due to these norms it is very necessary for the investor to remain vigilant. Investor should continuously evaluate the performance of mutual fund.

Following are the steps taken for improvement and compliance of standards of mutual fund:

1. All mutual funds should disclose full portfolio of their schemes in the annual report within one month of the close of each financial year. Mutual fund should either send it to each unit holder or publish it by way of an advertisement in one English daily and one in regional language.
2. The Asset Management Company must prepare a compliance manual and design internal audit systems including audit systems before the launch of any schemes. The trustees are also required to constitute an audit committee of the trustees which will review the internal audit systems and the recommendation of the internal and statutory audit reports and ensure their rectification.
3. The AMC shall constitute an in-house valuation committee consisting of senior executives including personnel from accounts, fund management and compliance departments. The committee would on a regular basis review the system practice of valuation of securities.

4. The trustees shall review all transactions of the mutual fund with the associates on a regular basis.

Investors' Rights

1. Unit holder has proportionate right in the beneficial ownership of the schemes assets as well as any dividend or income declared under the scheme.
2. For initial offers unit holders have right to expect allotment of units within 30 days from the closure of mutual offer period.
3. Receive dividend warrant within 42 days.
4. AMC can be terminated by 75% of the unit holders.
5. Right to inspect major documents i.e. material contracts, Memorandum of Association and Articles of Association (M.A. & A.A) of the AMC, Offer document etc.
6. 75% of the unit holders have the right to approve any changes in the close ended scheme.
7. Every unit holder have right to receive copy of the annual statement.
8. Right to wind up a scheme if 75% of investors pass a resolution to that effect.
9. Investors have a right to be informed about changes in the fundamental attributes of a scheme. Fundamental attributes include type of scheme, investment objectives and policies and terms of issue.
10. Lastly, investors can approach the investor relations officer for grievance redressal. In case the investor does not get appropriate solution, he can approach the investor grievance cell of SEBI. The investor can also sue the trustees.

Legal Limitations to Investors' Rights

1. Unit holders cannot sue the trust but they can initiate proceedings against the trustees, if they feel that they are being cheated.
2. Except in certain circumstances AMC cannot assure a specified level of return to the investors. AMC cannot be sued to make good any shortfall in such schemes.

Investors' Obligations

1. An investor should carefully study the risk factors and other information provided in the offer document. Failure to study will not entitle him for any rights thereafter.
2. It is the responsibility of the investor to monitor his schemes by studying the reports and other financial statements of the funds.

Methods for Evaluating the Performance

1. **Sharpe Ratio**

   The excess return earned over the risk free return on portfolio to the portfolio's total risk measured by the standard deviation. This formula uses the volatility of portfolio return. The Sharpe ratio is often used to rank the risk-adjusted performance of various portfolios

over the same time. The higher a Sharpe ratio, the better a portfolio's returns have been relative to the amount of investment risk the investor has taken.

$$S = \frac{\text{Return of portfolio - Return of risk free investment}}{\text{Standard Deviation of Portfolio}}$$

2. **Treynor Ratio**

This ratio is similar to the Sharpe Ratio except it uses Beta of portfolio instead of standard deviation. Treynor ratio evaluates the performance of a portfolio based on the systematic risk of a fund. Treynor ratio is based on the premise that unsystematic or specific risk can be diversified and hence, only incorporates the systematic risk (beta) to gauge the portfolio's performance.

$$T = \frac{\text{Return of portfolio - Return of risk free investment}}{\text{Beta of Portfolio}}$$

3. **Jensen's Alpha**

The comparison of actual return of the fund with the benchmark portfolio of the same risk. Normally, for the comparison of portfolios of mutual funds this ratio is applied and compared with market return. It shows the comparative risk and reward from the said portfolio. Alpha is the excess of actual return compared with expected return.

Question 7

What are the signals that indicate that is time for an investor to exit a mutual fund scheme?

Answer

(1) When the mutual fund consistently under performs the broad based index, it is high time that it should get out of the scheme.

(2) When the mutual fund consistently under performs its peer group instead of it being at the top. In such a case, it would have to pay to get out of the scheme and then invest in the winning schemes.

(3) When the mutual fund changes its objectives e.g. instead of providing a regular income to the investor, the composition of the portfolio has changed to a growth fund mode which is not in tune with the investor's risk preferences.

(4) When the investor changes his objective of investing in a mutual fund which no longer is beneficial to him.

(5) When the fund manager, handling the mutual fund schemes, has been replaced by a new entrant whose image is not known.

Question 8

Briefly explain what is an exchange traded fund.

Answer

Exchange Traded Funds (ETFs) were introduced in US in 1993 and came to India around 2002. ETF is a hybrid product that combines the features of an index mutual fund and stock and hence, is also called index shares. These funds are listed on the stock exchanges and their prices are linked to the underlying index. The authorized participants act as market makers for ETFs.

ETF can be bought and sold like any other stock on stock exchange. In other words, they can be bought or sold any time during the market hours at prices that are expected to be closer to the NAV at the end of the day. NAV of an ETF is the value of the underlying component of the benchmark index held by the ETF plus all accrued dividends less accrued management fees.

There is no paper work involved for investing in an ETF. These can be bought like any other stock by just placing an order with a broker.

Some other important features of ETF are as follows:

1. It gives an investor the benefit of investing in a commodity without physically purchasing the commodity like gold, silver, sugar etc.
2. It is launched by an asset management company or other entity.
3. The investor does not need to physically store the commodity or bear the costs of upkeep which is part of the administrative costs of the fund.
4. An ETF combines the valuation feature of a mutual fund or unit investment trust, which can be bought or sold at the end of each trading day for its net asset value, with the tradability feature of a closed-end fund, which trades throughout the trading day at prices that may be more or less than its net asset value.

Question 9

Distinguish between Open-ended and Close-ended Schemes.

Answer

Open Ended Scheme do not have maturity period. These schemes are available for subscription and repurchase on a continuous basis. Investor can conveniently buy and sell unit. The price is calculated and declared on daily basis. The calculated price is termed as NAV. The buying price and selling price is calculated with certain adjustment to NAV. The key feature of the scheme is liquidity.

Close Ended Scheme has a stipulated maturity period normally 5 to 10 years. The Scheme is open for subscription only during the specified period at the time of launce of the scheme. Investor can invest at the time of initial issue and there after they can buy or sell from stock exchange where the scheme is listed. To provide an exit rout some close-ended schemes give

an option of selling bank (repurchase) on the basis of NAV. The NAV is generally declared on weekly basis.

The points of difference between the two types of funds can be explained as under

Parameter	*Open Ended Fund*	*Closed Ended Fund*
Fund Size	Flexible	Fixed
Liquidity Provider	Fund itself	Stock Market
Sale Price	At NAV plus load, if any	Significant Premium/ Discount to NAV
Availability	Fund itself	Through Exchange where listed
-Day Trading	Not possible	Expensive

Question 10

Write short notes on Money market mutual fund.

Answer

An important part of financial market is Money market. It is a market for short-term money. It plays a crucial role in maintaining the equilibrium between the short-term demand and supply of money. Such schemes invest in safe highly liquid instruments included in commercial papers certificates of deposits and government securities.

Accordingly, the Money Market Mutual Fund (MMMF) schemes generally provide high returns and highest safety to the ordinary investors. MMMF schemes are active players of the money market. They channelize the idle short funds, particularly of corporate world, to those who require such funds. This process helps those who have idle funds to earn some income without taking any risk and with surety that whenever they will need their funds, they will get (generally in maximum three hours of time) the same. Short-term/emergency requirements of various firms are met by such Mutual Funds. Participation of such Mutual Funds provide a boost to money market and help in controlling the volatility.

Question 11

(i) Who can be appointed as Asset Management Company (AMC)?

(ii) Write the conditions to be fulfilled by an AMC.

(iii) What are the obligations of AMC?

Answer

(i) Asset Management Company (AMC): A company formed and registered under Companies Act 1956 and which has obtained the approval of SEBI to function as an asset management company may be appointed by the sponsor of the mutual fund as

AMC for creation and maintenance of investment portfolios under different schemes. The AMC is involved in the daily administration of the fund and typically has three departments: a) Fund Management; b) Sales and Marketing and c) Operations and Accounting.

(ii) Conditions to be fulfilled by an AMC

(1) The Memorandum and Articles of Association of the AMC is required to be approved by the SEBI.

(2) Any director of the asset management company shall not hold the place of a director in another asset management company unless such person is independent director referred to in clause (d) of sub-regulation (1) of regulation 21 of the Regulations and the approval of the Board of asset management company of which such person is a director, has been obtained. Atleast 50% of the directors of the AMC should be independent (i.e. not associated with the sponsor).

(3) The asset management company shall forthwith inform SEBI of any material change in the information or particulars previously furnished which have a bearing on the approval granted by SEBI.

(a) No appointment of a director of an asset management company shall be made without the prior approval of the trustees.

(b) The asset management company undertakes to comply with SEBI (Mutual Funds) Regulations, 1996.

(c) No change in controlling interest of the asset management company shall be made unless prior approval of the trustees and SEBI is obtained.

(i) A written communication about the proposed change is sent to each unit holder and an advertisement is given in one English Daily newspaper having nation wide circulation and in a newspaper published in the language of the region where the head office of the mutual fund is situated.

(ii) The unit holders are given an option to exit at the prevailing Net Asset Value without any exit load.

(iii) The asset management company shall furnish such information and documents to the trustees as and when required by the trustees.

(4) The minimum net worth of an AMC should be ₹ 10 crores, of which not less than 40% is to be contributed by the sponsor.

(iii) Obligations of the AMC

(1) The AMC shall manage the affairs of the mutual funds and operate the schemes of such fund.

(2) The AMC shall take all reasonable steps and exercise due diligence to ensure that the investment of the mutual funds pertaining to any scheme is not contrary to the provisions of SEBI Regulations and the trust deed of the mutual fund.

Question 12

Mr. A can earn a return of 16 per cent by investing in equity shares on his own. Now he is considering a recently announced equity based mutual fund scheme in which initial expenses are 5.5 per cent and annual recurring expenses are 1.5 per cent. How much should the mutual fund earn to provide Mr. A return of 16 per cent?

Answer

Personal earnings of Mr. A = R_1 = 16%

Mutual Fund earnings = R_2

$$R_2 = \frac{1}{1 - \text{Initial expenses}(\%)} R_1 + \text{Recurring expenses}(\%)$$

$$= \frac{1}{1-0.055} \times 16\% + 1.5\%$$

= 18.43%

Mutual Fund earnings = 18.43%

Question 13

Mr. X earns 10% on his investments in equity shares. He is considering a recently floated scheme of a Mutual Fund where the initial expenses are 6% and annual recurring expenses are expected to be 2%. How much the Mutual Fund scheme should earn to provide a return of 10% to Mr. X?

Answer

$$r_2 = \frac{1}{1-\text{initial exp}} \text{ x } r_1 + \text{recurring exp.}$$

The rate of return the mutual fund should earn;

$$= \frac{1}{1-0.06} \text{ x } 0.1 + 0.02$$

= 0.1264 or 12.64%

Question 14

A mutual fund that had a net asset value of ₹ 20 at the beginning of month - made income and capital gain distribution of Re. 0.0375 and Re. 0.03 per share respectively during the month, and then ended the month with a net asset value of ₹ 20.06. Calculate monthly return.

Answer

Calculation of Monthly Return on the Mutual Funds

$$r = \left[\frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}} \right]$$

Where,

r = Return on the mutual fund

NAV_t = Net assets value at time period t

NAV_{t-1} = Net assets value at time period t – 1

I_t = Income at time period t

G_t = Capital gain distribution at time period t

$$= \left[\frac{(₹\ 20.06 - ₹\ 20.00) + (₹\ 0.0375 + ₹\ 0.03)}{20} \right]$$

$$= \frac{0.06 + 0.0675}{20}$$

$$= \frac{0.1275}{20} = 0.006375$$

Or, r = 0.6375% p.m.

Or = 7.65% p.a.

Question 15

A mutual fund that had a net asset value of ₹16 at the beginning of a month, made income and capital gain distribution of ₹0.04 and ₹0.03 respectively per unit during the month, and then ended the month with a net asset value of ₹16.08. Calculate monthly and annual rate of return.

Answer

Calculation of monthly return on the mutual funds:

$$r = \frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}}$$

$$\text{Or, } r = \frac{(₹\ 16.08 - ₹16.00) + (₹\ 0.04 + ₹\ 0.03)}{16}$$

$$= \frac{0.08 + 0.07}{16} = 0.009375 \quad \text{or, } r = 0.9375\% \text{ or } 11.25\% \text{ p.a.}$$

Question 16

An investor purchased 300 units of a Mutual Fund at ₹ 12.25 per unit on 31st December, 2009. As on 31st December, 2010 he has received ₹ 1.25 as dividend and ₹ 1.00 as capital gains distribution per unit.

Required :

(i) The return on the investment if the NAV as on 31st December, 2010 is ₹ 13.00.

(ii) The return on the investment as on 31st December, 2010 if all dividends and capital gains distributions are reinvested into additional units of the fund at ₹ 12.50 per unit.

Answer

Return for the year (all changes on a per year basis)

Particulars	₹ /Unit
Change in price (₹ 13.00 – ₹ 12.25)	0.75
Dividend received	1.25
Capital gain distribution	1.00
Total Return	3.00

Return on investment = $\frac{3.00}{12.25} \times 100 = 24.49\%$

If all dividends and capital gain are reinvested into additional units at ₹ 12.50 per unit the position would be.

Total amount reinvested = ₹ 2.25 × 300 = ₹ 675

Additional units added = $\frac{₹\ 675}{12.50} = 54$ units

Value of 354 units as on 31-12-2010 = ₹ 4,602

Price paid for 300 units on 31-12-2009 (300 × ₹ 12.25) = ₹ 3,675

Return = $\frac{₹\ 4,602 - ₹\ 3,675}{₹\ 3,675} = \frac{₹\ 927}{₹\ 3,675} = 25.22\%$

Question 17

The following information is extracted from Steady Mutual Fund's Scheme:

- Asset Value at the beginning of the month - ₹ 65.78

- Annualised return *-15 %*

- Distributions made in the nature of Income & Capital gain (per unit respectively). *- ₹ 0.50 and ₹ 0.32*

You are required to:

(1) Calculate the month end net asset value of the mutual fund scheme (limit your answers to two decimals).

(2) Provide a brief comment on the month end NAV.

Answer

(1) Calculation of NAV at the end of month:

Given Annual Return = 15%

Hence Monthly Return = 1.25% (r)

$$r = \frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}}$$

$$0.0125 = \frac{\left(NAV_t - ₹\ 65.78\right) + ₹\ 0.50 + ₹\ 0.32}{₹\ 65.78}$$

$0.82 = NAV_t - ₹64.96$

$NAV_t = ₹65.78$

(2) There is no change in NAV.

Question 18

Orange purchased 200 units of Oxygen Mutual Fund at ₹ 45 per unit on 31st December, 2009. In 2010, he received ₹ 1.00 as dividend per unit and a capital gains distribution of ₹ 2 per unit.

Required:

(i) Calculate the return for the period of one year assuming that the NAV as on 31st December 2010 was ₹ 48 per unit.

(ii) Calculate the return for the period of one year assuming that the NAV as on 31st December 2010 was ₹ 48 per unit and all dividends and capital gains distributions have been reinvested at an average price of ₹ 46.00 per unit.

Ignore taxation.

Answer

(i) Returns for the year

(All changes on a Per -Unit Basis)

Change in Price:	₹48 – ₹45 =	₹ 3.00
Dividends received:		₹ 1.00
Capital gains distribution		₹ 2.00
Total reward		₹ 6.00

Holding period reward: $\frac{₹6.00}{₹45} \times 100 = 13.33\%$

(ii) When all dividends and capital gains distributions are re-invested into additional units of the fund @ (₹ 46/unit)

Dividend + Capital Gains per unit = ₹ 1.00 + ₹ 2.00 = ₹ 3.00

Total received from 200 units= ₹ 3.00 x 200 = ₹ 600/-.

Additional Units Acquired = ₹ 600/₹ 46 = 13.04 Units.

Total No. of Units = 200 units + 13.04 units = 213.04 units.

Value of 213.04 units held at the end of the year

= 213.04 units x ₹48 = ₹ 10225.92

Price Paid for 200 Units at the beginning of the year = 200 units x ₹ 45 = ₹ 9000.00

Holding Period Reward ₹ (10225.92 – 9000.00) = ₹1225.92

Holding Period Reward = $\frac{₹1225.92}{₹9000} \times 100 = 13.62\%$

Question 19

Cinderella Mutual Fund has the following assets in Scheme Rudolf at the close of business on 31st March,2014.

Company	*No. of Shares*	*Market Price Per Share*
Nairobi Ltd.	*25000*	*₹ 20*
Dakar Ltd.	*35000*	*₹ 300*
Senegal Ltd.	*29000*	*₹ 380*
Cairo Ltd.	*40000*	*₹ 500*

The total number of units of Scheme Rudol fare 10 lacs. The Scheme Rudolf has accrued expenses of ₹ 2,50,000 and other liabilities of ₹ 2,00,000. Calculate the NAV per unit of the Scheme Rudolf.

Answer

Shares	No. of shares	Price	Amount (₹)
Nairobi Ltd.	25,000	20.00	5,00,000
Dakar Ltd.	35,000	300.00	1,05,00,000
Senegal Ltd.	29,000	380.00	1,10,20,000
Cairo Ltd.	40,000	500.00	2,00,00,000
			4,20,20,000
Less: Accrued Expenses			2,50,000
Other Liabilities			2,00,000
Total Value			4,15,70,000
No. of Units			10,00,000
NAV per Unit (4,15,70,000/10,00,000)			41.57

Question 20

A Mutual Fund Co. has the following assets under it on the close of business as on:

Company	*No. of Shares*	*1st February 2012 Market price per share ₹*	*2nd February 2012 Market price per share ₹*
L Ltd	*20,000*	*20.00*	*20.50*
M Ltd	*30,000*	*312.40*	*360.00*
N Ltd	*20,000*	*361.20*	*383.10*
P Ltd	*60,000*	*505.10*	*503.90*

Total No. of Units 6,00,000

(i) Calculate Net Assets Value (NAV) of the Fund.

(ii) Following information is given:

Assuming one Mr. A, submits a cheque of ₹ 30,00,000 to the Mutual Fund and the Fund manager of this company purchases 8,000 shares of M Ltd; and the balance amount is held in Bank. In such a case, what would be the position of the Fund?

(iii) Find new NAV of the Fund as on 2nd February 2012.

Answer

(i) NAV of the Fund

$$= \frac{₹\ 4,00,000 + ₹\ 93,72,000 + ₹\ 72,24,000 + ₹\ 3,03,06,000}{6,00,000}$$

$$= \frac{₹\ 4,73,02,000}{6,00,000} = ₹\ 78.8366 \text{ rounded to } ₹\ 78.84$$

(ii) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (₹)
L Ltd.	20,000	20.00	4,00,000
M Ltd.	38,000	312.40	1,18,71,200
N Ltd.	20,000	361.20	72,24,000
P Ltd.	60,000	505.10	3,03,06,000
Cash			5,00,800
			5,03,02,000

$$\text{No. of units of fund} = 6,00,000 + \frac{30,00,000}{78.8366} = 6,38,053$$

(iii) On 2nd February 2012, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
L Ltd.	20,000	20.50	4,10,000
M Ltd.	38,000	360.00	1,36,80,000
N Ltd.	20,000	383.10	76,62,000
P Ltd.	60,000	503.90	3,02,34,000
Cash			5,00,800
			5,24,86,800

$$\text{NAV as on 2nd February 2012} = \frac{₹\ 5,24,86,800}{6,38,053} = ₹\ 82.26 \text{ per unit}$$

Question 21

On 1st April 2009 Fair Return Mutual Fund has the following assets and prices at 4.00 p.m.

Shares	***No. of Shares***	***Market Price Per Share (₹)***
A Ltd.	*10000*	*19.70*
B Ltd.	*50000*	*482.60*

C Ltd.	*10000*	*264.40*
D Ltd.	*100000*	*674.90*
E Ltd.	*30000*	*25.90*
No. of units of funds		*8,00,000*

Please calculate:

(a) NAV of the Fund on 1st April 2009.

(b) Assuming that on 1st April 2009, Mr. X, a HNI, send a cheque of ₹ 50,00,000 to the Fund and Fund Manager immediately purchases 18000 shares of C Ltd. and balance is held in bank. Then what will be position of fund.

(c) Now suppose on 2 April 2009 at 4.00 p.m. the market price of shares is as follows:

Shares	***₹***
A Ltd.	*20.30*
B Ltd.	*513.70*
C Ltd.	*290.80*
D Ltd.	*671.90*
E Ltd.	*44.20*

Then what will be new NAV.

Answer

(a) NAV of the Fund.

$$= \frac{₹\,1,97,000 + ₹\,2,41,30,000 + ₹\,26,44,000 + ₹\,6,74,90,000 + ₹\,7,77,000}{800000}$$

$$= \frac{₹\,9,52,38,000}{800000} = ₹\ 119.0475 \text{ rounded to } ₹\ 119.05$$

(b) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (Rs.)
A Ltd.	10000	19.70	1,97,000
B Ltd.	50000	482.60	2,41,30,000
C Ltd.	28000	264.40	74,03,200
D Ltd.	100000	674.90	674,90,000
E Ltd.	30000	25.90	7,77,000
Cash			2,40,800
			10,02,38,000

No. of units of fund = $800000 + \frac{5000000}{119.0475} = 842000$

(c) On 2nd April 2009, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
A Ltd.	10000	20.30	2,03,000
B Ltd.	50000	513.70	2,56,85,000
C Ltd.	28000	290.80	81,42,400
D Ltd.	100000	671.90	6,71,90,000
E Ltd.	30000	44.20	13,26,000
Cash			2,40,800
			10,27,87,200

NAV as on 2nd April 2009 = $\frac{₹\,10,27,87,200}{842000}$ = ₹ 122.075 per unit

Question 22

A has invested in three Mutual Fund Schemes as per details below:

Particulars	*MF A*	*MF B*	*MF C*
Date of investment	*01.12.2009*	*01.01.2010*	*01.03.2010*
Amount of investment	*₹ 50,000*	*₹ 1,00,000*	*₹ 50,000*
Net Asset Value (NAV) at entry date	*₹ 10.50*	*₹ 10*	*₹ 10*
Dividend received upto 31.03.2010	*₹ 950*	*₹ 1,500*	*Nil*
NAV as at 31.03.2010	*₹ 10.40*	*₹ 10.10*	*₹ 9.80*

Required:

What is the effective yield on per annum basis in respect of each of the three schemes to Mr. A upto 31.03.2010?

Answer

Scheme	*Investment* ₹	*Unit Nos. (Investment/NAV at entry date)*	*Unit NAV 31.3.2010* ₹	*Total NAV 31.3.2010 (Unit Nos. X Unit NAV as on 31.3.2010)* ₹
MF A	50,000	4761.905	10.40	49,523.812
MF B	1,00,000	10,000	10.10	1,01,000
MF C	50,000	5,000	9.80	49,000

Scheme	*NAV (+) / (–) (NAV as on 31.3.2010 – Investment)* ₹	*Dividend Received* ₹	*Total Yield Change in NAV +Dividend* ₹	*Number of days*	*Effective Yield (% P.A.) (Total Yield/ Investment) X (365/No. of days) X 100*
MF A	(–)476.188	950	473.812	121	2.858%
MF B	(+)1,000	1,500	2,500	90	10.139%
MF C	(–)1,000	Nil	(–)1,000	31	(–)24%

Question 23

Mr. Sinha has invested in three Mutual fund schemes as per details below:

	Scheme X	*Scheme Y*	*Scheme Z*
Date of Investment	*01.12.2008*	*01.01.2009*	*01.03.2009*
Amount of Investment	*₹5,00,000*	*₹1,00,000*	*₹50,000*
Net Asset Value at entry date	*₹10.50*	*₹10.00*	*₹10.00*
Dividend received upto 31.03.2009	*₹9,500*	*₹1,500*	*Nil*
NAV as at 31.3.2009	*₹10.40*	*₹10.10*	*₹9.80*

You are required to calculate the effective yield on per annum basis in respect of each of the three schemes to Mr. Sinha upto 31.03.2009.

Answer

Calculation of effective yield on per annum basis in respect of three mutual fund schemes to Mr. Sinha up to 31-03-2009:

Particulars	Mfx	Mfy	Mfz
(a) Investments	₹ 5,00,000	₹ 1,00,000	₹ 50,000
(b) Opening NAV	₹10.50	₹10.00	₹10.00
(c) No. of units (a/b)	47,619.05	10,000	5,000
(d) Unit NAV ON 31-3-2009	₹ 10.40	₹ 10.10	₹ 9.80
(e) Total NAV on 31-3-2009 (c x d)	₹ 4,95,238.12	₹ 1,01,000	₹ 49,000
(f) Increase / Decrease of NAV (e - a)	(₹ 4,761.88)	₹ 1,000	(₹ 1,000)
(g) Dividend Received	₹ 9,500	₹ 1,500	Nil
(h) Total yield (f + g)	₹ 4,738.12	₹ 2,500	(₹ 1,000)

(i)	Number of Days	121	90	31
(j)	Effective yield p.a. (h/a x 365/i x 100)	2.859%	10.139%	(-) 23.55%

Question 24

Mr. X on 1.7.2007, during the initial offer of some Mutual Fund invested in 10,000 units having face value of ₹10 for each unit. On 31.3.2008, the dividend operated by the M.F. was 10% and Mr. X found that his annualized yield was 153.33%. On 31.12.2009, 20% dividend was given. On 31.3.2010, Mr. X redeemed all his balance of 11,296.11 units when his annualized yield was 73.52%. What are the NAVs as on 31.3.2008, 31.3.2009 and 31.3.2010?

Answer

Yield for 9 months = (153.33 x 9/12) = 115%

Market value of Investments as on 31.03.2008 = 1,00,000/- + (1,00,000x 115%)

= ₹2,15,000/-

Therefore, NAV as on 31.03.2008 = (2,15,000-10,000)/10,000= ₹20.50

(NAV would stand reduced to the extent of dividend payout, being (10,000x10x10%) = ₹10,000)

Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹10,000}{₹\ 20.50}$ = 487.80 units

Therefore, units as on 31.03.2008 = 10, 000+ 487.80 = 10,487.80

[Alternately, units as on 31.03.2008 = (2,15,000/20.50) = 10,487.80]

Dividend as on 31.03.2009 = 10,487.80 x 10 x 0.2 = ₹20,975.60

Let X be the NAV on 31.03.2009, then number of new units reinvested will be ₹ 20,975.60/X. Accordingly 11296.11 units shall consist of reinvested units and 10487.80 (as on 31.03.2008). Thus, by way of equation it can be shown as follows:

$$11296.11 = \frac{20975.60}{X} + 10487.80$$

Therefore, NAV as on 31.03.2009 = 20,975.60/(11,296.11- 10,487.80)

= ₹25.95

NAV as on 31.03.2010 = ₹ 1,00,000 (1+0.7352x33/12)/11296.11

= ₹ 26.75

Question 25

On 01-07-2010, Mr. X Invested ₹ 50,000/- at initial offer in Mutual Funds at a face value of ₹ 10 each per unit. On 31-03-2011, a dividend was paid @ 10% and annualized yield was 120%. On 31-03-2012, 20% dividend and capital gain of ₹ 0.60 per unit was given. Mr. X

redeemed all his 6271.98 units when his annualized yield was 71.50% over the period of holding. Calculate NAV as on 31-03-2011, 31-03-2012 and 31-03-2013.

For calculations consider a year of 12 months.

Answer

Yield for 9 months (120% x 9/12) = 90%

Market value of Investments as on 31.03.2011= ₹ 50,000/- + (₹ 50,000x 90%)= ₹ 95,000/

Therefore, NAV as on 31.03.2011 = (₹ 95,000 - ₹ 5,000)/5,000 = ₹ 18.00

Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹\ 5,000}{₹\ 18}$ = 277.78 unit

Therefore, units as on 31.03.2011 = 5,000 + 277.78 = 5,277.78

Alternatively, units as on 31.03.2011 = (₹ 95,000/₹18)= 5,277.78

Dividend as on 31.03.2012= 5,277.78 x ₹ 10 x 0.2 = ₹10,555.56

Capital Gain (5277.78 x ₹ 0.60) = ₹ 3,166.67

= ₹13,722.23

Let X be the NAV on 31.03.2012, then number of new units reinvested will be ₹13,722.23/X.

Accordingly, 6,271.98 units shall consist of reinvested units and 5277.78 (as on 31.03.2011).

Thus, by way of equation it can be shown as follows:

$6{,}271.98 = \frac{₹\ 13{,}722.23}{X} + 5{,}277.78$

Therefore, NAV as on 31.03.2012 = ₹ 13,722.23/(6,271.98 – 5,277.78) = ₹ 13.80

NAV as on 31.03.2013 = ₹ 50,000 (1+0.715x33/12)/6,271.98 = ₹ 23.65

Question 26

Mr. X on 1.7.2012, during the initial public offer of a Mutual Fund (MF) invested ₹ 1,00,000 at Face Value of ₹ 10. On 31.3.2013, the MF declared a dividend of 10% when Mr. X calculated that his holding period return was 115%. On 31.3.2014, MF again declared a dividend of 20%. On 31.3.2015, Mr. X redeemed all his investment which had accumulated to 11,296.11 units when his holding period return was 202.17%.

Calculate the NAVs as on 31.03.2013, 31.03.2014 and 31.03.2015.

Answer

Yield for 9 months = 115%

Market value of Investments as on 31.03.2013 = 1,00,000/- + (1,00,000x 115%)

= ₹ 2,15,000/-

Therefore, NAV as on 31.03.2013 = (2,15,000-10,000)/10,000 = ₹ 20.50

(NAV would stand reduced to the extent of dividend payout, being (₹100,000 x 10%) = ₹ 10,000)

Since dividend was reinvested by Mr. X, additional units acquired

$$= \frac{₹\ 10,000}{₹\ 20.50} = 487.80 \text{ units}$$

Therefore, units as on 31.03.2013 = 10,000+ 487.80 = 10,487.80

[Alternately, units as on 31.03.2013 = (2,15,000/20.50) = 10,487.80]

Dividend as on 31.03.2014 = 10,487.80 x 10 x 0.2 = ₹ 20,975.60

Let X be the NAV on 31.03.2014, then number of new units reinvested will be ₹ 20,975.60/X. Accordingly 11296.11 units shall consist of reinvested units and 10487.80 (as on 31.03.2013). Thus, by way of equation it can be shown as follows:

$$11296.11 = \frac{20975.60}{X} + 10487.80$$

Therefore, NAV as on 31.03.2014 = 20,975.60/(11,296.11- 10,487.80)

= ₹ 25.95

NAV as on 31.03.2015 = ₹ 1,00,000 (1+2.0217)/11296.11

= ₹ 26.75

Question 27

A Mutual Fund having 300 units has shown its NAV of ₹8.75 and ₹9.45 at the beginning and at the end of the year respectively. The Mutual Fund has given two options:

(i) Pay ₹0.75 per unit as dividend and ₹0.60 per unit as a capital gain, or

(ii) These distributions are to be reinvested at an average NAV of ₹8.65 per unit.

What difference it would make in terms of return available and which option is preferable?

Answer

(i) Returns for the year

(All changes on a Per -Unit Basis)

Change in Price:	₹ 9.45 – ₹8.75 = ₹ 0.70
Dividends received:	₹ 0.75
Capital gains distribution	₹ 0.60
Total reward	₹ 2.05

Holding period reward: $\frac{₹2.05}{₹8.75} \times 100 = 23.43\%$

(ii) When all dividends and capital gains distributions are re-invested into additional units of the fund @ (₹ 8.65/unit)

Dividend + Capital Gains per unit

= ₹ 0.75 + ₹ 0.60 = ₹ 1.35

Total received from 300 units = ₹1.35 x 300 = ₹405/-.

Additional Units Acquired

= ₹405/₹8.65 = 46.82 Units.

Total No.of Units = 300 units + 46.82 units = 346.82 units.

Value of 346.82 units held at the end of the year

= 346.82 units x ₹9.45 = ₹3277.45

Price Paid for 300 Units at the beginning of the year

= 300 units x ₹8.75 = ₹2,625.00

Holding Period Reward

₹ (3277.45 – 2625.00) = ₹652.45

Holding Period Reward = $\frac{₹652.45}{₹2625.00} \times 100 = 24.85\%$

Conclusion: Since the holding period reward is more in terms of percentage in option-two i.e., reinvestment of distributions at an average NAV of ₹8.65 per unit, this option is preferable.

Question 28

On 1-4-2012 ABC Mutual Fund issued 20 lakh units at ₹ 10 per unit. Relevant initial expenses involved were ₹ 12 lakhs. It invested the fund so raised in capital market instruments to build a portfolio of ₹ 185 lakhs. During the month of April 2012 it disposed off some of the instruments costing ₹ 60 lakhs for ₹ 63 lakhs and used the proceeds in purchasing securities for ₹ 56 lakhs. Fund management expenses for the month of April 2012 was ₹ 8 lakhs of which 10% was in arrears. In April 2012 the fund earned dividends amounting to ₹ 2 lakhs and it distributed 80% of the realized earnings. On 30-4-2012 the market value of the portfolio was ₹ 198 lakhs.

Mr. Akash, an investor, subscribed to 100 units on 1-4-2012 and disposed off the same at closing NAV on 30-4-2012. What was his annual rate of earning?

Answer

	Amount in ₹ lakhs	Amount in ₹ lakhs	Amount in ₹ lakhs
Opening Bank (200 - 185 -12)	3.00		
Add: Proceeds from sale of securities	63.00		
Add: Dividend received	2.00	68.00	
Deduct:			
Cost of securities purchased	56.00		
Fund management expenses paid (90% of 8)	7.20		
Capital gains distributed = 80% of (63 – 60)	2.40		
Dividend distributed =80% of 2.00	1.60	67.20	
Closing Bank			0.80
Closing market value of portfolio			198.00
			198.80
Less: Arrears of expenses			0.80
Closing Net Assets			198.00
Number of units (Lakhs)			20
Closing NAV per unit (198.00/20)			9.90

Rate of Earning (Per Unit)

	Amount
Income received (₹ 2.40 + ₹ 1.60)/20	₹ 0.20
Loss: Loss on disposal (₹ 200 - ₹ 198)/20	₹ 0.10
Net earning	₹ 0.10
Initial investment	₹ 10.00
Rate of earning (monthly)	1%
Rate of earning (Annual)	12%

Question 29

Sun Moon Mutual Fund (Approved Mutual Fund) sponsored open-ended equity oriented scheme "Chanakya Opportunity Fund". There were three plans viz. 'A' – Dividend Re-investment Plan, 'B' – Bonus Plan & 'C' – Growth Plan.

At the time of Initial Public Offer on 1.4.1999, Mr. Anand, Mr. Bacchan & Mrs. Charu, three investors invested ₹ 1,00,000 each & chosen 'B', 'C' & 'A' Plan respectively.

The History of the Fund is as follows:

Date	*Dividend %*	Bonus Ratio	*Net Asset Value per Unit (F.V. ₹10)*		
			Plan A	*Plan B*	*Plan C*
28.07.2003	*20*		*30.70*	*31.40*	*33.42*
31.03.2004	*70*	*5 : 4*	*58.42*	*31.05*	*70.05*
31.10.2007	*40*		*42.18*	*25.02*	*56.15*
15.03.2008	*25*		*46.45*	*29.10*	*64.28*
31.03.2008		*1 : 3*	*42.18*	*20.05*	*60.12*
24.03.2009	*40*	*1 : 4*	*48.10*	*19.95*	*72.40*
31.07.2009			*53.75*	*22.98*	*82.07*

On 31st July 2009, all three investors redeemed all the balance units.

Calculate annual rate of return to each of the investors.

Consider:

1. *Long-term Capital Gain is exempt from Income tax.*
2. *Short-term Capital Gain is subject to 10% Income tax.*
3. *Security Transaction Tax 0.2 per cent only on sale/redemption of units.*
4. *Ignore Education Cess*

Answer

Mrs. Charu Plan A Dividend Reinvestment

(Amount in ₹)

Date	*Investment*	*Dividend payout (%)*	*Dividend Re-invested (Closing Units X Face value of ₹10 X Dividend Payout %)*	*NAV*	*Units*	*Closing Unit Balance ∑ Units*
01.04.1999	1,00,000.00			10.00	10,000.00	10,000.00
28.07.2003		*20*	20,000.00	30.70	651.47	10,651.47
31.03.2004		*70*	74,560.29	58.42	1,276.28	11,927.75
30.10.2007		*40*	47,711.00	42.18	1,131.13	13,058.88
15.03.2008		*25*	32,647.20	46.45	702.85	13,761.73
24.03.2009		40	55,046.92	48.10	1,144.43	14,906.16

Redemption value 14,906.16 × 53.75	8,01,206.10
Less: Security Transaction Tax (STT) is 0.2%	1,602.41
Net amount received	7,99,603.69
Less: Short term capital gain tax @ 10% on 1,144.43 (53.64* – 48.10≈) = 6,340	634
Net of tax	7,98,969.69
Less: Investment	1,00,000.00
	6,98,969.69

*(53.75 – STT @ 0.2%) ≈ This value can also be taken as zero

Annual average return (%) $\frac{6,98,969.69}{1,00,000} \times \frac{12}{124} \times 100 = 67.64\ \%$

Mr. Anand Plan B – Bonus

(Amount in ₹)

Date	*Units*	*Bonus units*	*Total Balance*	*NAV per unit*
01.04.1999	10,000		10,000	10
31.03.2004		12,500	22,500	31.05
31.03.2008		7,500	30,000	20.05
24.03.2009		7,500	37,500	19.95

Redemption value 37,500 × 22.98	8,61,750.00
Less: Security Transaction Tax (STT) is 0.2%	1,723.50
Net amount received	8,60,026.50
Less: Short term capital gain tax @ 10%	
7,500 × (22.93† – 19.95) = 22,350	2,235.00
Net of tax	8,57,791.50
Less: Investment	1,00,000.00
Net gain	7,57,791.50

†(22.98 – STT @ 0.2%)

Annual average return (%) $\frac{7,57,791.50}{1,00,000} \times \frac{12}{124} \times 100 = 73.33\ \%$

Mr. Bacchan Plan C – Growth

Particulars	*(Amount in ₹)*
Redemption value 10,000 × 82.07	8,20,700.00
Less: Security Transaction Tax (S.T.T) is .2%	1,641.40
Net amount received	8,19,058.60
Less: Short term capital gain tax @ 10%	0.00
Net of tax	8,19,058.60
Less: Investment	1,00,000.00
Net gain	7,19,058.60

Annual average return (%) $\frac{7,19,058}{1,00,000} \times \frac{12}{124} \times 100 = 69.59\ \%$

Note: Alternatively, figure of * and † can be taken as without net of Tax because, as per Proviso 5 of Section 48 of IT Act, no deduction of STT shall be allowed in computation of Capital Gain.

Question 30

A mutual fund company introduces two schemes i.e. Dividend plan (Plan-D) and Bonus plan (Plan-B).The face value of the unit is ₹ 10. On 1-4-2005 Mr. K invested ₹ 2,00,000 each in Plan-D and Plan-B when the NAV was ₹ 38.20 and ₹ 35.60 respectively. Both the plans matured on 31-3-2010.

Particulars of dividend and bonus declared over the period are as follows:

Date	***Dividend***	***Bonus***	***Net Asset Value (₹)***	
	%	***Ratio***	***Plan D***	***Plan B***
30-09-2005	*10*		*39.10*	*35.60*
30-06-2006		*1:5*	*41.15*	*36.25*
31-03-2007	*15*		*44.20*	*33.10*
15-09-2008	*13*		*45.05*	*37.25*
30-10-2008		*1:8*	*42.70*	*38.30*
27-03-2009	*16*		*44.80*	*39.10*
11-04-2009		*1:10*	*40.25*	*38.90*
31-03-2010			*40.40*	*39.70*

What is the effective yield per annum in respect of the above two plans?

Answer

Plan – D

Unit acquired = $\frac{2,00,000}{38.20}$ = 5235.60

Date	*Units held*	*Dividend*		*Reinvestment*	*New*	*Total*
		%	*Amount*	*Rate*	*Units*	*Units*
01.04.2005						5235.60
30.09.2005	5235.60	10	5235.60	39.10	133.90	5369.50
31.03.2007	5369.50	15	8054.25	44.20	182.22	5551.72
15.09.2008	5551.72	13	7217.24	45.05	160.20	5711.92
27.03.2009	5711.92	16	9139.07	44.80	204	5915.92
31.03.2010	Maturity Value		(₹ 40.40 X 5915.92)			₹ 2,39,003.17
	Less: Cost of Acquisition					₹ 2,00,000.00
	Total Gain					₹ 39,003.17

$\therefore$ Effective Yield = $\frac{₹39,003.17}{₹2,00,000} \times \frac{1}{5} \times 100$ = 3.90%

Alternatively, it can be computed by using the IRR method as follows:

NPV at 4% = -2,00,000 + 1,96,443 = -3,557

NPV at 2% = -2,00,000 + 2,16,473 = 16,473

IRR= $LR + \frac{\text{NPV at LR}}{\text{NPV at LR - NPV at HR}}(HR - LR)$ = $2\% + \frac{16473}{16473 - (-3557)}(4\% - 2\%)$ = 3.645%

Plan – B

Date	Particulars	Calculation Working	No. of Units	NAV (₹)
1.4.05	Investment	₹2,00,000/35.60=	5617.98	35.60
30.6.06	Bonus	5617.98/5 =	1123.60	36.25
			6741.58	
30.10.08	"	6741.58/8 =	842.70	38.30
			7584.28	
11.4.09	"	7584.28/10 =	758.43	38.90
			8342.71	
31.3.10	Maturity Value	8342.71 x ₹ 39.70=		3,31,205.59

	Less: Investment		2,00,000.00
	Gain		1,31,205.59

$$\therefore \text{Effective Yield } \frac{1,31,205.59}{2,00,000} \times \frac{1}{5} \times 100 = 13.12\%$$

Alternatively, it can be computed by using the IRR method as follows:

NPV at 13% = -2,00,000 + 1,79,765 = -20,235

NPV at 8% = -2,00,000 + 2,25,413 = 25,413

$$\text{IRR} = \text{LR} + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} (\text{HR} - \text{LR}) = 8\% + \frac{25413}{25413 - (-20235)} (13\% - 8\%) = 10.78\%$$

Question 31

A mutual fund made an issue of 10,00,000 units of ₹ 10 each on January 01, 2008. No entry load was charged. It made the following investments:

Particulars	*₹*
50,000 Equity shares of ₹ 100 each @ ₹ 160	*80,00,000*
7% Government Securities	*8,00,000*
9% Debentures (Unlisted)	*5,00,000*
10% Debentures (Listed)	*5,00,000*
	98,00,000

During the year, dividends of ₹ 12,00,000 were received on equity shares. Interest on all types of debt securities was received as and when due. At the end of the year equity shares and 10% debentures are quoted at 175% and 90% respectively. Other investments are at par.

Find out the Net Asset Value (NAV) per unit given that operating expenses paid during the year amounted to ₹ 5,00,000. Also find out the NAV, if the Mutual fund had distributed a dividend of ₹ 0.80 per unit during the year to the unit holders.

Answer

In order to find out the NAV, the cash balance at the end of the year is calculated as follows-

Particulars	**₹**
Cash balance in the beginning	
(₹ 100 lakhs – ₹ 98 lakhs)	2,00,000
Dividend Received	12,00,000
Interest on 7% Govt. Securities	56,000

Interest on 9% Debentures	45,000
Interest on 10% Debentures	50,000
	15,51,000
(-) Operating expenses	5,00,000
Net cash balance at the end	10,51,000
Calculation of NAV	₹
Cash Balance	10,51,000
7% Govt. Securities (at par)	8,00,000
50,000 equity shares @ ₹ 175 each	87,50,000
9% Debentures (Unlisted) at cost	5,00,000
10% Debentures @90%	4,50,000
Total Assets	1,15,51000
No. of Units	10,00,000
NAV per Unit	₹ 11.55

Calculation of NAV, if dividend of ₹ 0.80 is paid –

Net Assets (₹ 1,15,51,000 – ₹ 8,00,000)	₹ 1,07,51,000
No. of Units	10,00,000
NAV per unit	₹ 10.75

Question 32

Based on the following information, determine the NAV of a regular income scheme on per unit basis:

Particulars	***₹ Crores***
Listed shares at Cost (ex-dividend)	*20*
Cash in hand	*1.23*
Bonds and debentures at cost	*4.3*
Of these, bonds not listed and quoted	*1*
Other fixed interest securities at cost	*4.5*
Dividend accrued	*0.8*
Amount payable on shares	*6.32*
Expenditure accrued	*0.75*
Number of units (₹ 10 face value)	*20 lacs*

Current realizable value of fixed income securities of face value of ₹ 100	*106.5*
The listed shares were purchased when Index was	*1,000*
Present index is	*2,300*
Value of listed bonds and debentures at NAV date	*8*

There has been a diminution of 20% in unlisted bonds and debentures. Other fixed interest securities are at cost.

Answer

Particulars	**Adjusted Values** ₹ crores
Equity Shares	46.00
Cash in hand	1.23
Bonds and debentures not listed	0.80
Bonds and debentures listed	8.00
Dividends accrued	0.80
Fixed income securities	4.50
Sub total assets (A)	**61.33**
***Less:* Liabilities**	
Amount payable on shares	6.32
Expenditure accrued	0.75
Sub total liabilities (B)	**7.07**
Net Assets Value (A) – (B)	**54.26**
No. of units	20,00,000
Net Assets Value per unit (₹ 54.26 crore / 20,00,000)	₹ 271.30

Question 33

Based on the following data, estimate the Net Asset Value (NAV) on per unit basis of a Regular Income Scheme of a Mutual Fund:

	₹ (in lakhs)
Listed Equity shares at cost (ex-dividend)	*40.00*
Cash in hand	*2.76*
Bonds & Debentures at cost	*8.96*
Of these, Bonds not listed & not quoted	*2.50*
Other fixed interest securities at cost	*9.75*
Dividend accrued	*1.95*
Amount payable on shares	*13.54*
Expenditure accrued	*1.76*

Current realizable value of fixed income securities of face value of ₹ 100 is ₹ 96.50.

Number of Units (₹ 10 face value each): 275000

All the listed equity shares were purchased at a time when market portfolio index was 12,500. On NAV date, the market portfolio index is at 19,975.

There has been a diminution of 15% in unlisted bonds and debentures valuation.

Listed bonds and debentures carry a market value of ₹ 7.5 lakhs, on NAV date.

Operating expenses paid during the year amounted to ₹ 2.24 lakhs.

Answer

Particulars	Adjusted Value ₹ lakhs
Equity Shares	63.920
Cash in hand	2.760
Bonds and debentures not listed	2.125
Bonds and debentures listed	7.500
Dividends accrued	1.950
Fixed income securities	9.409
Sub total assets (A)	87.664
Less: Liabilities	
Amount payable on shares	13.54
Expenditure accrued	1.76
Sub total liabilities (B)	15.30
Net Assets Value (A) – (B)	72.364
No. of units	2,75,000
Net Assets Value per unit (₹ 72.364 lakhs / 2,75,000)	₹ 26.3142

Question 34

On 1st April, an open ended scheme of mutual fund had 300 lakh units outstanding with Net Assets Value (NAV) of ₹ 18.75. At the end of April, it issued 6 lakh units at opening NAV plus 2% load, adjusted for dividend equalization. At the end of May, 3 Lakh units were repurchased at opening NAV less 2% exit load adjusted for dividend equalization. At the end of June, 70% of its available income was distributed.

In respect of April-June quarter, the following additional information are available:

	₹ in lakh
Portfolio value appreciation	*425.47*
Income of April	*22.950*
Income for May	*34.425*
Income for June	*45.450*

You are required to calculate

(i) Income available for distribution;

(ii) Issue price at the end of April;

(iii) repurchase price at the end of May; and

(iv) net asset value (NAV) as on 30th June.

Answer

Calculation of Income available for Distribution

	Units (Lakh)	Per Unit (₹)	Total (₹ In lakh)
Income from April	300	0.0765	22.9500
Add: Dividend equalization collected on issue	6	0.0765	0.4590
	306	0.0765	23.4090
Add: Income from May		0.1125	34.4250
	306	0.1890	57.8340
Less: Dividend equalization paid on repurchase	3	0.1890	(0.5670)
	303	0.1890	57.2670
Add: Income from June		0.1500	45.4500
	303	0.3390	102.7170
Less: Dividend Paid		0.2373	(71.9019)
	303	0.1017	30.8151

Calculation of Issue Price at the end of April

	₹
Opening NAV	18.750
Add: Entry Load 2% of ₹ 18.750	(0.375)

	19.125
Add: Dividend Equalization paid on Issue Price	0.0765
	19.2015

Calculation of Repurchase Price at the end of May

	₹
Opening NAV	18.750
Less: Exit Load 2% of ₹ 18.750	(0.375)
	18.375
Add: Dividend Equalization paid on Issue Price	0.1890
	18.564

Closing NAV

		₹ (Lakh)
Opening Net Asset Value (₹ 18.75 × 300)		5625.0000
Portfolio Value Appreciation		425.4700
Issue of Fresh Units (6 × 19.2015)		115.2090
Income Received (22.950 + 34.425 + 45.450)		102.8250
		6268.504
Less: Units repurchased (3 × 18.564)	-55.692	
Income Distributed	-71.9019	(-127.5939)
Closing Net Asset Value		6140.9101
Closing Units (300 + 6 – 3) lakh		303 lakh
∴ Closing NAV as on 30th June		₹ 20.2670

Question 35

Five portfolios experienced the following results during a 7- year period:

Portfolio	*Average Annual Return (R_p) (%)*	*Standard Deviation (S_p)*	*Correlation with the market returns (r)*
A	*19.0*	*2.5*	*0.840*
B	*15.0*	*2.0*	*0.540*
C	*15.0*	*0.8*	*0.975*
D	*17.5*	*2.0*	*0.750*

E	*17.1*	*1.8*	*0.600*
Market Risk (σm)		*1.2*	
Market rate of Return (R_m)	*14.0*		
Risk-free Rate (R_f)	*9.0*		

Rank the portfolios using (a) Sharpe's method, (b) Treynor's method and (c) Jensen's Alpha

Answer

Let portfolio standard deviation be σ_p

Market Standard Deviation = σ_m

Coefficient of correlation = r

Portfolio beta (β_p) = $\frac{\sigma_p r}{\sigma_m}$

Required portfolio return (R_p) = $R_f + \beta_p (R_m - R_f)$

Portfolio	*Beta*	*Return from the portfolio (R_p) (%)*
A	1.75	17.75
B	0.90	13.50
C	0.65	12.25
D	1.25	15.25
E	0.90	13.50

Portfolio	*Sharpe Method*		*Treynor Method*		*Jensen's Alpha*	
	Ratio	*Rank*	*Ratio*	*Rank*	*Ratio*	*Rank*
A	4.00	IV	5.71	V	1.25	V
B	3.00	V	6.67	IV	1.50	IV
C	7.50	I	9.23	I	2.75	II
D	4.25	III	6.80	III	2.25	III
E	4.50	II	9.00	II	3.60	I

Question 36

There are two Mutual Funds viz. D Mutual Fund Ltd. and K Mutual Fund Ltd. Each having close ended equity schemes.

NAV as on 31-12-2014 of equity schemes of D Mutual Fund Ltd. is ₹ 70.71 (consisting 99% equity and remaining cash balance) and that of K Mutual Fund Ltd. is 62.50 (consisting 96% equity and balance in cash).

Following is the other information:

Particular	***Equity Schemes***	
	D Mutual Fund Ltd.	***K Mutual Fund Ltd.***
Sharpe Ratio	*2*	*3.3*
Treynor Ratio	*15*	*15*
Standard deviation	*11.25*	*5*

There is no change in portfolios during the next month and annual average cost is ₹ 3 per unit for the schemes of both the Mutual Funds.

If Share Market goes down by 5% within a month, calculate expected NAV after a month for the schemes of both the Mutual Funds.

For calculation, consider 12 months in a year and ignore number of days for particular month.

Answer

Working Notes:

(i) Decomposition of Funds in Equity and Cash Components

	D Mutual Fund Ltd.	**K Mutual Fund Ltd.**
NAV on 31.12.14	₹ 70.71	₹ 62.50
% of Equity	99%	96%
Equity element in NAV	₹ 70	₹ 60
Cash element in NAV	₹ 0.71	₹ 2.50

(ii) Calculation of Beta

(a) D Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 2 = \frac{E(R) - R_f}{\sigma_D} = \frac{E(R) - R_f}{11.25}$$

$$E(R) - R_f = 22.50$$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_D} = \frac{22.50}{\beta_D}$$

$$\beta_D = 22.50/15 = 1.50$$

(b) K Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 3.3 = \frac{E(R) - R_f}{\sigma_K} = \frac{E(R) - R_f}{5}$$

$$E(R) - R_f = 16.50$$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_K} = \frac{16.50}{\beta_K}$$

$$\beta_K = 16.50/15 = 1.10$$

(iii) Decrease in the Value of Equity

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Market goes down by	5.00%	5.00%
Beta	1.50	1.10
Equity component goes down	7.50%	5.50%

(iv) Balance of Cash after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Cash in Hand on 31.12.14	₹ 0.71	₹ 2.50
Less: Exp. Per month	₹ 0.25	₹ 0.25
Balance after 1 month	₹ 0.46	₹ 2.25

NAV after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Value of Equity after 1 month		
70 x (1 - 0.075)	₹ 64.75	-
60 x (1 - 0.055)	-	₹ 56.70
Cash Balance	0.46	2.25
	65.21	58.95

Question 37

ANP Plan, a hedge fund currently has assets of ₹ 20 crore. CA. X, the manager of fund charges fee of 0.10% of portfolio asset. In addition to it he charges incentive fee of 2%. The incentive will be linked to gross return each year in excess of the portfolio maximum value since the inception of fund. The maximum value the fund achieved so far since inception of fund about one and half year ago was ₹ 21 crores.

You are required to compute the fee payable to CA. X, if return on the fund this year turns out to be (a) 29%, (b) 4.5%, (c) -1.8%

Answer

(a) If return is 29%

	₹
Fixed fee (A) 0.10% of ₹ 20 crore	2,00,000
New Fund Value (1.29 x ₹ 20 crore)	25.80 crore
Excess Value of best achieved (25.8 crore – 21.0 crore)	4.80 crore
Incentive Fee (2% of 4.80 crores) (B)	9,60,000
Total Fee (A)+(B)	11,60,000

(b) If return is 4.5%

	₹
Fixed (A) 0.10% of ₹ 20 crore	2,00,000
New Fund Value (1.045 x ₹ 20 crore)	20.90 crore
Excess Value of best achieved (20.90 crore –21.00 crore)	(₹ 0.10 crore)
Incentive Fee (as does not exceed best achieved) (B)	Nil
Total Fee (A)+(B)	2,00,000

(c) If return is (-1.8%)

No incentive only fixed fee of ₹ 2,00,000 will be paid

Question 38

Ms. Sunidhi is working with an MNC at Mumbai. She is well versant with the portfolio management techniques and wants to test one of the techniques on an equity fund she has constructed and compare the gains and losses from the technique with those from a passive buy and hold strategy. The fund consists of equities only and the ending NAVs of the fund he constructed for the last 10 months are given below:

Month	***Ending NAV (₹/unit)***	***Month***	***Ending NAV (₹/unit)***
December 2008	*40.00*	*May 2009*	*37.00*
January 2009	*25.00*	*June 2009*	*42.00*
February 2009	*36.00*	*July 2009*	*43.00*
March 2009	*32.00*	*August 2009*	*50.00*
April 2009	*38.00*	*September 2009*	*52.00*

Assume Sunidhi had invested a notional amount of ₹ 2 lakhs equally in the equity fund and a conservative portfolio (of bonds) in the beginning of December 2008 and the total portfolio was being rebalanced each time the NAV of the fund increased or decreased by 15%.

*You are **required** to determine the value of the portfolio for each level of NAV following the Constant Ratio Plan.*

Answer

Constant Ratio Plan:

Stock Portfolio NAV (₹)	Value of buy – hold strategy (₹)	Value of Conservative Portfolio (₹)	Value of aggressive Portfolio (₹)	Total value of Constant Ratio Plan (₹)	Revaluation Action	Total No. of units in aggressive portfolio
40.00	2,00,000	1,00,000	1,00,000	2,00,000	-	2500
25.00	1,25,000	1,00,000	62,500	1,62,500	-	2500
	1,25,000	81,250	81,250	1,62,500	Buy 750 units	3250
36.00	1,80,000	81,250	1,17,000	1,98,250	-	3250
	1,80,000	99,125	99,125	1,98,250	Sell 496.53 units	2753.47
32.00	1,60,000	99,125	88,111.04	1,87,236.04	-	2753.47
38.00	1,90,000	99,125	1,04,631.86	2,03,756.86	-	2753.47
	1,90,000	1,01,878.43	1,01,878.43	2,03,756.86	Sell 72.46 units	2681.01
37.00	1,85,000	1,01,878.50	99,197.37	2,01,075.87	-	2681.01
42.00	2,10,000	1,01,878.50	1,12,602.42	2,14,480.92	-	2681.01
43.00	2,15,000	1,01,878.50	1,15,283.43	2,17,161.93	-	2681.01
50.00	2,50,000	1,01,878.50	1,34,050.50	2,35,929	-	2681.01
	2,50,000	1,17,964.50	1,17,964.50	2,35,929	Sell 321.72 units	2359.29
52.00	2,60,000	1,17,964.50	1,22,683.08	2,40,647.58	-	2359.29

Hence, the ending value of the mechanical strategy is ₹ 2,40,647.58 and buy & hold strategy is ₹ 2,60,000.

10
Money Market Operations

BASIC CONCEPTS

1. **Introduction**

The financial system of any country is a conglomeration of sub-markets, viz money, capital and foreign exchange market. The presence of an active and vibrant money market is an essential pre-requisite for the growth and development of an economy. The major players in the money market are the Reserve Bank of India and financial institutions like the UTI, GIC and LIC.

2. **Distinct Features of Money Market**

- Though it is one market but it is a collection /network of various inter-related sub-markets such as call money, notice money, repos, etc.
- Normally activities of money market tend to concentrate in some centres for e.g. London and New York which have become World Financial Centres.
- In true money market, price differentials for assets of similar type tend to be eliminated by interplay of demand and supply.
- There are constant endeavours for introducing new instruments/innovative dealing techniques.

3. **Pre-Conditions for an Efficient Money Market**

Development of money market into a sophisticated market depends upon certain conditions. They are:

- Institutional development.
- Banks and other players in the market have to be licensed and effectively supervised by regulators.
- Demand and supply must exist for idle cash.
- Electronic Fund Transfer (EFT), Depository System, Delivery versus Payment (DVP), High Value Inter-bank Payment System, etc. are pre-requisites.
- Market should have varied instruments with distinctive maturity and risk profiles to meet the varied aptitude of the players in the market.

- Govt. /Central Bank should intervene to moderate liquidity profile.
- Market should be integrated with the rest of the markets in the financial system to ensure perfect equilibrium.

4. **Rigidities in the Indian Money Market**

Indian money market suffers from following rigidities:

- Markets not integrated,
- Highly volatile,
- Interest rates not properly aligned,
- Restricted players,
- Influence used by supply sources,
- Limited Instruments,
- Reserve requirements, and
- Lack of Transparency.

5. **Distinction between Capital and Money Market**

Following are some of the major distinctions between money market and capital market:

Basis	Capital Market	Money Market
1. Classification	Primary Market and Secondary Market	No such classification
2. Requirement	Deals with funds for long-term requirement	Deals with supply of short-term requirements
3. Number of Instruments	Only shares and debentures	Many like CPs, T-Bills, etc
4. Players	General investors, brokers, Merchant Bankers, Registrar to the Issue, Underwriters, Corporate investors, FIIs and bankers.	Bankers, RBI and Government.

6. **Vaghul Group Report**

The RBI appointed a working group under the chairmanship of Shri N. Vaghul in September 1986. The recommendations of the working group laid foundation for systematic action by RBI for the development of the Indian money market.

The Committee outlined the conceptual framework in the form of broad objectives of the money market which are as follows:

- Money market should provide an equilibrating mechanism for evening out short-term surpluses and deficits.
- It should provide a focal point for influencing liquidity in the economy.
- It should provide reasonable access to users of short-term money to meet their requirements at a realistic price.

7. **Institutions**

The important institutions operating in money market are:

- RBI – Takes requisite measures to implement monetary policy of the country.
- **Scheduled Commercial Banks** – They form the most important borrower/supplier of short term funds.
- **Discount and Finance House of India (DFHI)** – Set up by RBI jointly with public sector banks and all-India financial institutions to deal in short-term money market instruments.

8. **Instruments**

The traditional short-term money market instruments consist mainly of call money and notice money with limited players, treasury and commercial bills. The new instruments were introduced giving a wider choice to short-term holders of money to reap yield on funds even for a day or to earn little more by parking funds by instruments for a few days more or until such time they need it for lending at a higher rate.

The instruments used by various players to borrow and lend money are as follows:

- **Call/Notice Money:** Call money refers to that transaction which is received or delivered by the participants in the call money market and where the funds are returnable next day. Notice money on the other hand is a transaction where the participants receive or deliver for more than two days but generally for a maximum of fourteen days.
- **Inter-bank term money:** the DFIs are permitted to borrow from the market for a period of 3 months upto a period of not more than 6 months within the limits stipulated by RBI.
- **Inter-bank participation certificates (IBPC):** It is a short-term money market instrument by which the banks can raise money or deploy short term surplus.
- **Inter corporate deposits:** They are short-term borrowing and lending of funds amongst the corporations.
- **Treasury Bills:** They are short-term instruments issued by RBI on behalf of the Government of India to tide over short-term liquidity shortfalls.
- **Commercial Bills:** It is a written instrument containing unconditional order signed by the maker, directing to pay a certain amount of money only to a particular

person, or to the bearer of the instrument.

- **Certificate and Deposits (CDs):** They are money market instruments in form of usance Promissory Notes issued at a discount and are negotiable in character. There is a lock-in-period of 15 days, after which they can be sold.
- **Commercial Papers:** They are debt instruments for short-term borrowings that enable highly-rated corporate borrowers to diversify their sources of short-term borrowings and provide an additional financial instrument to investors with a freely negotiable interest rate.

9. **Determination of Interest Rates**

Call money rates were regulated in the past by the RBI or by a voluntary agreement between the participants through the intermediation of the Indian Bank Association (IBA). Now, the interest rates have been regulated and left to the market forces of demand for and supply of short-term money as a part of the financial sector reforms.

10. **Recent Development in Money Market**

Debt Securitisation: It means converting retail loans into whole sale loans. The philosophy behind the arrangement is that an individual body cannot go on lending sizable amount for about a longer period continuously but if loan amount is divided in small pieces and made transferable like negotiable instruments in the secondary market, it becomes easy to finance large projects having long gestation period.

Money Market Mutual Funds (MMMFs): These Mutual Funds are primarily intended for individual investors including NRIs who may invest on a non-repatriable basis.

Repurchase Options (Repo) and Ready Forward (RFS) Contracts: Under this transaction the borrower places with lender certain acceptable securities against funds received and agrees to reverse this transaction on a pre-determined future date at an agreed interest cost. While Ready Forward transaction are structured to suit the requirements of both borrowers/ and lenders and have therefore, become extremely popular mode of raising/investing short-term funds.

Question 1

Write a short note on commercial paper.

Answer

A commercial paper is an unsecured money market instrument issued in the form of a promissory note. Since the CP represents an unsecured borrowing in the money market, the regulation of CP comes under the purview of the Reserve Bank of India which issued guidelines in 1990 on the basis of the recommendations of the Vaghul Working Group. These guidelines were aimed at:

(i) Enabling the highly rated corporate borrowers to diversify their sources of short term

borrowings, and

(ii) To provide an additional instrument to the short term investors.

It can be issued for maturities between 7 days and a maximum upto one year from the date of issue. These can be issued in denominations of Rs. 5 lakh or multiples therefore. All eligible issuers are required to get the credit rating from credit rating agencies.

Eligibility criteria for issuer of commercial paper

The companies satisfying the following conditions are eligible to issue commercial paper.

- The tangible net worth of the company is Rs. 5 crores or more as per audited balance sheet of the company.
- The fund base working capital limit is not less than Rs. 5 crores.
- The company is required to obtain the necessary credit rating from the rating agencies such as CRISIL, ICRA etc.
- The issuers should ensure that the credit rating at the time of applying to RBI should not be more than two months old.
- The minimum current ratio should be 1.33:1 based on classification of current assets and liabilities.
- For public sector companies there are no listing requirement but for companies other than public sector, the same should be listed on one or more stock exchanges.
- All issue expenses shall be borne by the company issuing commercial paper.

Question 2

Write a short note on Treasury bills.

Answer

Treasury Bills: Treasury bills are short-term debt instruments of the Central Government, maturing in a period of less than one year. Treasury bills are issued by RBI on behalf of the Government of India for periods ranging from 14 days to 364 days through regular auctions. They are highly liquid instruments and issued to tide over short-term liquidity shortfalls.

Treasury bills are sold through an auction process according to a fixed auction calendar announced by the RBI. Banks and primary dealers are the major bidders in the competitive auction process. Provident Funds and other investors can make non-competitive bids. RBI makes allocation to non-competitive bidders at a weighted average yield arrived at on the basis of the yields quoted by accepted competitive bids. These days the treasury bills are becoming very popular on account of falling interest rates. Treasury bills are issued at a discount and redeemed at par. Hence, the implicit yield on a treasury bill is a function of the size of the discount and the period of maturity. Now, these bills are becoming part of debt market. In India, the largest holders of the treasury bills are commercial banks, trust, mutual

funds and provident funds. Although the degree of liquidity of treasury bills are greater than trade bills, they are not self liquidating as the genuine trade bills are. T-bills are claim against the government and do not require any grading or further endorsement or acceptance.

Question 3

Explain briefly 'Call Money' in the context of financial market.

Answer

Call Money: The Call Money is a part of the money market where, day to day surplus funds, mostly of banks, are traded. Moreover, the call money market is most liquid of all short-term money market segments.

The maturity period of call loans vary from 1 to 14 days. The money that is lent for one day in call money market is also known as 'overnight money'. The interest paid on call loans are known as the call rates. The call rate is expected to freely reflect the day-to-day lack of funds. These rates vary from day-to-day and within the day, often from hour-to-hour. High rates indicate the tightness of liquidity in the financial system while low rates indicate an easy liquidity position in the market.

In India, call money is lent mainly to even out the short-term mismatches of assets and liabilities and to meet CRR requirement of banks. The short-term mismatches arise due to variation in maturities i.e. the deposits mobilized are deployed by the bank at a longer maturity to earn more returns and duration of withdrawal of deposits by customers vary. Thus, the banks borrow from call money markets to meet short-term maturity mismatches.

Moreover, the banks borrow from call money market to meet the cash Reserve Ratio (CRR) requirements that they should maintain with RBI every fortnight and is computed as a percentage of Net Demand and Time Liabilities (NDTL).

Question 4

What is money market? What are its features? What kind of inefficiencies it is suffering from?

Answer

In a wider spectrum, a money market can be defined as a market for short-term money and financial assets that are near substitutes for money with minimum transaction cost.

Features:

- The term short-term means generally a period upto one year and near substitutes to money is used to denote any financial asset which can be quickly converted into money.
- Low cost.
- It provides an avenue for equilibrating the short-term surplus funds of lenders and the requirements of borrowers.
- It, thus, provides a reasonable access to the users of short term money to meet their requirements at realistic prices.

- The money market can also be defined as a centre in which financial institutions congregate for the purpose of dealing impersonally in monetary assets.

Inefficiencies:

(i) Markets not integrated,

(ii) High volatility,

(iii) Interest rates not properly aligned,

(iv) Players restricted,

(v) Supply based-sources influence uses,

(vi) Not many instruments,

(vii) Players do not alternate between borrowing and lending,

(viii) Reserve requirements,

(ix) Lack of transparency,

(x) Inefficient Payment Systems,

(xi) Seasonal shortage of funds,

(xii) Commercial transactions are mainly in cash, and

(xiii) Heavy Stamp duty limiting use of exchange bills

Question 5

Distinguish between Money market and Capital Market.

Answer

The capital market deals in financial assets. Financial assets comprises of shares, debentures, mutual funds etc. The capital market is also known as stock market.

Stock market and money market are two basic components of Indian financial system. Capital market deals with long and medium term instruments of financing while money market deals with short term instruments.

Some of the points of distinction between capital market and money market are as follows:

	Money Market	Capital Market
(i)	There is no classification between primary market and secondary market	There is a classification between primary market and secondary market.
(ii)	It deals for funds of short-term requirement (less than a year).	It deals with funds of long-term requirement (more than 1 year).
(iii)	Money market instruments include interbank call money, notice money upto	Capital Market instruments are shares and debt instruments.

	14 days, short-term deposits upto three months, commercial paper, 91 days treasury bills.	
(iv)	Money market participants are banks, financial institution, RBI and Government.	Capital Market participants include retail investors, institutional investors like Mutual Funds, Financial Institutions, corporate and banks.
(v)	Supplies funds for working capital requirement.	Supplies funds for fixed capital requirements.
(vi)	Each single instrument is of a large amount.	Each single instrument is of a small amount.
(vii)	Risk involved in money market is less due to smaller term of maturity. In short term the risk of default is less.	Risk is higher
(viii)	Transactions take place over phone calls. Hence there is no formal place for transactions.	Transactions are at a formal place viz. the stock exchange.
(ix)	The basic role of money market is liquidity adjustment.	The basic role of capital market includes putting capital to work, preferably to long term, secure and productive employment.
(x)	Closely and directly linked with the Central Bank of India	The Capital market feels the influence of the Central Bank but only indirectly and through the money market
(xi)	Commercial Banks are closely regulated.	The institutions are not much regulated.

Question 6

Write a short note on Inter Bank Participation Certificate.

Answer

Inter Bank Participation Certificate (IBPC): The Inter Bank Participation Certificates are short term instruments to even out the short-term liquidity within the Banking system particularly when there are imbalances affecting the maturity mix of assets in Banking Book.

The primary objective is to provide some degree of flexibility in the credit portfolio of banks. It can be issued by schedule commercial bank and can be subscribed by any commercial bank.

The IBPC is issued against an underlying advance, classified standard and the aggregate amount of participation in any account time issue. During the currency of the participation, the aggregate amount of participation should be covered by the outstanding balance in account.

There are two types of participation certificates, with risk to the lender and without risk to the lender. Under 'with risk participation', the issuing bank will reduce the amount of participation from the advances outstanding and participating bank will show the participation as part of its advances. Banks are permitted to issue IBPC under 'with risk' nomenclature classified under Health Code-I status and the aggregate amount of such participation in any account should not exceed 40% of outstanding amount at the time of issue. The interest rate on IBPC is freely determined in the market. The certificates are neither transferable nor prematurely redeemable by the issuing bank.

Under without risk participation, the issuing bank will show the participation as borrowing from banks and participating bank will show it as advances to bank.

The scheme is beneficial both to the issuing and participating banks. The issuing bank can secure funds against advances without actually diluting its asset-mix. A bank having the highest loans to total asset ratio and liquidity bind can square the situation by issuing IBPCs. To the lender, it provides an opportunity to deploy the short-term surplus funds in a secured and profitable manner. The IBPC with risk can also be used for capital adequacy management.

This is simple system as compared to consortium tie up.

Question 7

What are a Repo and a Reverse Repo?

Answer

The term Repurchase Agreement (Repo) and Reverse Repurchase Agreement (Reverse Repo) refer to a type of transaction in which money market participant raises funds by selling securities and simultaneously agreeing to repurchase the same after a specified time generally at a specified price, which typically includes interest at an agreed upon rate. Such a transaction is called a Repo when viewed from the perspective of the seller of securities (the party acquiring funds) and Reverse Repo when described from the point of view of the supplier of funds.

Indian Repo market is governed by Reserve Bank of India. At present Repo is permitted between 64 players against Central and State Government Securities (including T-Bills) at Mumbai.

Question 8

What is interest rate risk, reinvestment risk & default risk & what are the types of risk involved in investments in G-Sec.?

Answer

Interest Rate Risk: Interest Rate Risk, market risk or price risk are essentially one and the same. These are typical of any fixed coupon security with a fixed period to maturity. This is on account of inverse relation of price and interest. As the interest rate rises the price of a

security will fall. However, this risk can be completely eliminated in case an investor's investment horizon identically matches the term of security.

Re-investment Risk: This risk is again akin to all those securities, which generate intermittent cash flows in the form of periodic coupons. The most prevalent tool deployed to measure returns over a period of time is the yield-to-maturity (YTM) method. The YTM calculation assumes that the cash flows generated during the life of a security is reinvested at the rate of YTM. The risk here is that the rate at which the interim cash flows are reinvested may fall thereby affecting the returns.

Thus, reinvestment risk is the risk that future coupons from a bond will not be reinvested at the prevailing interest rate when the bond was initially purchased.

Default Risk: The event in which companies or individuals will be unable to make the required payments on their debt obligations. Lenders and investors are exposed to default risk in virtually all forms of credit extensions. To mitigate the impact of default risk, lenders often charge rates of return that correspond the debtor's level of default risk. The higher the risk, the higher the required return, and vice versa. This type of risk in the context of a Government security is always zero. However, these securities suffer from a small variant of default risk i.e. maturity risk. Maturity risk is the risk associated with the likelihood of government issuing a new security in place of redeeming the existing security. In case of Corporate Securities it is referred to as credit risk.

Question 9

Write a short note on Debt/ Asset Securitisation.

Answer

Debt Securitisation is a method of recycling of funds. This method is mostly used by finance companies to raise funds against financial assets such as loan receivables, mortgage backed receivables, credit card balances, hire purchase debtors, lease receivables, trade debtors, etc. and thus beneficial to such financial intermediaries to support their lending volumes. Thus, assets generating steady cash flows are packaged together and against this assets pool market securities can be issued. Investors are usually cash-rich institutional investors like mutual funds and insurance companies.

The process can be classified in the following three functions:

1. **The origination function –** A borrower seeks a loan from finance company, bank, housing company or a financial institution. On the basis of credit worthiness repayment schedule is structured over the life of the loan.
2. **The pooling function –** Many similar loans or receivables are clubbed together to create an underlying pool of assets. This pool is transferred in favour of a SPV (Special Purpose Vehicle), which acts as a trustee for the investor. Once the assets are transferred they are held in the organizers portfolios.

3. **The securitisation function –** It is the SPV's job to structure and issue the securities on the basis of asset pool. The securities carry coupon and an expected maturity, which can be asset base or mortgage based. These are generally sold to investors through merchant bankers. The investors interested in this type of securities are generally institutional investors like mutual fund, insurance companies etc. The originator usually keeps the spread available (i.e. difference) between yield from secured asset and interest paid to investors.

Generally, the process of securitisation is without recourse i.e. the investor bears the credit risk of default and the issuer is under an obligation to pay to investors only if the cash flows are received by issuer from the collateral.

Question 10

Write a short note on Call Money.

Answer

Call Money: The Call Money is a part of the money market where, day to day surplus funds, mostly of banks, are traded. Moreover, the call money market is most liquid of all short-term money market segments.

The maturity period of call loans vary from 1 to 14 days. The money that is lent for one day in call money market is also known as 'overnight money'. The interest paid on call loans are known as the call rates. The call rate is expected to freely reflect the day-to-day lack of funds. These rates vary from day-to-day and within the day, often from hour-to-hour. High rates indicate the tightness of liquidity in the financial system while low rates indicate an easy liquidity position in the market.

In India, call money is lent mainly to even out the short-term mismatches of assets and liabilities and to meet CRR requirement of banks. The short-term mismatches arise due to variation in maturities i.e. the deposits mobilized are deployed by the bank at a longer maturity to earn more returns and duration of withdrawal of deposits by customers vary. Thus, the banks borrow from call money markets to meet short-term maturity mismatches.

Moreover, the banks borrow from call money market to meet the cash Reserve Ratio (CRR) requirements that they should maintain with RBI every fortnight and is computed as a percentage of Net Demand and Time Liabilities (NDTL).

Question 11

RBI sold a 91 day T-bill of face value of ₹100 at an yield of 6%. What was the issue price?

Answer

Let the issue price be X

By the terms of the issue of the T-bills:

$$6\% = \frac{100 - x}{x} \times \frac{365}{91} \times 100$$

$$\frac{6 \times 91 \times x}{36,500} = (100 - x)$$

$$0.01496\ x = 100 - x$$

$$x = \frac{100}{1.01496} = ₹\ 98.53$$

Question 12

Wonderland Limited has excess cash of ₹ 20 lakhs, which it wants to invest in short term marketable securities. Expenses relating to investment will be ₹ 50,000.

The securities invested will have an annual yield of 9%.

The company seeks your advice

(i) as to the period of investment so as to earn a pre-tax income of 5%.

(ii) the minimum period for the company to breakeven its investment expenditure overtime value of money.

Answer

(i) Pre-tax Income required on investment of ₹ 20,00,000

Let the period of Investment be 'P' and return required on investment ₹ 1,00,000 (₹ 20,00,000 x 5%)

Accordingly,

$$(₹\ 20,00,000 \times \frac{9}{100} \times \frac{P}{12}) - ₹\ 50,000 = ₹\ 1,00,000$$

P = 10 months

(ii) Break-Even its investment expenditure

$$(₹\ 20,00,000 \times \frac{9}{100} \times \frac{P}{12}) - ₹\ 50,000 = 0$$

P = 3.33 months

Question 13

Z Co. Ltd. issued commercial paper worth ₹10 crores as per following details:

Date of issue :	*16th January, 2009*
Date of maturity:	*17th April, 2009*

No. of days :	*91*
Interest rate	*12.04% p.a*

What was the net amount received by the company on issue of CP? (Charges of intermediary may be ignored)

Answer

The company had issued commercial paper worth ₹10 crores

No. of days Involves = 91 days

Interest rate applicable = 12.04 % p.a.

Interest for 91 days $= 12.04\% \times \frac{91 \text{days}}{365 \text{days}} = 3.001\%$

$= \text{or } ₹ 10 \text{ crores x } \frac{3.001}{100 + 3.001} = ₹ 29{,}13{,}563$

or ₹ 29.1356 Lakhs

∴ Net amount received at the time of issue:- ₹10.00 Crores – 0.2913 Crore = ₹ 9.7087 Crore

Question 14

From the following particulars, calculate the effective rate of interest p.a. as well as the total cost of funds to Bhaskar Ltd., which is planning a CP issue:

Issue Price of CP	*₹ 97,550*
Face Value	*₹ 1,00,000*
Maturity Period	*3 Months*
Issue Expenses:	
Brokerage	*0.15% for 3 months*
Rating Charges	*0.50% p.a.*
Stamp Duty	*0.175% for 3 months*

Answer

Nominal Interest or Bond Equivalent Yield $= \left[\frac{F - P}{P}\right] \times \frac{12}{M} \times 100$

Where

F= Face Vale

P= Issue Price

$$= \frac{1,00,000 - 97,550}{97,550} \times \frac{12}{3} \times 100 = 0.025115 \times 4 \times 100 = 10.046 = 10.05\% \text{ p.a.}$$

$$\text{Effective interest rate} = [1 + \frac{0.1005}{4}]^4 - 1 = 10.435\% \text{ p.a.}$$

Cost of Funds to the Company

Effective Interest	10.435
Brokerage (0.150 × 4)	0.60%
Rating Charge	0.50%
Stamp duty (0.175 × 4)	0.70%
	12.235

Question 15

From the following particulars, calculate the effective interest p.a. as well as the total cost of funds to ABC Ltd., which is planning a CP issue:

Issue Price of CP = ₹ 97,350

Face Value = ₹ 1,00,000

Maturity period = 3 months.

Issue Expenses:

Brokerage: 0.125% for 3 months.

Rating Charges: 0.5% p.a.

Stamp duty: 0.125% for 3 months

Answer

$$\text{Nominal Interest or Bond Equivalent Yield} = \left[\frac{F - P}{P}\right] \times \frac{12}{m} \times 100$$

$$= \frac{1,00,000 - 97,350}{97,350} \times \frac{12}{3} \times 100$$

$$= 0.02722 \times 4 \times 100 = 10.888$$

$$= 10.89$$

$$\text{Effective Interest} = [1 + \frac{0.1089}{4}]^4 - 1 = 11.34\% \text{ p.a.}$$

Cost of Funds to the Company

Effective Interest	11.34%
Brokerage (0.125 x 4)	0.50%
Rating Charge	0.50%
Stamp Duty (0.125 x 4)	0.50%
Cost of funds	12.84%

Question 16

M Ltd. has to make a payment on 30th January, 2010 of Rs. 80 lakhs. It has surplus cash today, i.e. 31st October, 2009; and has decided to invest sufficient cash in a bank's Certificate of Deposit scheme offering an yield of 8% p.a. on simple interest basis. What is the amount to be invested now?

Answer

Calculation of Investment Amount

Amount required for making payment on 30th January, 2010 = ₹ 80,00,000

Investment in Certificates of Deposit (CDs) on 31st October, 2009

Rate of interest = 8% p.a.

No. of days to maturity = 91 days

Interest on ₹ 1 of 91 days

(₹ 1 × 0.08 × 91/365) = 0.0199452

Amount to be received for Re. 1

(₹ 1.00 + ₹ 0.0199452) = 1.0199452

Calculation of amount to be invested now to get ₹ 80 lakhs after 91 days:

$$= \frac{₹\ 80,00,000}{₹\ 1.0199452} = ₹\ 78,43,558.65$$

Or, ₹ 78,43,600 or ₹ 78,44,000 approximately.

Question 17

A money market instrument with face value of ₹100 and discount yield of 6% will mature in 45 days. You are required to calculate:

(i) Current price of the instrument.

(ii) Bond equivalent yield

(iii) Effective annual return.

Answer

(i) Current price of the Bond = 100 x [1-{45/360} x 0.06] = ₹ 99.25

Alternatively, the current price of bond may also be calculated as follows:

$$\frac{D}{100-D}\times\frac{360}{45}=0.06$$

$$\frac{D}{100-D}=0.06\times\frac{45}{360}$$

$$\frac{D}{100-D}=0.06\times\frac{1}{8}$$

8D = 6 – 0.06D

8.06D = 6

$$D = \frac{6}{8.06}=0.7444$$

Current price of the bond = Face value – D

= ₹100 – 0.7444 = ₹99.2556

(ii) Bond equivalent yield $= \frac{100-99.25}{99.25}\times\frac{360}{45}=6.045\%$ P.A.

(iii) Effective annual return $= \left[1+(0.06045/8)^{8}\right]-1 = 6.207\%$ P.A..

Note: If a year of 365 days is considered the Bond equivalent yield and Effective annual return works out to 6.296% P.A.

Question 18

AXY Ltd. is able to issue commercial paper of ₹ 50,00,000 every 4 months at a rate of 12.5% p.a. The cost of placement of commercial paper issue is ₹ 2,500 per issue. AXY Ltd. is required to maintain line of credit ₹ 1,50,000 in bank balance. The applicable income tax rate for AXY Ltd. is 30%. What is the cost of funds (after taxes) to AXY Ltd. for commercial paper issue? The maturity of commercial paper is four months.

Answer

	₹
Issue Price	50,00,000
Less: Interest @ 12.5% for 4 months	2,08,333
Issue Expenses	2,500
Minimum Balance	1,50,000
	46,39,167

$$\text{Cost of Funds} = \frac{2,10,833(1-0.30)}{46,39,167} \times \frac{12}{4} \times 100 = 9.54\%$$

Alternatively

	₹
Issue Price	50,00,000
Less: Interest @ 12.5% for 4 months	2,08,333
Issue Expenses	2,500
Minimum Balance	1,50,000
	46,39,167
Opportunity Cost @ 12.5% of ₹ 1,50,000 for 4 months	6,250

$$\text{Cost of Funds} = \frac{2,10,833(1-0.30)+6,250}{46,39,167} \times \frac{12}{4} \times 100 = 9.95\%$$

11

Foreign Direct Investment (FDI), Foreign Institutional Investment (FIIs) and International Financial Management

BASIC CONCEPTS AND FORMULAE

1. Introduction

Foreign direct investment (FDI) is that investment, which is made to serve the business interest of the investor in a company, which is in a different national (host country) distinct from the investor's country of origin (home country).

2. Cost Involved

Although FDI improves balance of payments position but it involves following costs for the host country :

(a) MNCs are reluctant to hire and train local persons.

(b) Damage to environment and natural resources.

(c) Higher prices of products.

(d) Foreign culture infused.

Apart from the above costs, FDI causes a transfer of capital, skilled personnel and managerial talent from the country resulting in the home country's interest being hampered. Further, the objective of maximization of profit of MNCs also leads to deterioration in bilateral relations between the host country and the home country.

3. Benefits Derived

(i) **For the Host Country**

(a) Improves balance of payment.

(b) Faster forward and backward economic linkages.

(c) Develop a support base essential for quick industrialization.

(d) Maintain a proper balance amongst the factor of production by supply of scarce resources.

(e) Make available key raw materials along with updated technology and also provide access to continued updation of R & D work.

(ii) **For the Home Country**

(a) BOP situation improves due to receipt of dividend, royalty, fee for technical services.

(b) Develop closer political relationships between the home country and the host country, which is advantageous to both.

4. Foreign Institutional Investment

An investor or investment fund that is from or registered in a country outside of the one in which it is currently investing. Institutional investors include hedge funds, insurance companies, pension funds and mutual funds. In Indian context, it refers to outside companies investing in the financial markets of India. International Institutional investors must register with the Securities and Exchange Board of India to participate in the market. One of the major market regulations pertaining to FIIs involves placing limits on FII ownership in Indian companies.

5. Raising of Capital Abroad (ADRs, GDRs, ECBs)

The various sources of international finance are as follows :

(a) **External Commercial Borrowings:** Mainly it includes commercial bank loans, buyer and supplier's credit credit from official export credit agencies and investment by FIIs in dedicated debt funds. The external commercial borrowing can be obtained and utilized for specified purposes only.

(b) **International Capital Market:** Lending and borrowing in foreign currencies to finance the international trade and industry has led to the development of international capital market. In international market, International bond is known as a "Euroboard".

6. Instruments of International Finance

The various financial instruments dealt with in the international market are briefly described below :

- **Euro Bonds:** Denominated in a currency issued outside the country of that currency.
- **Foreign Bonds:** Example a British firm placing dollar denominated bonds in U.S.A.

- **Fully Hedged Bonds:** Currency risk eliminated by selling in forward market entire stream of interest and principal payments.
- **Floating Rate Notes:** Interests are adjusted to reflect the prevailing exchange rate, Not so popular.
- **Euro Commercial Papers:** Designated in US Dollar, they are short-term instruments.
- **Foreign Currency Options:** Provide hedge against financial and economic risk.
- **Foreign Currency Futures:** Obligation to buy or sell a specified currency in the present for settlement at a future dates.

7. Indian Depository Receipts (IDRs)

Like ADRs and GDRs, foreign companies are now available for investments in India in the form of IDRs. Investment in these companies can be made by Indian investors. However, such companies would be required to fulfill a number of guidelines for listing in India through IDRs.

8. International Financial Instruments and Indian Companies

Now Indian Companies have been able to tap global markets to raise foreign currency funds by issuing various types of financial instruments which are as follows :

(a) **Foreign Currency Convertible Bonds (FCCBs)** – A type of convertible bond issues in a currency different than the issuer's domestic currency. FCCBs are issued in accordance with the guidelines dated 12th November 1993 and as amended from time to time.

(b) **Global Depository Receipts (GDRs)** – GDR is a depository receipt (a negotiable certificate denominated in US Dollars, representing a non-US company's publicly – traded local currency (Indian rupees) equity shares.

(c) **Euro-Convertible Bonds (ADRs)** – A Convertible bond is a debt instrument which gives the holders of the bond an option to convert the bond into a predetermined number of equity shares of a company. The payment of interest on and the redemption of the bond will be made by the issuer company in US dollars.

(d) **American Depository Receipts (ADRs)** – Depository receipts issued by a company in the United States of America (USA) issued in accordance with provisions stipulated by the Securities and Exchange Commission of USA. ADRs are following types:

(i) **Unsponsored ADRs** – Issued without any formal agreement between the issuing company and the depository.

(ii) **Sponsored ADRs** – Created by a single depository which is appointed by the issuing company under rules provided in a deposit agreement. These can be further classified into following two types :

- **Restricted –** With respect to types of buyers, which are allowed.
- **Unrestricted –** Issued to and traded by the general investing public in US capital markets.

(e) **Other Sources**

Following are some other sources

- Euro Bonds
- Euro-convertible Zero Bonds
- Euro-bond with Equity Warrants.
- Syndicated Bank Loans.
- Euro Bonds.
- Foreign Bonds
- Euro Commercial Papers
- Credit Instruments.

(f) **Euro-Issues** – In Indian context, it denotes the issue that is listed on a European Stock Exchange. However, subscription can come from any part of the World except India. GDRs and FCCBs are most popular in this category.

9. **Cross Border Leasing**

In this type of leasing, the lessor and the lessee are situated in two different countries. This type of arrangement means more complications in terms of different legal, fiscal, credit and currency requirements and risk involved. Cross border lease benefits are more or less the same as are available in domestic lease viz 100% funding off-balance sheets.

10. **International Capital Budgeting**

Multinational Capital Budgeting has to take into consideration the different factors and variables which affect a foreign project and are complex in nature than domestic projects. An important aspect in multinational capital budgeting is to adjust cash flows or the discount rate for additional risk arising from location of the project. Adjusted Present Value (APV) is used in evaluating foreign projects. The APV model is a value

additive approach under which each cash flow is considered individually and discounted at a rate consistent with risk involved in the cash flow.

11. **International Working Capital Management**

The management of working capital in an international firm is very much complex as compared to domestic one because of the following reasons :

- A multinational firm has a wider option for financing its current assets.
- Interest and tax rates vary from one country to other.
- Presence of foreign exchange risk.
- Limited knowledge of the politico-economic conditions prevailing in different host countries.

12. **Multinational Cash Management**

The main objectives of multinational cash management are minimizing various risk and transaction costs associated with cash management. Broadly, following are two basic objectives of International Cash Management – first is optimizing cash flow movements and second is investing excess cash.

(a) **Optimizing Cash Flow Movements**

Following are ways by which cash flow movement can be optimized:

(i) Accelerating Cash Inflows.

(ii) Managing Blocked Funds.

(iii) Leading and Lagging.

(iv) Netting.

(v) International Transfer Pricing.

(b) **Investing Excess Cash**

Through centralized cash management, decision about stock piling (EOQ) is to be weighted in light of cumulative carrying cost vis-à-vis expected increase in the price of input due to changes in the exchange rate. Normally, final decision on the quantity of goods to be imported and how much of them are locally available.

13. **International Receivables Management**

International receivables management can be discussed under two heads which are as follows :

(a) **Inter-firm Sales** – The focus is on the currency of denomination.

(b) **Intra-firm Sales** – The focus is on global allocation of firm's resources.

Question 1

Write a short note on Instruments of International Finance.

Answer

The various financial instruments dealt with in the international market are briefly described below:

1. **Euro Bonds:** A *Eurobond* is an international bond that is denominated in a currency not native to the country where it is issued. Also called external bond e.g. A Yen floated in Germany; a yen bond issued in France.
2. **Foreign Bonds:** These are debt instruments denominated in a currency which is foreign to the borrower and is denominated in a currency that is native to the country where it is issued. A British firm placing $ denominated bonds in USA is said to be selling foreign bonds.
3. **Fully Hedged Bonds:** In foreign bonds, the risk of currency fluctuations exists. Fully hedged bonds eliminate that risk by selling in forward markets the entire stream of interest and principal payments.
4. **Floating Rate Notes:** These are debt instruments issued upto 7 years maturity. Interest rates are adjusted to reflect the prevailing exchange rates. They provide cheaper money than fixed rate debt instruments; however, they suffer from inherent interest rate volatility risk.
5. **Euro Commercial Papers:** Euro Commercial Papers (ECPs) are short-term money market instruments. They are for maturities for less than a year. They are usually designated in US dollars.

Question 2

Write a short note on Euro Convertible Bonds.

Answer

Euro Convertible Bonds: They are bonds issued by Indian companies in foreign market with the option to convert them into pre-determined number of equity shares of the company. Usually price of equity shares at the time of conversion will fetch premium. The Bonds carry fixed rate of interest.

The issue of bonds may carry two options:

Call option: Under this the issuer can call the bonds for redemption before the date of maturity. Where the issuer's share price has appreciated substantially, i.e., far in excess of the redemption value of bonds, the issuer company can exercise the option. This call option forces the investors to convert the bonds into equity. Usually, such a case arises when the share prices reach a stage near 130% to 150% of the conversion price.

***Put option*:** It enables the buyer of the bond a right to sell his bonds to the issuer company at a pre-determined price and date. The payment of interest and the redemption of the bonds will be made by the issuer-company in US dollars.

Question 3

Write short note on American Depository Receipts (ADRs).

Answer

American Depository Receipts (ADRs): A depository receipt is basically a negotiable certificate denominated in US dollars that represent a non- US Company's publicly traded local currency (INR) equity shares/securities. While the term refer to them is global depository receipts however, when such receipts are issued outside the US, but issued for trading in the US they are called ADRs.

An ADR is generally created by depositing the securities of an Indian company with a custodian bank. In arrangement with the custodian bank, a depository in the US issues the ADRs. The ADR subscriber/holder in the US is entitled to trade the ADR and generally enjoy rights as owner of the underlying Indian security. ADRs with special/unique features have been developed over a period of time and the practice of issuing ADRs by Indian Companies is catching up.

Only such Indian companies that can stake a claim for international recognition can avail the opportunity to issue ADRs. The listing requirements in US and the US GAAP requirements are fairly severe and will have to be adhered. However if such conditions are met ADR becomes an excellent sources of capital bringing in foreign exchange.

These are depository receipts issued by a company in USA and are governed by the provisions of Securities and Exchange Commission of USA. As the regulations are severe, Indian companies tap the American market through private debt placement of GDRS listed in London and Luxemburg stock exchanges.

Apart from legal impediments, ADRS are costlier than Global Depository Receipts (GDRS). Legal fees are considerably high for US listing. Registration fee in USA is also substantial. Hence, ADRS are less popular than GDRS.

Question 4

Write a short note on Global Depository Receipts (GDRs).

Answer

Global Depository Receipt: It is an instrument in the form of a depository receipt or certificate created by the Overseas Depository Bank outside India denominated in dollar and issued to non-resident investors against the issue of ordinary shares or FCCBs of the issuing company. It is traded in stock exchange in Europe or USA or both. A GDR usually represents one or more shares or convertible bonds of the issuing company.

A holder of a GDR is given an option to convert it into number of shares/bonds that it represents after 45 days from the date of allotment. The shares or bonds which a holder of GDR is entitled to get are traded in Indian Stock Exchanges. Till conversion, the GDR does not carry any voting right. There is no lock-in-period for GDR.

Impact of GDR's on Indian Capital Market: Since the inception of GDR's a remarkable change in Indian capital market has been observed as follows:

(i) Indian stock market to some extent is shifting from Bombay to Luxemberg.

(ii) There is arbitrage possibility in GDR issues.

(iii) Indian stock market is no longer independent from the rest of the world. This puts additional strain on the investors as they now need to keep updated with worldwide economic events.

(iv) Indian retail investors are completely sidelined. GDR's/Foreign Institutional Investors' placements + free pricing implies that retail investors can no longer expect to make easy money on heavily discounted rights/public issues.

As a result of introduction of GDR's a considerable foreign investment has flown into India. This has also helped in the creation of specific markets like

(i) GDR's are sold primarily to institutional investors.

(ii) Demand is likely to be dominated by emerging market funds.

(iii) Switching by foreign institutional investors from ordinary shares into GDR's is likely.

(iv) Major demand is also in UK, USA (Qualified Institutional Buyers), South East Asia (Hong Kong, Singapore), and to some extent continental Europe (principally France and Switzerland).

The following parameters have been observed in regard to GDR investors.

(i) Dedicated convertible investors.

(ii) Equity investors who wish to add holdings on reduced risk or who require income enhancement.

(iii) Fixed income investors who wish to enhance returns.

(iv) Retail investors: Retail investment money normally managed by continental European banks which on an aggregate basis provide a significant base for Euro-convertible issues.

Question 5

What is the impact of GDRs on Indian Capital Market?

Answer

Impact of Global Depository Receipts (GDRs) on Indian Capital Market

After the globalization of the Indian economy, accessibility to vast amount of resources was available to the domestic corporate sector. One such accessibility was in terms of raising financial resources abroad by internationally prudent companies. Among others, GDRs were the most important source of finance from abroad at competitive cost. Global depository receipts are basically negotiable certificates denominated in US dollars, that represent a non-US company's publicly traded local currency (Indian rupee) equity shares. Companies in India, through the issue of depository receipts, have been able to tap global equity market to raise foreign currency funds by way of equity.

Since the inception of GDRs, a remarkable change in Indian capital market has been observed. Some of the changes are as follows:

(i) Indian capital market to some extent is shifting from Bombay to Luxemburg and other foreign financial centres.

(ii) There is arbitrage possibility in GDR issues. Since many Indian companies are actively trading on the London and the New York Exchanges and due to the existence of time differences, market news, sentiments etc. at times the prices of the depository receipts are traded at discounts or premiums to the underlying stock. This presents an arbitrage opportunity wherein the receipts can be bought abroad and sold in India at a higher price.

(iii) Indian capital market is no longer independent from the rest of the world. This puts additional strain on the investors as they now need to keep updated with worldwide economic events.

(iv) Indian retail investors are completely sidelined. Due to the placements of GDRs with Foreign Institutional Investor's on the basis free pricing, the retail investors can now no longer expect to make easy money on heavily discounted right/public issues.

(v) A considerable amount of foreign investment has found its way in the Indian market which has improved liquidity in the capital market.

(vi) Indian capital market has started to reverberate by world economic changes, good or bad.

(vii) Indian capital market has not only been widened but deepened as well.

(viii) It has now become necessary for Indian capital market to adopt international practices in its working including financial innovations.

Question 6

Write a brief note on External Commercial Borrowings (ECBs).

Answer

ECB include bank loans, supplier credit, securitised instruments, credit from export credit agencies and borrowings from multilateral financial institutions. These securitised instruments may be FRNs, FRBs etc. Indian corporate sector is permitted to raise finance through ECBs within the framework of the policies and procedures prescribed by the Central Government.

Multilateral financial institutions like IFC, ADB, AFIC, CDC are providing such facilities while the ECB policy provides flexibility in borrowing consistent with maintenance of prudential limits for total external borrowings, its guiding principles are to keep borrowing maturities long, costs low and encourage infrastructure/core and export sector financing which are crucial for overall growth of the economy. The government of India, from time to time changes the guidelines and limits for which the ECB alternative as a source of finance is pursued by the corporate sector. During past decade the government has streamlined the ECB policy and procedure to enable the Indian companies to have their better access to the international financial markets.

The government permits the ECB route for variety of purposes namely expansion of existing capacity as well as for fresh investment. But ECB can be raised through internationally recognized sources. There are caps and ceilings on ECBs so that macro economy goals are better achieved. Units in SEZ are permitted to use ECBs under a special window.

Question 7

Explain briefly the salient features of Foreign Currency Convertible Bonds.

Answer

FCCBs are important source of raising funds from abroad. Their salient features are –

1. FCCB is a bond denominated in a foreign currency issued by an Indian company which can be converted into shares of the Indian Company denominated in Indian Rupees.
2. Prior permission of the Department of Economic Affairs, Government of India, Ministry of Finance is required for their issue
3. There will be a domestic and a foreign custodian bank involved in the issue
4. FCCB shall be issued subject to all applicable Laws relating to issue of capital by a company.
5. Tax on FCCB shall be as per provisions of Indian Taxation Laws and Tax will be deducted at source.
6. Conversion of bond to FCCB will not give rise to any capital gains tax in India.

Question 8

Write a short note on Debt route for foreign exchange funds.

Answer

Debt route for foreign exchange funds: The following are some of the instruments used for borrowing of funds from the international market:

(i) *Syndicated bank loans*: The borrower should obtain a good credit rating from the rating agencies. Large loans can be obtained in a reasonably short period with few formalities. Duration of the loan is generally 5 to 10 years. Interest rate is based on LIBOR plus spread depending upon the rating. Some covenants are laid down by the lending

institutions like maintenance of key financial ratios.

(ii) *Euro bonds*: These are basically debt instruments denominated in a currency issued outside the country of the currency. For example, Yen bond floated in France. Primary attraction of these bonds is the shelter from tax and regulations which provide Scope for arbitraging yields. These are usually bearer bonds and can take the form of (i) traditional fixed rate bonds (ii) floating rate notes (FRN's) (iii) Convertible bonds.

(iii) *Foreign bonds*: Foreign bonds are foreign currency bonds and sold at the country of that currency and are subject to the restrictions as placed by that country on the foreigners' funds.

(iv) *Euro Commercial Papers*: These are short term money market securities usually issued at a discount, for maturity in less than one year.

(v) *External Commercial Borrowings (ECB's)*: These include commercial bank loans, buyer's credit and supplier's credit, securitised instruments such as floating rate notes and fixed rate bonds, credit from official export credit agencies and commercial borrowings from multi-lateral financial institutions like IFCI, ADB etc. External Commercial borrowings have been a popular source of financing for most of capital goods imports. They are gaining importance due to liberalization of restrictions. ECB's are subject to overall ceilings with sub-ceilings fixed by the government from time to time.

(vi) All other loans are approved by the government.

Question 9

Explain the term 'Exposure netting', with an example.

Answer

Exposure Netting refers to offsetting exposures in one currency with Exposures in the same or another currency, where exchange rates are expected to move in such a way that losses or gains on the first exposed position should be offset by gains or losses on the second currency exposure.

The objective of the exercise is to offset the likely loss in one exposure by likely gain in another. This is a manner of hedging foreign exchange exposures though different from forward and option contracts. This method is similar to portfolio approach in handling systematic risk.

For example, let us assume that a company has an export receivables of US$ 10,000 due 3 months hence, if not covered by forward contract, here is a currency exposure to US$.

Further, the same company imports US$ 10,000 worth of goods/commodities and therefore also builds up a reverse exposure. The company may strategically decide to leave both exposures open and not covered by forward, it would be doing an exercise in exposure netting.

Despite the difficulties in managing currency risk, corporates can now take some concrete steps towards implementing risk mitigating measures, which will reduce both actual and future exposures. For years now, banking transactions have been based on the principle of netting, where only the difference of the summed transactions between the parties is actually transferred. This is called settlement netting. Strictly speaking in banking terms this is known as settlement risk. Exposure netting occurs where outstanding positions are netted against one another in the event of counter party default.

Question 10

Write a short note on Forfaiting.

Answer

Forfaiting: During recent years the forfaiting has acquired immense importance as a source of financing. It means 'surrendering' or relinquishing rights to something. This is very commonly used in international practice among the exporters and importers. In the field of exports, it implies surrenders by an exporter of the claim to receive payment for goods or services rendered to an importer in return for cash payment for those goods and services from the forfaiter (generally a bank), who takes over the importer's promissory notes or the exporters' bills of exchange. The forfaiter, thus assumes responsibility for the collection of such documents from the importer. This arrangement is to help exporter, however, there is always a fixed cost of finance by way of discounting of the debt instruments by the forfaiter. Forfaiting assumes the nature of a purchase transaction without recourse to any previous holder in respect of the instrument of debts at the time of maturity in future.

The exporter generally takes bill or promissory notes to the forfaiter which buys the instrument at a discount from the face value. The importer party's bank has already guaranteed payment unconditionally and irrevocably, and the exporter party's bank now takes complete responsibility for collection without recourse to exporter. Thus a forfaiting arrangement eliminates all credit risks. It also protects against the possibility that interest rate may fluctuate before the bills or notes are paid off. Any adverse movement in exchange rate, any political uncertainties or business conditions may change to the disadvantage of the parties concerned. The forfaiting business is very common in Europe and has come as an important source of export financing in leading currencies.

Question 11

Distinguish between Forfeiting and Factoring.

Answer

Forfeiting was developed to finance medium to long term contracts for financing capital goods. It is now being more widely used in the short-term also especially where the contracts involve large values. There are specialized finance houses that deal in this business and many are linked to some of main banks.

This is a form of fixed rate finance which involves the purchase by the forfeiture of trade receivables normally in the form of trade bills of exchange or promissory notes, accepted by the buyer with the endorsement or guarantee of a bank in the buyer's country.

The benefits are that the exporter can obtain full value of his export contract on or near shipment without recourse. The importer on the other hand has extended payment terms at fixed rate finance.

The forfeiture takes over the buyer and country risks. Forfeiting provides a real alternative to the government backed export finance schemes.

Factoring can however, broadly be defined as an agreement in which receivables arising out of sale of goods/services are sold by a "firm" (client) to the "factor" (a financial intermediary) as a result of which the title to the goods/services represented by the said receivables passes on to the factor. Henceforth, the factor becomes responsible for all credit control, sales accounting and debt collection from the buyer(s). In a full service factoring concept (without recourse facility) if any of the debtors fails to pay the dues as a result of his financial instability/insolvency/bankruptcy, the factor has to absorb the losses.

Some of the points of distinction between forfeiting and factoring have been outlined in the following table.

Factoring	Forfeiting
This may be with recourse or without recourse to the supplier.	This is without recourse to the exporter. The risks are borne by the forfeiter.
It usually involves trade receivables of short maturities.	It usually deals in trade receivables of medium and long term maturities.
It does not involve dealing in negotiable instruments.	It involves dealing in negotiable instrument like bill of exchange and promissory note.
The seller (client) bears the cost of factoring.	The overseas buyer bears the cost of forfeiting.
Usually it involves purchase of all book debts or all classes of book debts.	Forfeiting is generally transaction or project based. Its structuring and costing is case to case basis.
Factoring tends to be a 'case of' sell of debt obligation to the factor, with no secondary market.	There exists a secondary market in forfeiting. This adds depth and liquidity to forfeiting.

Question 12

Write a short note on the application of Double taxation agreements on Global depository receipts.

Answer

(i) During the period of fiduciary ownership of shares in the hands of the overseas

depository bank, the provisions of avoidance of double taxation agreement entered into by the Government of India with the country of residence of the overseas depository bank will be applicable in the matter of taxation of income from dividends from the underline shares and the interest on foreign currency convertible bounds.

(ii) During the period if any, when the redeemed underline shares are held by the non-residence investors on transfer from fiduciary ownership of the overseas depository bank, before they are sold to resident purchasers, the avoidance of double taxation agreement entered into by the government of India with the country of residence of the non-resident investor will be applicable in the matter of taxation of income from dividends from the underline shares, or interest on foreign currency convertible bonds or any capital gains arising out of the transfer of the underline shares.

Question 13

Discuss the major sources available to an Indian Corporate for raising foreign currency finances.

Answer

Major Sources Available to an Indian Corporate for Raising Foreign Currency Finances

1. **Foreign Currency Term Loan from Financial Institutions:** Financial Institutions provide foreign currency term loan for meeting the foreign currency expenditures towards import of plant, machinery, and equipment and also towards payment of foreign technical knowhow fees.

2. **Export Credit Schemes**: Export credit agencies have been established by the government of major industrialized countries for financing exports of capital goods and related technical services. These agencies follow certain consensus guidelines for supporting exports under a convention known as the Berne Union. As per these guidelines, the interest rate applicable for export credits to Indian companies for various maturities is regulated. Two kinds of export credit are provided i.e., buyer's and supplier's credit.

   Buyer's Credit- Under this arrangement, credit is provided directly to the Indian buyer for purchase of capital goods and/or technical service from the overseas exporter.

   Supplier's Credit - This is a credit provided to the overseas exporters so that they can make available medium-term finance to Indian importers.

3. **External Commercial Borrowings:** Subject to certain terms and conditions, the Government of India permits Indian firms to resort to external commercial borrowings for the import of plant and machinery. Corporates are allowed to raise up to a stipulated amount from the global markets through the automatic route. Companies wanting to raise more than the stipulated amount have to get an approval of the MOF. ECBs include bank loans, supplier's and buyer's credit, fixed and floating rate bonds and borrowing from private sector windows of Multilateral Financial Institution such as International Finance Corporation.

4. **Euro Issues**: The two principal mechanisms used by Indian companies are Depository Receipts mechanism and Euro convertible Issues. The former represents indirectly equity investment while the latter is debt with an option to convert it into equity.
5. **Issues in Foreign Domestic Markets:** Indian firms can also issue bonds and Equities in the domestic capital market of a foreign country. In recent year, Indian companies like Infosys Technologies and ICICI have successfully tapped the US equity market by issuing American Depository Receipts (ADRs). Like GDRs, ADRs represent claim on a specific number of shares. The principal difference between the two is that the GDRs are issued in the euro market whereas ADRs are issued in the U.S. domestic capital market.
6. **Foreign Collaboration**: Joint participation between private firms, or between foreign firms and Indian Government, or between foreign governments and Indian Government has been a major source of foreign currency finance in recent times
7. **NRI Deposits and Investments**: Government, with a view to attract foreign capital have been introducing various schemes for the Non- resident Indians which ensure higher returns; simplified procedures, tax incentives on interest earned and dividends received, etc. A fairly large portion of the foreign currency capital includes the NRI Deposits and Investments.
8. **Bilateral Government Funding Arrangement:** Generally, advanced countries provide aid in the form of loans and advances, grants, subsidies to governments of under-developed and developing countries. The aid is provided usually for financing government and public sector projects. Funds are provided at concessional terms in respect of cost (interest), maturity, and repayment schedule.

Question 14

What are the issues that need to be considered by an Indian investor and incorporated within the Net Present Value (NPV) model for the evaluation of foreign investment proposals?

Answer

The issues that need to be considered by an Indian investor and incorporated within the Net Present Value (NPV) model for the evaluation of foreign investment proposals are the following:

(1) *Taxes on income associated with foreign projects*: The host country levies taxes (rates differ from country to country) on the income earned in that country by the Multi National Company (MNC). Major variations that occur regarding taxation of MNC's are as follows:

(i) Many countries rely heavily on indirect taxes such as excise duty; value added tax and turnover taxes etc.

(ii) Definition of taxable income differs from country to country and also some allowances e.g. rates allowed for depreciation.

(iii) Some countries allow tax exemption or reduced taxation on income from certain

"desirable" investment projects in the form of tax holidays, exemption from import and export duties and extra depreciation on plant and machinery etc.

(iv) Tax treaties entered into with different countries e.g. double taxation avoidance agreements.

(v) Offer of tax havens in the form of low or zero corporate tax rates.

(2) *Political risks*: The extreme risks of doing business in overseas countries can be seizure of property/nationalisation of industry without paying full compensation. There are other ways of interferences in the operations of foreign subsidiary e.g. levy of additional taxes on profits or exchange control regulations may block the flow of funds, restrictions on employment of foreign managerial/technical personnel, restrictions on imports of raw materials/supplies, regulations requiring majority ownership vetting within the host country.

NPV model can be used to evaluate the risk of expropriation by considering probabilities of the occurrence of various events and these estimates may be used to calculate expected cash flows. The resultant expected net present value may be subjected to extensive sensitivity analysis.

(3) *Economic risks*: The two principal economic risks which influence the success of a project are exchange rate changes and inflation.

The impact of exchange rate changes and inflation upon incremental revenue and upon each element of incremental cost needs to be computed.

Question 15

ABC Ltd. is considering a project in US, which will involve an initial investment of US $ 1,10,00,000. The project will have 5 years of life. Current spot exchange rate is ₹ 48 per US $. The risk free rate in US is 8% and the same in India is 12%. Cash inflow from the project is as follows:

Year	*Cash inflow*
1	*US $ 20,00,000*
2	*US $ 25,00,000*
3	*US $ 30,00,000*
4	*US $ 40,00,000*
5	*US $ 50,00,000*

Calculate the NPV of the project using foreign currency approach. Required rate of return on this project is 14%.

Answer

(1 + 0.12) (1 + Risk Premium) = (1 + 0.14)

Or, 1 + Risk Premium = 1.14/1.12 = 1.0179

Therefore, Risk adjusted dollar rate is = 1.0179 x 1.08 = 1.099 – 1 = 0.099

Calculation of NPV

Year	*Cash flow (Million) US$*	*PV Factor at 9.9%*	*P.V.*
1	2.00	0.910	1.820
2	2.50	0.828	2.070
3	3.00	0.753	2.259
4	4.00	0.686	2.744
5	5.00	0.624	3.120
			12.013
		Less: Investment	11.000
		NPV	1.013

Therefore, Rupee NPV of the project is = ₹ (48 x 1.013) Million

= ₹48.624 Million

Question 16

Odessa Limited has proposed to expand its operations for which it requires funds of $ 15 million, net of issue expenses which amount to 2% of the issue size. It proposed to raise the funds though a GDR issue. It considers the following factors in pricing the issue:

(i) The expected domestic market price of the share is ₹ 300

(ii) 3 shares underly each GDR

(iii) Underlying shares are priced at 10% discount to the market price

(iv) Expected exchange rate is ₹ 60/$

You are required to compute the number of GDR's to be issued and cost of GDR to Odessa Limited, if 20% dividend is expected to be paid with a growth rate of 20%.

Answer

Net Issue Size = $15 million

Gross Issue = $\frac{\$15\,\text{million}}{0.98}$ = $15.306 million

Issue Price per GDR in ₹ (300 x 3 x 90%) ₹ 810

Issue Price per GDR in $ (₹ 810/ ₹ 60) $13.50

Dividend Per GDR (D_1) = ₹ 2* x 3 = ₹ 6

* Assumed to be on based on Face Value of ₹ 10 each share.

Net Proceeds Per GDR = ₹ 810 x 0.98 = ₹ 793.80

(a) Number of GDR to be issued

$$\frac{\$15.306 \text{ million}}{\$13.50} = 1.1338 \text{ million}$$

(b) Cost of GDR to Odessa Ltd.

$$k_e = \frac{6.00}{793.80} + 0.20 = 20.76\%$$

Question 17

A USA based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by the US parent at a transfer price of US $10 millions. The unit will remain in existence in India for one year; the software is expected to get developed within this time frame.

The US based company will be subject to corporate tax of 30 per cent and a withholding tax of 10 per cent in India and will not be eligible for tax credit in the US. The software developed will be sold in the US market for US $ 12.0 millions. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India	*₹ 15,00,000*
Man power cost (80 software professional will be working for 10 hours each day)	*₹ 400 per man hour*
Administrative and other costs	*₹ 12,00,000*

Advise the US Company on the financial viability of the project. The rupee-dollar rate is ₹48/$.

Answer

Proforma profit and loss account of the Indian software development unit

	₹	₹
Revenue		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	11,95,00,000
Earnings before tax		36,05,00,000
Less: Tax		10,81,50,000
Earnings after tax		25,23,50,000

Less: Withholding tax(TDS)		2,52,35,000
Repatriation amount (in rupees)		22,71,15,000
Repatriation amount (in dollars)		$4.7 million

Note: Students may assume the year of 360 days instead of 365 days as has been done in the answer provided above. In such a case where a year is assumed to be of 360 days, manpower cost is ₹ 11,52,00,000 and repatriated amount ₹ 22,87,15,000.

Advise: The cost of development software in India for the US based company is $5.268 million. As the USA based Company is expected to sell the software in the US at $12.0 million, it is advised to develop the software in India.

Question 18

XY Limited is engaged in large retail business in India. It is contemplating for expansion into a country of Africa by acquiring a group of stores having the same line of operation as that of India.

The exchange rate for the currency of the proposed African country is extremely volatile. Rate of inflation is presently 40% a year. Inflation in India is currently 10% a year. Management of XY Limited expects these rates likely to continue for the foreseeable future.

Estimated projected cash flows, in real terms, in India as well as African country for the first three years of the project are as follows:

	Year – 0	*Year – 1*	*Year – 2*	*Year - 3*
Cash flows in Indian ₹ (000)	*-50,000*	*-1,500*	*-2,000*	*-2,500*
Cash flows in African Rands (000)	*-2,00,000*	*+50,000*	*+70,000*	*+90,000*

XY Ltd. assumes the year 3 nominal cash flows will continue to be earned each year indefinitely. It evaluates all investments using nominal cash flows and a nominal discounting rate. The present exchange rate is African Rand 6 to ₹ 1.

You are required to calculate the net present value of the proposed investment considering the following:

(i) African Rand cash flows are converted into rupees and discounted at a risk adjusted rate.

(ii) All cash flows for these projects will be discounted at a rate of 20% to reflect it's high risk.

(iii) Ignore taxation.

	Year - 1	*Year - 2*	*Year - 3*
PVIF @ 20%	*.833*	*.694*	*.579*

Answer

Calculation of NPV

Year	0	1	2	3
Inflation factor in India	1.00	1.10	1.21	1.331
Inflation factor in Africa	1.00	1.40	1.96	2.744
Exchange Rate (as per IRP)	6.00	7.6364	9.7190	12.3696
Cash Flows in ₹ '000				
Real	-50000	-1500	-2000	-2500
Nominal (1)	-50000	-1650	-2420	-3327.50
Cash Flows in African Rand '000				
Real	-200000	50000	70000	90000
Nominal	-200000	70000	137200	246960
In Indian ₹ '000 (2)	-33333	9167	14117	19965
Net Cash Flow in ₹ '000 (1)+(2)	-83333	7517	11697	16637
PVF@20%	1	0.833	0.694	0.579
PV	-83333	6262	8118	9633

NPV of 3 years = -59320 (₹ '000)

NPV of Terminal Value = $\frac{16637}{0.20} \times 0.579 = 48164$ (₹ '000)

Total NPV of the Project = -59320 (₹ '000) + 48164 (₹ '000) = -11156 (₹ '000)

Question 19

A multinational company is planning to set up a subsidiary company in India (where hitherto it was exporting) in view of growing demand for its product and competition from other MNCs. The initial project cost (consisting of Plant and Machinery including installation) is estimated to be US$ 500 million. The net working capital requirements are estimated at US$ 50 million. The company follows straight line method of depreciation. Presently, the company is exporting two million units every year at a unit price of US$ 80, its variable cost per unit being US$ 40.

The Chief Financial Officer has estimated the following operating cost and other data in respect of proposed project:

(i) Variable operating cost will be US $ 20 per unit of production;

(ii) Additional cash fixed cost will be US $ 30 million p.a. and project's share of allocated fixed cost will be US $ 3 million p.a. based on principle of ability to share;

(iii) Production capacity of the proposed project in India will be 5 million units;

(iv) Expected useful life of the proposed plant is five years with no salvage value;

(v) Existing working capital investment for production & sale of two million units through exports was US $ 15 million;

(vi) Export of the product in the coming year will decrease to 1.5 million units in case the company does not open subsidiary company in India, in view of the presence of competing MNCs that are in the process of setting up their subsidiaries in India;

(vii) Applicable Corporate Income Tax rate is 35%, and

(viii) Required rate of return for such project is 12%.

Assuming that there will be no variation in the exchange rate of two currencies and all profits will be repatriated, as there will be no withholding tax, estimate Net Present Value (NPV) of the proposed project in India.

Present Value Interest Factors (PVIF) @ 12% for five years are as below:

Year	*1*	*2*	*3*	*4*	*5*
PVIF	*0.8929*	*0.7972*	*0.7118*	*0.6355*	*0.5674*

Answer

Financial Analysis whether to set up the manufacturing units in India or not may be carried using NPV technique as follows:

I. Incremental Cash Outflows

	$ Million
Cost of Plant and Machinery	500.00
Working Capital	50.00
Release of existing Working Capital	(15.00)
	535.00

II. Incremental Cash Inflow after Tax (CFAT)

(a) Generated by investment in India for 5 years

	$ Million
Sales Revenue (5 Million x $80)	400.00
Less: Costs	
Variable Cost (5 Million x $20)	100.00
Fixed Cost	30.00
Depreciation ($500Million/5)	100.00
EBIT	170.00
Taxes@35%	59.50

EAT	110.50
Add: Depreciation	100.00
CFAT (1-5 years)	210.50
Cash flow at the end of the 5 years (Release of Working Capital)	35.00

(b) Cash generation by exports

	$ Million
Sales Revenue (1.5 Million x $80)	120.00
Less: Variable Cost (1.5 Million x $40)	60.00
Contribution before tax	60.00
Tax@35%	21.00
CFAT (1-5 years)	39.00

(c) Additional CFAT attributable to Foreign Investment

	$ Million
Through setting up subsidiary in India	210.50
Through Exports in India	39.00
CFAT (1-5 years)	171.50

III. Determination of NPV

Year	CFAT ($ Million)	PVF@12%	PV($ Million)
1-5	171.50	3.6048	618.2232
5	35	0.5674	19.8590
			638.0822
Less: Initial Outflow			535.0000
			103.0822

Since NPV is positive the proposal should be accepted.

Question 20

XYZ Ltd., a company based in India, manufactures very high quality modem furniture and sells to a small number of retail outlets in India and Nepal. It is facing tough competition. Recent studies on marketability of products have clearly indicated that the customer is now more interested in variety and choice rather than exclusivity and exceptional quality. Since the cost of quality wood in India is very high, the company is reviewing the proposal for import of woods in bulk from Nepalese supplier.

The estimate of net Indian (₹) and Nepalese Currency (NC) cash flows for this proposal is shown below:

	Net Cash Flow (in millions)			
Year	*0*	*1*	*2*	*3*
NC	*-25.000*	*2.600*	*3.800*	*4.100*
Indian (₹)	*0*	*2.869*	*4.200*	*4.600*

The following information is relevant:

(i) XYZ Ltd. evaluates all investments by using a discount rate of 9% p.a. All Nepalese customers are invoiced in NC. NC cash flows are converted to Indian (₹) at the forward rate and discounted at the Indian rate.

(ii) Inflation rates in Nepal and India are expected to be 9% and 8% p.a. respectively. The current exchange rate is ₹ 1= NC 1.6

Assuming that you are the finance manager of XYZ Ltd., calculate the net present value (NPV) and modified internal rate of return (MIRR) of the proposal.

You may use following values with respect to discount factor for ₹ 1 @9%.

	Present Value	***Future Value***
Year 1	*0.917*	*1.188*
Year 2	*0.842*	*1.090*
Year 3	*0.772*	*1*

Answer

Working Notes:

(i) Computation of Forward Rates

End of Year	*NC*	*NC/₹*
1	$NC1.60 \times \left(\frac{(1+0.09)}{(1+0.08)}\right)$	1.615
2	$NC1.615 \times \left(\frac{(1+0.09)}{(1+0.08)}\right)$	1.630
3	$NC1.630 \times \left(\frac{(1+0.09)}{(1+0.08)}\right)$	1.645

(ii) NC Cash Flows converted in Indian Rupees

Year	*NC (Million)*	*Conversion Rate*	*₹ (Million)*
0	-25.00	1.600	-15.625

1	2.60	1.615	1.61
2	3.80	1.630	2.33
3	4.10	1.645	2.49

Net Present Value

(₹ Million)

Year	Cash Flow in India	Cash Flow in Nepal	Total	PVF @ 9%	PV
0	---	-15.625	-15.625	1.000	-15.625
1	2.869	1.61	4.479	0.917	4.107
2	4.200	2.33	6.53	0.842	5.498
3	4.600	2.49	7.09	0.772	5.473
					-0.547

Modified Internal Rate of Return

	Year			
	0	1	2	3
Cash Flow (₹ Million)	-15.625	4.479	6.53	7.09
Year 1 Cash Inflow reinvested for 2 years (1.188 x 4.479)				5.32
Year 2 Cash Inflow reinvested for 1 years (1.090 x 6.53)				7.12
				19.53

$$MIRR = \sqrt[n]{\frac{Terminal\ Cash\ Flow}{Initial\ Outlay}} - 1 = \sqrt[3]{\frac{19.53}{15.625}} - 1 = 0.0772 \text{ say } 7.72\%$$

12

Foreign Exchange Exposure and Risk Management

BASIC CONCEPTS AND FORMULAE

1. Foreign Exchange Market

The foreign exchange market is the market in which individuals, firms and banks buy and sell foreign currencies or foreign exchange. The purpose of the foreign exchange market is to permit transfers of purchasing power denominated in one currency to another i.e. to trade one currency for another. Like any other market buyer and seller exist in this market and the demand and supply functions play a big role in determination of exchange rate of the currency.

2. Exchange Rate Determination

An exchange rate is, simply, the price of one nation's currency in terms of another currency, often termed as the reference currency. The foreign exchange market includes both the spot and forward exchange rates.

(a) The Spot Market: A spot rate occurs when buyers and sellers of currencies agree for immediate delivery of the currency.

(b) The Forward Market: A forward exchange rate occurs when buyers and sellers of currencies agree to deliver the currency at some future date. The forward exchange rate is set and agreed by the parties and remains fixed for the contract period regardless of the fluctuations in the spot exchange rates in future.

3. Exchange Rate Quotation

(a) Direct and Indirect Quote: A foreign exchange quotation can be either a direct quotation and or an indirect quotation, depending upon the home currency of the person concerned. A direct quote (also called the European terms) is the home currency price of one unit of foreign currency. An indirect quote (also called the American terms) is the foreign currency price of one unit of the home currency. Mathematically, expressed as follows:

Direct quote = 1/indirect quote and vice versa

(b) Bid, Offer and Spread: Foreign exchange quotes are two-way quotes, expressed as a 'bid and an offer' (or ask) price. Bid is the price at which the

dealer is willing to buy another currency. The offer is the rate at which he is willing to sell another currency.

4. Exchange Rate Forecasting

Corporates need to do the exchange rate forecasting for taking decisions regarding hedging, short-term financing, short-term investment, capital budgeting, earnings assessments and long-term financing. Investors and traders need tools to select and analyze the right data from the vast amount of data available to them to help them make good decisions.

5. Techniques of Exchange Rate Forecasting

There are numerous methods available for forecasting exchange rates. They can be categorized into four general groups- technical, fundamental, market-based, and mixed.

(a) **Technical Forecasting:** It involves the use of historical data to predict future values. For example time series models.

(b) **Fundamental Forecasting:** It is based on the fundamental relationships between economic variables and exchange rates. For example subjective assessments, quantitative measurements based on regression models and sensitivity analyses.

(c) **Market-Based Forecasting:** It uses market indicators to develop forecasts. The current spot/forward rates are often used, since speculators will ensure that the current rates reflect the market expectation of the future exchange rate.

(d) **Mixed Forecasting:** It refers to the use of a combination of forecasting techniques. The actual forecast is a weighted average of the various forecasts developed.

6. Exchange Rate Theories

(a) Interest Rate Parity (IRP): This theory which states that 'the size of the forward premium (or discount) should be equal to the interest rate differential between the two countries of concern". When interest rate parity exists, covered interest arbitrage (means foreign exchange risk is covered) is not feasible, because any interest rate advantage in the foreign country will be offset by the discount on the forward rate.

Covered Interest Rate Parity equation is given by:

$$(1+r_D) = \frac{F}{S}(1+r_F)$$

Where,

$(1 + r_D)$ = Amount that an investor would get after a unit period by investing a

rupee in the domestic market at r_D rate of interest and $\frac{F}{S}(1 + r_F)$ is the amount that an investor by investing in the foreign market at r_F so that the investment of one rupee yield same return in the domestic as well as in the foreign market.

Uncovered Interest Rate Parity equation is given by:

$$(1+r_D)=\frac{S_1}{S}(1+r_F)$$

Where,

S_1 = Expected future spot rate when the receipts denominated in foreign currency is converted into domestic currency.

(b) Purchasing Power Parity (PPP): This theory focuses on the 'inflation-exchange rate' relationship.

There are two forms of PPP theory:

- **Absolute Form**- Also called the 'Law of One Price' suggests that "prices of similar products of two different countries should be equal when measured in a common currency". If a discrepancy in prices as measured by a common currency exists, the demand should shift so that these prices should converge.
- **Relative Form** – An alternative version that accounts for the possibility of market imperfections such as transportation costs, tariffs, and quotas. It suggests that 'because of these market imperfections, prices of similar products of different countries will not necessarily be the same when measured in a common currency.'

In Equilibrium Form:

$$S = \alpha \frac{P_D}{P_F}$$

Where,

S (₹/$) = spot rate

P_D = is the price level in India, the domestic market.

P_F = is the price level in the foreign market, the US in this case.

A = Sectoral price and sectoral shares constant.

(c) International Fisher Effect (IFE): According to this theory, 'nominal risk-free interest rates contain a real rate of return and anticipated inflation'. This means if investors of all countries require the same real return, interest rate differentials

between countries may be the result of differential in expected inflation.

The IFE equation can be given by:

$r_D - P_D = r_F - \Delta P_F$ or $P_D - P_F = \Delta S = r_D - r_F$

7. Comparison of PPP, IRP AND IFE Theories

Theory	*Key*	*Variables*	*Summary*
Interest Rate Parity (IRP)	Forward rate premium (or discount)	Interest rate differential	The forward rate of one currency will contain a premium (or discount) that is determined by the differential in interest rates between the two countries.
Purchasing Power Parity (PPP)	Percentage change in spot exchange rate	Inflation rate differential	The spot rate of one currency with respect to another will change in reaction to the differential in inflation rates between two countries.
International Fisher Effect (IFE)	Percentage change in spot exchange rate	Interest rate differential	The spot rate of one currency with respect to another will change in accordance with the differential in interest rates between the two countries.

8. Risk Management

A 'risk' is anything that can lead to results that deviate from the requirements. Risk Management is, "any activity which identifies risks, and takes action to remove or control 'negative results' (deviations from the requirements)." Unpredictable changes in interest rates, yield curve structures, exchange rates, and commodity prices, exacerbated by the explosion in international expansion, have made the financial environment riskier today than it ever was in the past. For this reason, boards of directors, shareholders, and executive and tactical management need to be seriously concerned that corporate risk management activities be adequately assessed, prioritized, driven by strategy, controlled, and reported.

9. Risk Considerations

There are several types of risk that an investor should consider and pay careful attention to. Some types of risk are as follows:

(a) Financial Risk: It is the potential loss or danger due to the uncertainty in movement of foreign exchange rates, interest rates, credit quality, liquidity

position, investment price, commodity price, or equity price, as well as the unpredictability of sales price, growth, and financing capabilities.

(b) **Business Risk:** This risk, also known as investment risk, may materialize because of forecasting errors made in market acceptance of products, future technological changes, and changes in costs related to projects.

(c) **Credit or Default Risk:** This type of risk is of particular concern to investors who hold bonds within their portfolio.

(d) **Country Risk:** This refers to the risk that a country would not be able to honour its financial commitments. When a country defaults it can harm the performance of all other financial instruments in that country as well as other countries it has relations with.

(e) **Interest Rate Risk:** It refers to the change in the interest rates. A rise in interest rates during the term of an investor's debt security hurts the performance of stocks and bonds.

(f) **Political Risk:** This represents the financial risk that a country's government will suddenly change its policies.

(g) **Market Risk:** It is the day-to-day fluctuations in a stock's price. It is also referred to as volatility.

(h) **Foreign Exchange Risk:** Foreign exchange risk applies to all financial instruments that are in a currency other than the domestic currency.

10. Foreign Exchange Exposure

Foreign exchange exposure refers to those parts of a company's business that would be affected if exchange rate changes.

11. Types of Exposures

(a) **Transaction Exposure:** It measures the effect of an exchange rate change on outstanding obligations that existed before exchange rates changed but were settled after the exchange rate changed. Thus, it deals with cash flows that result from existing contractual obligations.

(b) **Translation Exposure**: Also known as accounting exposure, it refers to gains or losses caused by the translation of foreign currency assets and liabilities into the currency of the parent company for accounting purposes.

(c) **Economic Exposure:** It refers to the extent to which the economic value of a company can decline due to changes in exchange rate. It is the overall impact of exchange rate changes on the value of the firm.

12. Techniques for Managing Exposure

The aim of foreign exchange risk management is to stabilize the cash flows and reduce the uncertainty from financial forecasts. Various techniques for managing the exposure are as follows:

(A) Derivatives: A derivatives transaction is a bilateral contract or payment exchange agreement whose value depends on - derives from - the value of an underlying asset, reference rate or index. Every derivatives transaction is constructed from two simple building blocks that are fundamental to all derivatives: forwards and options. They include:

(a) Forwards-based Derivatives: There are three divisions of forwards-based derivatives:

(i) The Forward Contract-The simplest form of derivatives is the forward contract. It obliges one party to buy, and the other to sell, a specified quantity of a nominated underlying financial instrument at a specific price, on a specified date in the future.

(ii) Swaps-Swaps are infinitely flexible. They are a method of exchanging the underlying economic basis of a debt or asset without affecting the underlying principal obligation on the debt or asset.

Swaps can be classified into the following groups:

- Interest rate;
- Currency;
- Commodity; and
- Equity.

(iii) Futures Contracts- A basic futures contract is very similar to the forward contract in its obligation and payoff profile. Some important distinctions between futures and forwards and swaps are:

- The contract terms of futures are standardized.
- All transactions are carried out though the exchange clearing system thus avoiding the other party risk.

(b) Options: They offer, in exchange for a premium, the right - but *not* the obligation - to buy or sell the underlying at the strike price during a period or on a specific date. So the owner of the option can choose not to exercise the option and let it expire.

An option is a contract which has one or other of the two key attributes:

- to buy **(call option)**- It is a contract that gives the buyer the right, but not the obligation, to buy a specified number of units of commodity or a foreign currency from the seller of option at a fixed price on or up to a specific date.
- to sell **(put option**)- It is a contract that gives the buyer the right, but not the obligation, to sell a specified number of units of commodity or a

foreign currency to a seller of option at a fixed price on or up to a specific date.

The holder of an ***American option*** has the right to exercise the contract at any stage during the period of the option, whereas the holder of a ***European option*** can exercise his right only at the end of the period.

(B) Money Market Hedge: A money market hedge involves simultaneous borrowing and lending activities in two different currencies to lock in the home currency value of a future foreign currency cash flow. The simultaneous borrowing and lending activities enable a company to create a homemade forward contract.

(C) Forward Market Hedge: In a forward market hedge, a company that has a long position in a foreign currency will sell the foreign currency forward, whereas a company that has a short position in a foreign currency will buy the foreign currency forward. In this manner, the company can fix the dollar value of future foreign currency cash flow.

(D) Netting: Netting involves associated companies, which trade with each other. The technique is simple. Group companies merely settle inter affiliate indebtedness for the net amount owing. Gross intra-group trade, receivables and payables are netted out.

(E) Matching: Matching is a mechanism whereby a company matches its foreign currency inflows with its foreign currency outflows in respect of amount and approximate timing. Receipts in a particular currency are used to make payments in that currency thereby reducing the need for a group of companies to go through the foreign exchange markets to the unmatched portion of foreign currency cash flows.

(F) Leading and Lagging: Leading means paying an obligation in advance of the due date. Lagging means delaying payment of an obligation beyond its due date. Leading and lagging are foreign exchange management tactics designed to take advantage of expected devaluations and revaluations of currencies.

(G) Price Variation: Price variation involves increasing selling prices to counter the adverse effects of exchange rate change.

(H) Invoicing in Foreign Currency: Sellers usually wish to sell in their own currency or the currency in which they incur cost. This avoids foreign exchange exposure. For the buyer, the ideal currency is usually its own or one that is stable relative to it, or it may be a currency of which the purchaser has reserves.

(I) Asset and Liability Management: Asset and liability management can involve aggressive or defensive postures. In the aggressive attitude, the firm simply increases exposed cash inflows denominated in currencies expected to be strong or increases exposed cash outflows denominated in weak currencies. By contrast, the defensive approach involves matching cash inflows and outflows

according to their currency of denomination, irrespective of whether they are in strong or weak currencies.

(J) Arbitrage: The simple notion in arbitrage is to purchase and sell a currency simultaneously in more than one foreign exchange markets. Arbitrage profits are the result of the difference in exchange rates at two different exchange centres and the difference, due to interest yield which can be earned at different exchanges.

13. Strategies for Exposure Management

Four separate strategy options are feasible for exposure management. They are:

(a) Low Risk: Low Reward- This option involves automatic hedging of exposures in the forward market as soon as they arise, irrespective of the attractiveness or otherwise of the forward rate.

(b) Low Risk: Reasonable Reward- This strategy requires selective hedging of exposures whenever forward rates are attractive but keeping exposures open whenever they are not.

(c) High Risk: Low Reward- Perhaps the worst strategy is to leave all exposures unhedged.

(d) High Risk: High Reward- This strategy involves active trading in the currency market through continuous cancellations and re-bookings of forward contracts. With exchange controls relaxed in India in recent times, a few of the larger companies are adopting this strategy.

Question 1

Outland Steel has a small but profitable export business. Contracts involve substantial delays in payment, but since the company has had a policy of always invoicing in dollars, it is fully protected against changes in exchange rates. More recently the sales force has become unhappy with this, since the company is losing valuable orders to Japanese and German firms that are quoting in customers' own currency. How will you, as Finance Manager, deal with the situation?

Answer

As a Finance Manager to deal with the situation two problems emerge – (i) the problem of negotiating individual contracts and (ii) managing the company's foreign exchange exposure.

The sales force can be allowed to quote in customer's own currency and hedge for currency risk by obtaining the forward contracts etc.

The finance manager can decide whether the company ought to insure. There are two ways of protecting against exchange loss. Firstly, by selling the foreign currency forward and secondly, to borrow foreign currency against its receivables, sell the foreign currency spot and invest the proceeds in the foreign currency say dollars. Interest rate parity theory tells us that in free market the difference between selling forward and selling spot should be exactly equal to

difference between the interest on the money one has to pay overseas and the interest one earns from dollars.

Question 2

"Operations in foreign exchange market are exposed to a number of risks." Discuss.

Answer

A firm dealing with foreign exchange may be exposed to foreign currency exposures. The exposure is the result of possession of assets and liabilities and transactions denominated in foreign currency. When exchange rate fluctuates, assets, liabilities, revenues, expenses that have been expressed in foreign currency will result in either foreign exchange gain or loss. A firm dealing with foreign exchange may be exposed to the following types of risks:

(i) **Transaction Exposure:** A firm may have some contractually fixed payments and receipts in foreign currency, such as, import payables, export receivables, interest payable on foreign currency loans etc. All such items are to be settled in a foreign currency. Unexpected fluctuation in exchange rate will have favourable or adverse impact on its cash flows. Such exposures are termed as transactions exposures.

(ii) **Translation Exposure:** The translation exposure is also called accounting exposure or balance sheet exposure. It is basically the exposure on the assets and liabilities shown in the balance sheet and which are not going to be liquidated in the near future. It refers to the probability of loss that the firm may have to face because of decrease in value of assets due to devaluation of a foreign currency despite the fact that there was no foreign exchange transaction during the year.

(iii) **Economic Exposure:** Economic exposure measures the probability that fluctuations in foreign exchange rate will affect the value of the firm. The intrinsic value of a firm is calculated by discounting the expected future cash flows with appropriate discounting rate. The risk involved in economic exposure requires measurement of the effect of fluctuations in exchange rate on different future cash flows.

Question 3

What is the meaning of:

(i) Interest Rate Parity and

(ii) Purchasing Power Parity?

Answer

(i) Interest Rate Parity (IRP): Interest rate parity is a theory which states that 'the size of the forward premium (or discount) should be equal to the interest rate differential between the two countries of concern". When interest rate parity exists, covered interest arbitrage (means foreign exchange risk is covered) is not feasible, because any interest rate advantage in the foreign country will be offset by the discount on the forward rate. Thus, the act of covered interest arbitrage would generate a return that is no higher than

what would be generated by a domestic investment.

The Covered Interest Rate Parity equation is given by:

$$(1+r_D)=\frac{F}{S}(1+r_F)$$

Where $(1 + r_D)$ = Amount that an investor would get after a unit period by investing a rupee in the domestic market at r_D rate of interest and $(1+ r_F)$ F/S = is the amount that an investor by investing in the foreign market at r_F that the investment of one rupee yield same return in the domestic as well as in the foreign market.

Thus IRP is a theory which states that the size of the forward premium or discount on a currency should be equal to the interest rate differential between the two countries of concern.

(ii) Purchasing Power Parity (PPP): Purchasing Power Parity theory focuses on the 'inflation – exchange rate' relationship. There are two forms of PPP theory:-

The ABSOLUTE FORM, also called the 'Law of One Price' suggests that "prices of similar products of two different countries should be equal when measured in a common currency". If a discrepancy in prices as measured by a common currency exists, the demand should shift so that these prices should converge.

The RELATIVE FORM is an alternative version that accounts for the possibility of market imperfections such as transportation costs, tariffs, and quotas. It suggests that 'because of these market imperfections, prices of similar products of different countries will not necessarily be the same when measured in a common currency.' However, it states that the rate of change in the prices of products should be somewhat similar when measured in a common currency, as long as the transportation costs and trade barriers are unchanged.

The formula for computing the forward rate using the inflation rates in domestic and foreign countries is as follows:

$$F = S\ \frac{(1+i_D)}{(1+i_F)}$$

Where F= Forward Rate of Foreign Currency and S= Spot Rate

i_D = Domestic Inflation Rate and i_F= Inflation Rate in foreign country

Thus PPP theory states that the exchange rate between two countries reflects the relative purchasing power of the two countries i.e. the price at which a basket of goods can be bought in the two countries.

Question 4

Write short notes on the following:

(a) Leading and lagging

(b) Meaning and Advantages of Netting

(c) Nostro, Vostro and Loro Accounts

Answer

(a) Leading means advancing a payment i.e. making a payment before it is due. Lagging involves postponing a payment i.e. delaying payment beyond its due date.

In forex market Leading and lagging are used for two purposes:-

(1) Hedging foreign exchange risk: A company can lead payments required to be made in a currency that is likely to appreciate. For example, a company has to pay $100000 after one month from today. The company apprehends the USD to appreciate. It can make the payment now. Leading involves a finance cost i.e. one month's interest cost of money used for purchasing $100000.

A company may lag the payment that it needs to make in a currency that it is likely to depreciate, provided the receiving party agrees for this proposition. The receiving party may demand interest for this delay and that would be the cost of lagging. Decision regarding leading and lagging should be made after considering (i) likely movement in exchange rate (ii) interest cost and (iii) discount (if any).

(2) Shifting the liquidity by modifying the credit terms between inter-group entities: For example, A Holding Company sells goods to its 100% Subsidiary. Normal credit term is 90 days. Suppose cost of funds is 12% for Holding and 15% for Subsidiary. In this case the Holding may grant credit for longer period to Subsidiary to get the best advantage for the group as a whole. If cost of funds is 15% for Holding and 12% for Subsidiary, the Subsidiary may lead the payment for the best advantage of the group as a whole. The decision regarding leading and lagging should be taken on the basis of cost of funds to both paying entity and receiving entity. If paying and receiving entities have different home currencies, likely movements in exchange rate should also be considered.

(b) It is a technique of optimising cash flow movements with the combined efforts of the subsidiaries thereby reducing administrative and transaction costs resulting from currency conversion. There is a co-ordinated international interchange of materials, finished products and parts among the different units of MNC with many subsidiaries buying /selling from/to each other. Netting helps in minimising the total volume of inter-company fund flow.

Advantages derived from netting system includes:

(1) Reduces the number of cross-border transactions between subsidiaries thereby decreasing the overall administrative costs of such cash transfers

(2) Reduces the need for foreign exchange conversion and hence decreases transaction costs associated with foreign exchange conversion.

(3) Improves cash flow forecasting since net cash transfers are made at the end of each period

(4) Gives an accurate report and settles accounts through co-ordinated efforts among all subsidiaries.

(c) In interbank transactions, foreign exchange is transferred from one account to another account and from one centre to another centre. Therefore, the banks maintain three types of current accounts in order to facilitate quick transfer of funds in different currencies. These accounts are Nostro, Vostro and Loro accounts meaning "our", "your" and "their". A bank's foreign currency account maintained by the bank in a foreign country and in the home currency of that country is known as Nostro Account or "our account with you". For example, An Indian bank's Swiss franc account with a bank in Switzerland. Vostro account is the local currency account maintained by a foreign bank/branch. It is also called "your account with us". For example, Indian rupee account maintained by a bank in Switzerland with a bank in India. The Loro account is an account wherein a bank remits funds in foreign currency to another bank for credit to an account of a third bank.

Question 5

The price of a bond just before a year of maturity is $ 5,000. Its redemption value is $ 5,250 at the end of the said period. Interest is $ 350 p.a. The Dollar appreciates by 2% during the said period. Calculate the rate of return.

Answer

Here we can assume two cases (i) If investor is US investor then there will be no impact of appreciation in $. (ii) If investor is from any other nation other than US say Indian then there will be impact of $ appreciation on his returns.

First we shall compute return on bond which will be common for both investors.

$$\text{Return} = \frac{(\text{Price at end - Price at begining}) + \text{Interest}}{\text{Price at begining}}$$

$$= \frac{(5250 - 5000) + 350}{5000}$$

$$= \frac{250 + 350}{5000} = 0.12 \text{ say } 12\%$$

(i) For US investor the return shall be 12% and there will be no impact of appreciation in $.

(ii) If $ appreciate by 2% then return for non-US investor shall be:

Return x 1.02 = 0.12 x 1.02=0.1224 i.e. 12.24%

Alternatively it can also be considered that $ appreciation will be applicable to the amount of principal as well. The answer therefore could also be

(1+0.12)(1+0.02) -1 =1.12X1.02 - 1 = 0.1424 i.e. 14.24%

Question 6

ABN-Amro Bank, Amsterdam, wants to purchase ₹ 15 million against US$ for funding their Vostro account with Canara Bank, New Delhi. Assuming the inter-bank, rates of US$ is ₹ 51.3625/3700, what would be the rate Canara Bank would quote to ABN-Amro Bank? Further, if the deal is struck, what would be the equivalent US$ amount.

Answer

Here Canara Bank shall buy US$ and credit ₹ to Vostro account of ABN-Amro Bank. Canara Bank's buying rate will be based on the Inter-bank Buying Rate (as this is the rate at which Canara Bank can sell US$ in the Interbank market)

Accordingly, the Interbank Buying Rate of US$ will be ₹ 51.3625 (lower of two)

Equivalent of US$ for ₹ 15 million at this rate will be

$$= \frac{15,000,000}{51.3625} \quad = \text{US\$ } 2,92,041.86$$

Question 7

ABC Ltd. of UK has exported goods worth Can $ 5,00,000 receivable in 6 months. The exporter wants to hedge the receipt in the forward market. The following information is available:

Spot Exchange Rate	*Can $ 2.5/£*
Interest Rate in UK	*12%*
Interest Rate In Canada	*15%*

The forward rates truly reflect the interest rates differential. Find out the gain/loss to UK exporter if Can $ spot rates (i) declines 2%, (ii) gains 4% or (iii) remains unchanged over next 6 months.

Answer

$$\text{Forward Rate} = \frac{2.50\,(1+0.075)}{(1+0.060)} = \text{Can\$ } 2.535/£$$

(i) If spot rate decline by 2%

Spot Rate = Can$ 2.50 x 1.02 = Can$ 2.55/£

	£
£ receipt as per Forward Rate (Can $ 5,00,000/ Can$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can $ 5,00,000/ Can$ 2.55)	1,96,078
Gain due to forward contract	1,161

(ii) If spot rate gains by 4%

Spot Rate = Can$ 2.50 x 0.96 = Can$ 2.40/£

	£
£ receipt as per Forward Rate (Can $ 5,00,000/ Can$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can $ 5,00,000/ Can$ 2.40)	2,08,333
Loss due to forward contract	11,094

(iii) If spot rate remains unchanged

	£
£ receipt as per Forward Rate (Can $ 5,00,000/ Can$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can $ 5,00,000/ Can$ 2.50)	2,00,000
Loss due to forward contract	2,761

Question 8

XYZ Bank, Amsterdam, wants to purchase ₹ 25 million against £ for funding their Nostro account and they have credited LORO account with Bank of London, London.

Calculate the amount of £'s credited. Ongoing inter-bank rates are per $, ₹ 61.3625/3700 & per £, $ 1.5260/70.

Answer

To purchase Rupee, XYZ Bank shall first sell £ and purchase $ and then sell $ to purchase Rupee. Accordingly, following rate shall be used:

$(£/₹)_{ask}$

The available rates are as follows:

$(\$/£)_{bid}$ = $1.5260

$(\$/£)_{ask}$ = $1.5270

$(₹/\$)_{bid}$ = ₹ 61.3625

$(₹/\$)_{ask}$ = ₹ 61.3700

From above available rates we can compute required rate as follows:

$(£/₹)_{ask} = (£/\$)_{ask} \times (\$/₹)_{ask}$

= (1/1.5260) x (1/61.3625)

= £ 0.01068 or £ 0.0107

Thus amount of £ to be credited

= ₹ 25,000,000 x £ 0.0107

= £ 267,500

Question 9

JKL Ltd., an Indian company has an export exposure of JPY 10,000,000 payable August 31, 2014. Japanese Yen (JPY) is not directly quoted against Indian Rupee.

The current spot rates are:

INR/US $ = ₹ 62.22

JPY/US$ = JPY 102.34

It is estimated that Japanese Yen will depreciate to 124 level and Indian Rupee to depreciate against US $ to ₹ 65.

Forward rates for August 2014 are

INR/US $ = ₹ 66.50

JPY/US$ = JPY 110.35

Required:

(i) Calculate the expected loss, if the hedging is not done. How the position will change, if the firm takes forward cover?

(ii) If the spot rates on August 31, 2014 are:

INR/US $= ₹ 66.25

JPY/US$ = JPY 110.85

Is the decision to take forward cover justified?

Answer

Since the direct quote for ¥ and ₹ is not available it will be calculated by cross exchange rate as follows:

₹/$ x $/¥ = ₹/¥

62.22/102.34 = 0.6080

Spot rate on date of export 1¥ = ₹ 0.6080

Expected Rate of ¥ for August 2014 = ₹ 0.5242 (₹ 65/¥124)

Forward Rate of ¥ for August 2014 = ₹ 0.6026 (₹ 66.50/¥110.35)

(i) Calculation of expected loss without hedging

Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2014 (₹ 0.5242 x ¥10,000,000)	₹ 52,42,000
Loss	₹ 8,38,000

Hedging of loss under Forward Cover

₹ Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Payment to be received under Forward Cover (₹ 0.6026 x ¥10,000,000)	₹ 60,26,000
Loss	₹ 54,000

By taking forward cover loss is reduced to ₹ 54,000.

(ii) Actual Rate of ¥ on August 2014 = ₹ 0.5977 (₹ 66.25/¥110.85)

Value of export at the time of export (₹ 0.6080 x ¥10,000,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2014 (₹ 0.5977 x ¥10,000,000)	₹ 59,77,000
Loss	₹ 1,03,000

The decision to take forward cover is still justified.

Question 10

You sold Hong Kong Dollar 1,00,00,000 value spot to your customer at ₹ 5.70 & covered yourself in London market on the same day, when the exchange rates were

US$ 1 = H.K.$ 7.5880 7.5920

Local inter bank market rates for US$ were

Spot US$ 1 = ₹ 42.70 42.85

Calculate cover rate and ascertain the profit or loss in the transaction. Ignore brokerage.

Answer

The bank (Dealer) covers itself by buying from the market at market selling rate.

Rupee – Dollar selling rate = ₹ 42.85

Dollar – Hong Kong Dollar = HK $ 7.5880

Rupee – Hong Kong cross rate = ₹ 42.85 / 7.5880

= ₹ 5.6471

Profit / Loss to the Bank

Amount received from customer (1 crore × 5.70)	₹ 5,70,00,000
Amount paid on cover deal (1 crore × 5.6471)	₹ 5,64,71,000
Profit to Bank	₹ 5,29,000

Question 11

You, a foreign exchange dealer of your bank, are informed that your bank has sold a T.T. on Copenhagen for Danish Kroner 10,00,000 at the rate of Danish Kroner 1 = ₹ 6.5150. You are required to cover the transaction either in London or New York market. The rates on that date are as under:

Mumbai-London	*₹ 74.3000*	*₹ 74.3200*
Mumbai-New York	*₹ 49.2500*	*₹ 49.2625*
London-Copenhagen	*DKK 11.4200*	*DKK 11.4350*
New York-Copenhagen	*DKK 07.5670*	*DKK 07.5840*

In which market will you cover the transaction, London or New York, and what will be the exchange profit or loss on the transaction? Ignore brokerages.

Answer

Amount realized on selling Danish Kroner 10,00,000 at ₹ 6.5150 per Kroner = ₹ 65,15,000.

Cover at London:

Bank buys Danish Kroner at London at the market selling rate.

Pound sterling required for the purchase (DKK 10,00,000 ÷ DKK 11.4200) = GBP 87,565.67

Bank buys locally GBP 87,565.67 for the above purchase at the market selling rate of ₹ 74.3200.

The rupee cost will be = ₹ 65,07,88

Profit (₹ 65,15,000 - ₹ 65,07,881) = ₹ 7,119

Cover at New York:

Bank buys Kroners at New York at the market selling rate.

Dollars required for the purchase of Danish Kroner (DKK10,00,000 ÷ 7.5670) = USD 1,32,152.77

Bank buys locally USD 1,32,152.77 for the above purchase at the market selling rate of ₹ 49.2625.

The rupee cost will be = ₹ 65,10,176.

Profit (₹ 65,15,000 - ₹ 65,10,176) = ₹ 4,824

The transaction would be covered through London which gets the maximum profit of ₹ 7,119 or lower cover cost at London Market by (₹ 65,10,176 - ₹ 65,07,881) = ₹ 2,295

Question 12

On January 28, 2013 an importer customer requested a Bank to remit Singapore Dollar (SGD) 2,500,000 under an irrevocable Letter of Credit (LC). However, due to unavoidable factors, the Bank could effect the remittances only on February 4, 2013. The inter-bank market rates were as follows:

	January 28, 2013	*February 4, 2013*
US$ 1=	*₹ 45.85/45.90*	*₹ 45.91/45.97*
GBP £ 1	*US$ 1.7840/1.7850*	*US$ 1.7765/1.7775*
GBP £ 1	*SGD 3.1575/3.1590*	*SGD 3. 1380/3.1390*

The Bank wishes to retain an exchange margin of 0.125%

Required:

How much does the customer stand to gain or lose due to the delay?

(Note: Calculate the rate in multiples of 0.0001)

Answer

On January 28, 2013 the importer customer requested to remit SGD 25 lakhs.

To consider sell rate for the bank:

US $	=	₹ 45.90
Pound 1	=	US$ 1.7850
Pound 1	=	SGD 3.1575
Therefore, SGD 1	=	₹ 45.90 * 1.7850 / SGD 3.1575
SGD 1	=	₹ 25.9482
Add: Exchange margin (0.125%)		₹ 0.0324
		₹ 25.9806

On February 4, 2013 the rates are

US $	=	₹ 45.97
Pound 1	=	US$ 1.7775
Pound 1	=	SGD 3.1380
Therefore, SGD 1	=	₹ 45.97 * 1.7775 / SGD 3.1380
SGD 1	=	₹ 26.0394
Add: Exchange margin (0.125%)		₹ 0.0325
		₹ 26.0719

Hence, loss to the importer

= SGD 25,00,000 (₹ 26.0719 – ₹ 25.9806)= ₹ 2,28,250

Question 13

Following are the details of cash inflows and outflows in foreign currency denominations of MNP Co. an Indian export firm, which have no foreign subsidiaries:

Currency	*Inflow*	*Outflow*	*Spot rate*	*Forward rate*
US $	*4,00,00,000*	*2,00,00,000*	*48.01*	*48.82*
French Franc (FFr)	*2,00,00,000*	*80,00,000*	*7.45*	*8.12*

U.K. £	*3,00,00,000*	*2,00,00,000*	*75.57*	*75.98*
Japanese Yen	*1,50,00,000*	*2,50,00,000*	*3.20*	*2.40*

(i) Determine the net exposure of each foreign currency in terms of Rupees.

(ii) Are any of the exposure positions offsetting to some extent?

Answer

(i) Net exposure of each foreign currency in Rupees

	Inflow	Outflow	Net Inflow	Spread	Net Exposure
	(Millions)	(Millions)	(Millions)		(Millions)
US$	40	20	20	0.81	16.20
FFr	20	8	12	0.67	8.04
UK£	30	20	10	0.41	4.10
Japan Yen	15	25	-10	-0.80	8.00

(ii) The exposure of Japanese yen position is being offset by a better forward rate

Question 14

The following 2-way quotes appear in the foreign exchange market:

	Spot	*2-months forward*
RS/US $	*₹46.00/₹46.25*	*₹47.00/₹47.50*

Required:

(i) How many US dollars should a firm sell to get ₹25 lakhs after 2 months?

(ii) How many Rupees is the firm required to pay to obtain US $ 2,00,000 in the spot market?

(iii) Assume the firm has US $ 69,000 in current account earning no interest. ROI on Rupee investment is 10% p.a. Should the firm encash the US $ now or 2 months later?

Answer

(i) US $ required to get ₹ 25 lakhs after 2 months at the Rate of ₹ 47/$

$$\frac{₹\ 25,00,000}{₹\ 47} = \text{US \$ } 53191.489$$

(ii) ₹ required to get US$ 2,00,000 now at the rate of ₹ 46.25/$

∴ US $ 200,000 × ₹ 46.25 = ₹ 92,50,000

(iii) Encashing US $ 69000 Now Vs 2 month later

Proceed if we can encash in open mkt $ 69000 × ₹46 = ₹ 31,74,000

Opportunity gain

$= 31{,}74{,}000 \times \frac{10}{100} \times \frac{2}{12}$ ₹ 52,900

Likely sum at end of 2 months 32,26,900

Proceeds if we can encash by forward rate :

$ 69000 × ₹47.00 32,43,000

It is better to encash the proceeds after 2 months and get opportunity gain.

Question 15

Z Ltd. importing goods worth USD 2 million, requires 90 days to make the payment. The overseas supplier has offered a 60 days interest free credit period and for additional credit for 30 days an interest of 8% per annum.

The bankers of Z Ltd offer a 30 days loan at 10% per annum and their quote for foreign exchange is as follows:

	₹
Spot 1 USD	*56.50*
60 days forward for 1 USD	*57.10*
90 days forward for 1 USD	*57.50*

You are required to evaluate the following options:

(I) Pay the supplier in 60 days, or

(II) Avail the supplier's offer of 90 days credit.

Answer

(I) Pay the supplier in 60 days

If the payment is made to supplier in 60 days the applicable forward rate for 1 USD	₹ 57.10
Payment Due	USD 2,000,000
Outflow in Rupees (USD 2000000 × ₹57.10)	₹114,200,000
Add: Interest on loan for 30 days@10% p.a.	₹ 9,51,667
Total Outflow in ₹	₹11,51,51,667

(II) Availing supplier's offer of 90 days credit

Amount Payable	USD 2,000,000
Add: Interest on credit period for 30 days@8% p.a.	USD 13,333
Total Outflow in USD	USD 2,013,333

Applicable forward rate for 1 USD	₹57.50
Total Outflow in ₹ (USD 2,013,333 ×₹57.50)	₹115,766,648

Alternative 1 is better as it entails lower cash outflow.

Question 16

Followings are the spot exchange rates quoted at three different forex markets:

USD/INR	*48.30 in Mumbai*
GBP/INR	*77.52 in London*
GBP/USD	*1.6231 in New York*

The arbitrageur has USD1,00,00,000. Assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates.

Answer

The arbitrageur can proceed as stated below to realize arbitrage gains.

(i) Buy ₹ from USD 10,000,000 At Mumbai 48.30 × 10,000,000 ₹483,000,000

(ii) Convert these ₹ to GBP at London $\left(\frac{₹\ 483,000,000}{\text{Rs. } 77.52}\right)$ GBP 6,230,650.155

(iii) Convert GBP to USD at New York GBP 6,230,650.155 × 1.6231 USD 10,112,968.26

There is net gain of USD 10,112968.26 less USD 10,000,000 i.e USD 112,968.26

Question 17

The US dollar is selling in India at ₹55.50. If the interest rate for a 6 months borrowing in India is 10% per annum and the corresponding rate in USA is 4%.

(i) Do you expect that US dollar will be at a premium or at discount in the Indian Forex Market?

(ii) What will be the expected 6-months forward rate for US dollar in India? and

(iii) What will be the rate of forward premium or discount?

Answer

(i) Under the given circumstances, the USD is expected to quote at a premium in India as the interest rate is higher in India.

(ii) Calculation of the forward rate:

$$\frac{1+R_h}{1+R_f}=\frac{F_1}{E_o}$$

Where: R_h is home currency interest rate, R_f is foreign currency interest rate, F_1 is end of the period forward rate, and E_o is the spot rate.

Therefore $\frac{1 + (0.10/2)}{1 + (0.04/2)} = \frac{F_1}{55.50}$

$\frac{1 + 0.05}{1 + 0.02} = \frac{F_1}{55.50}$

or $\frac{1.05}{1.02} \times 55.50 = F_1$

or $\frac{58.275}{1.02} = F_1$

or F_1 = ₹57.13

(iii) Rate of premium:

$$\frac{57.13 - 55.50}{55.50} \times \frac{12}{6} \times 100 = 5.87\%$$

Question 18

In March, 2009, the Multinational Industries make the following assessment of dollar rates per British pound to prevail as on 1.9.2009:

$/Pound	*Probability*
1.60	*0.15*
1.70	*0.20*
1.80	*0.25*
1.90	*0.20*
2.00	*0.20*

(i) What is the expected spot rate for 1.9.2009?

(ii) If, as of March, 2009, the 6-month forward rate is $ 1.80, should the firm sell forward its pound receivables due in September, 2009?

Answer

(i) Calculation of expected spot rate for September, 2009:

$ for £ *(1)*	*Probability* *(2)*	*Expected $/£* *(1) × (2) = (3)*
1.60	0.15	0.24
1.70	0.20	0.34
1.80	0.25	0.45

1.90	0.20	0.38
2.00	0.20	0.40
	1.00	EV = 1.81

Therefore, the expected spot value of $ for £ for September, 2009 would be $ 1.81.

(ii) If the six-month forward rate is $ 1.80, the expected profits of the firm can be maximised by retaining its pounds receivable.

Question 19

A company operating in Japan has today effected sales to an Indian company, the payment being due 3 months from the date of invoice. The invoice amount is 108 lakhs yen. At today's spot rate, it is equivalent to ₹ 30 lakhs. It is anticipated that the exchange rate will decline by 10% over the 3 months period and in order to protect the yen payments, the importer proposes to take appropriate action in the foreign exchange market. The 3 months forward rate is presently quoted as 3.3 yen per rupee. You are required to calculate the expected loss and to show how it can be hedged by a forward contract.

Answer

Spot rate of ₹ 1 against yen = 108 lakhs yen/₹ 30 lakhs = 3.6 yen

3 months forward rate of Re. 1 against yen = 3.3 yen

Anticipated decline in Exchange rate = 10%.

Expected spot rate after 3 months = 3.6 yen – 10% of 3.6 = 3.6 yen – 0.36 yen = 3.24 yen per rupee

	₹ (in lakhs)
Present cost of 108 lakhs yen	30
Cost after 3 months: 108 lakhs yen/ 3.24 yen	33.33
Expected exchange loss	3.33

If the expected exchange rate risk is hedged by a Forward contract:

Present cost	30
Cost after 3 months if forward contract is taken 108 lakhs yen/ 3.3 yen	32.73
Expected loss	2.73

Suggestion: If the exchange rate risk is not covered with forward contract, the expected exchange loss is ₹ 3.33 lakhs. This could be reduced to ₹ 2.73 lakhs if it is covered with Forward contract. Hence, taking forward contract is suggested.

Question 20

ABC Co. have taken a 6 month loan from their foreign collaborators for US Dollars 2 millions. Interest payable on maturity is at LIBOR plus 1.0%. Current 6-month LIBOR is 2%.

Enquiries regarding exchange rates with their bank elicits the following information:

Spot USD 1	*₹ 48.5275*
6 months forward	*₹ 48.4575*

(i) What would be their total commitment in Rupees, if they enter into a forward contract?

(ii) Will you advise them to do so? Explain giving reasons.

Answer

Firstly, the interest is calculated at 3% p.a. for 6 months. That is:

USD 20,00,000 × 3/100 × 6/12 = USD 30,000

From the forward points quoted, it is seen that the second figure is less than the first, this means that the currency is quoted at a discount.

(i) The value of the total commitment in Indian rupees is calculated as below:

Principal Amount of loan	USD 20,00,000
Add: Interest	USD 30,000
Amount due	USD 20,30,000
Spot rate	₹ 48.5275
Forward Points (6 months)	(–) 0.0700
Forward Rate	₹ 48.4575
Value of Commitment	₹ 9,83,68,725

(ii) It is seen from the forward rates that the market expectation is that the dollar will depreciate. If the firm's own expectation is that the dollar will depreciate more than what the bank has quoted, it may be worthwhile not to cover forward and keep the exposure open.

If the firm has no specific view regarding future dollar price movements, it would be better to cover the exposure. This would freeze the total commitment and insulate the firm from undue market fluctuations. In other words, it will be advisable to cut the losses at this point of time.

Given the interest rate differentials and inflation rates between India and USA, it would be unwise to expect continuous depreciation of the dollar. The US Dollar is a stronger currency than the Indian Rupee based on past trends and it would be advisable to cover the exposure.

Question 21

Excel Exporters are holding an Export bill in United States Dollar (USD) 1,00,000 due 60 days hence. They are worried about the falling USD value which is currently at ₹ 45.60 per USD. The concerned Export Consignment has been priced on an Exchange rate of ₹ 45.50 per USD. The Firm's Bankers have quoted a 60-day forward rate of ₹ 45.20.

Calculate:

(i) Rate of discount quoted by the Bank

(ii) The probable loss of operating profit if the forward sale is agreed to.

Answer

(i) Rate of discount quoted by the bank

$$= \frac{(45.20 - 45.60) \times 365 \times 100}{45.60 \times 60} = 5.33\%$$

(ii) Probable loss of operating profit:

$(45.20 – 45.50) \times 1,00,000 = ₹ 30,000$

Question 22

Airlines Company entered into an agreement with Airbus for buying latest plans for a total value of F.F. (French Francs) 1,000 Million payable after 6 months. The current spot exchange rate is INR (Indian Rupees) 6.60/FF. The Airlines Company cannot predict the exchange rate in the future. Can the Airlines Company hedge its Foreign Exchange risk? Explain by examples.

Answer

Airlines Company can hedge its foreign exchange risk by the following ways:

(i) **Hedging through Forward Contract:** The Company can take full forward cover against foreign exchange exposure and entirely hedge its risk. It can contract with a bank to buy French franc forward at an agreed exchange rate e.g. suppose the 6 months forward rate is INR 6.77/FF. The liability is fixed and the airlines can concentrate on operation. Cost of forward contract

$$= \frac{6.60 - 6.77}{6.60} \times \frac{360}{\text{days}}$$

(ii) **Foreign Currency Option:** Foreign currency option is the right (not an obligation) to buy or sell a currency at an agreed exchange rate (exercise price) on or before an agreed maturity period. The right to buy is called a call option and right to sell is put option. Suppose, the airlines wants to purchase a 6 months put option. The put option exercise rate (say) is INR 6.70. The Airlines will be required to pay a premium for purchasing the option say 5% of the value of put option INR 6700×0.05 = INR 335

Maximum final cost = 6700 + 335 = INR 7035

Suppose at the end of 6 months the exchange rate stay at INR 6.8/FF

Airlines will exercise its put option hence it will sell (pay) INR 6.7

The exercise price to obtain one French Franc in this market, it will be required to pay INR 6.80.

Suppose exchange rate at the end of 6 months is INR 6.35, Airlines should not exercise its option. In the open market it need to pay only INR 6.35 (instead of INR 6.70) to buy one FF. However, it has already paid the option premium.

(iii) **Money Market Operations:** Airlines can borrow in Indian Rupee an amount and get it converted in FFs at Spot Rate. This amount can be invested in France for 6 months so that this amount along with interest due on it becomes equal to FFs 1000 million and is used for making the payment. The loan in Indian Rupee can be repaid back after 6 months along with the interest due thereon. If interest rate parity holds, the difference in the forward rate and the spot rate is the reflection of the difference in the interest rates in two countries.

Thus Airlines will be able to hedge against the changes in the exchange rate. The problem with money market is that all markets are not open and all countries are not fully convertible.

Question 23

(a) On 1st April, 3 months interest rate in the US and Germany are 6.5 per cent and 4.5 per cent per annum respectively. The $/DM spot rate is 0.6560. What would be the forward rate for DM for delivery on 30th June?

(b) In International Monetary Market an international forward bid for December, 15 on pound sterling is $ 1.2816 at the same time that the price of IMM sterling future for delivery on December, 15 is $ 1.2806. The contract size of pound sterling is £ 62,500. How could the dealer use arbitrage in profit from this situation and how much profit is earned?

Answer

(a)

	USD	DM
Spot	0.6560	1.000
Interest rate p.a.	6.5%	4.5%
Interest for 91 days	0.0106	0.0112
Amount after 91 days	0.6666	1.0112
Hence forward rate	0.6666	0.6592
	1.0112	

OR

$$\text{Forward rate} = \frac{0.6560 \times \left\{1 + \left(0.065 \times \frac{91}{365}\right)\right\}}{\left\{1 + \left(0.045 \times \frac{91}{365}\right)\right\}}$$

= 0.6592

(b) Buy £ 62500 × 1.2806 = $ 80037.50

Sell £ 62500 × 1.2816 = $ 80100.00

Profit $ 62.50

Alternatively if the market comes back together before December 15, the dealer could unwind his position (by simultaneously buying £ 62,500 forward and selling a futures contract. Both for delivery on December 15) and earn the same profit of $ 62.5.

Question 24

An Indian importer has to settle an import bill for $ 1,30,000. The exporter has given the Indian exporter two options:

(i) Pay immediately without any interest charges.

(ii) Pay after three months with interest at 5 percent per annum.

The importer's bank charges 15 percent per annum on overdrafts. The exchange rates in the market are as follows:

Spot rate (₹/$) : 48.35 /48.36

3-Months forward rate (₹/$) : 48.81 /48.83

The importer seeks your advice. Give your advice.

Answer

If importer pays now, he will have to buy US$ in Spot Market by availing overdraft facility. Accordingly, the outflow under this option will be

	₹
Amount required to purchase $130000[$130000X₹48.36]	6286800
Add: Overdraft Interest for 3 months @15% p.a.	235755
	6522555

If importer makes payment after 3 months then, he will have to pay interest for 3 months @ 5% p.a. for 3 month along with the sum of import bill. Accordingly, he will have to buy $ in forward market. The outflow under this option will be as follows:

	$
Amount of Bill	130000
Add: Interest for 3 months @5% p.a.	1625
	131625

Amount to be paid in Indian Rupee after 3 month under the forward purchase contract

₹ 6427249 (US$ 131625 X ₹ 48.83)

Since outflow of cash is least in (ii) option, it should be opted for.

Question 25

DEF Ltd. has imported goods to the extent of US$ 1 crore. The payment terms are 60 days interest-free credit. For additional credit of 30 days, interest at the rate of 7.75% p.a. will be charged.

The banker of DEF Ltd. has offered a 30 days loan at the rate of 9.5% p.a. Their quote for the foreign exchange is as follows:

Spot rate INR/US$ 62.50

60 days forward rate INR/US$ 63.15

90 days forward rate INR/US$ 63.45

Which one of the following options would be better?

(i) Pay the supplier on 60th day and avail bank loan for 30 days.

(ii) Avail the supplier's offer of 90 days credit.

Answer

(i) Pay the supplier in 60 days

If the payment is made to supplier in 60 days the applicable forward rate for 1 USD	₹ 63.15
Payment Due	USD 1 crore
Outflow in Rupees (USD 1 crore × ₹ 63.15)	₹ 63.15 crore
Add: Interest on loan for 30 days@9.5% p.a.	₹ 0.50 crore
Total Outflow in ₹	₹ 63.65 crore

(ii) Availing supplier's offer of 90 days credit

Amount Payable	USD 1.00000 crore
Add: Interest on credit period for 30 days@7.75% p.a.	USD 0.00646 crore
Total Outflow in USD	USD 1.00646 crore

Applicable forward rate for 1 USD	₹ 63.45
Total Outflow in ₹ (USD 1.00646 crore ×₹ 63.45)	₹ 63.86 crore

Alternative 1 is better as it entails lower cash outflow.

Question 26

A company is considering hedging its foreign exchange risk. It has made a purchase on 1st. January, 2008 for which it has to make a payment of US $ 50,000 on September 30, 2008. The present exchange rate is 1 US $ = ₹ 40. It can purchase forward 1 US $ at ₹ 39. The company will have to make a upfront premium of 2% of the forward amount purchased. The cost of funds to the company is 10% per annum and the rate of corporate tax is 50%. Ignore taxation. Consider the following situations and compute the Profit/Loss the company will make if it hedges its foreign exchange risk:

(i) If the exchange rate on September 30, 2008 is ₹ 42 per US $.

(ii) If the exchange rate on September 30, 2008 is ₹ 38 per US $.

Answer

	(₹)
Present Exchange Rate ₹40 = 1 US$	
If company purchases US$ 50,000 forward premium is	
50000 × 39 × 2%	39,000
Interest on ₹39,000 for 9 months at 10%	2,925
Total hedging cost	41,925
If exchange rate is ₹42	
Then gain (₹42 – ₹39) for US$ 50,000	1,50,000
Less: Hedging cost	41,925
Net gain	1,08,075
If US$ = ₹38	
Then loss (39 – 38) for US$ 50,000	50,000
Add: Hedging Cost	41,925
Total Loss	91,925

Question 27

Following information relates to AKC Ltd. which manufactures some parts of an electronics device which are exported to USA, Japan and Europe on 90 days credit terms.

Cost and Sales information:

	Japan	*USA*	*Europe*
Variable cost per unit	*₹225*	*₹395*	*₹510*
Export sale price per unit	*Yen 650*	*US$10.23*	*Euro 11.99*

Receipts from sale due in 90 days	*Yen 78,00,000*	*US$1,02,300*	*Euro 95,920*

Foreign exchange rate information:

	Yen/₹	*US$/₹*	*Euro/₹*
Spot market	*2.417-2.437*	*0.0214-0.0217*	*0.0177-0.0180*
3 months forward	*2.397-2.427*	*0.0213-0.0216*	*0.0176-0.0178*
3 months spot	*2.423-2.459*	*0.02144-0.02156*	*0.0177-0.0179*

Advice AKC Ltd. by calculating average contribution to sales ratio whether it should hedge it's foreign currency risk or not.

Answer

If foreign exchange risk is hedged

				Total (₹)
Sum due	Yen 78,00,000	US$1,02,300	Euro 95,920	
Unit input price	Yen 650	US$10.23	Euro 11.99	
Unit sold	12000	10000	8000	
Variable cost per unit	₹225/-	395	510	
Variable cost	₹27,00,000	₹ 39,50,000	₹ 40,80,000	₹ 1,07,30,000
Three months forward rate for selling	2.427	0.0216	0.0178	
Rupee value of receipts	₹32,13,844	₹ 47,36,111	₹ 53,88,764	₹ 1,33,38,719
Contribution	₹5,13,844	₹ 7,86,111	₹ 13,08,764	₹ 26,08,719
Average contribution to sale ratio				19.56%
If risk is not hedged				
Rupee value of receipt	₹31,72,021	₹ 47,44,898	₹ 53,58,659	₹ 1,32,75,578
Total contribution				₹ 25,45,578
Average contribution to sale ratio				19.17%

AKC Ltd. Is advised to hedge its foreign currency exchange risk.

Question 28

XYZ Ltd. is an export oriented business house based in Mumbai. The Company invoices in customers' currency. Its receipt of US $ 1,00,000 is due on September 1, 2009.

Market information as at June 1, 2009 is:

Exchange Rates		*Currency Futures*		
US $/₹		*US $/₹*	*Contract size*	*₹4,72,000*
Spot	*0.02140*	*June*	*0.02126*	
1 Month Forward	*0.02136*	*September*	*0.02118*	
3 Months Forward	*0.02127*			
		Initial Margin		*Interest Rates in India*
June		*₹ 10,000*		*7.50%*
September		*₹ 15,000*		*8.00%*

On September 1, 2009 the spot rate US $Re. is 0.02133 and currency future rate is 0.02134. Comment which of the following methods would be most advantageous for XYZ Ltd.

(a) Using forward contract

(b) Using currency futures

(c) Not hedging currency risks.

It may be assumed that variation in margin would be settled on the maturity of the futures contract.

Answer

Receipts using a forward contract (1,00,000/0.02127)	= ₹47,01,457
Receipts using currency futures	
The number of contracts needed is (1,00,000/0.02118)/4,72,000 = 10	
Initial margin payable is 10 x ₹15,000 = ₹1,50,000	
On September 1 Close at 0.02133	
Receipts = US$1,00,000/0.02133	= 46,88,233
Variation Margin = [(0.02134 – 0.02118) x 10 x 472000/-]/0.02133	
OR (0.00016x10x472000)/.02133 = 755.2/0.02133	35,406
	47,23,639
Less: Interest Cost – 1,50,000 x 0.08 x 3/12	₹3,000
Net Receipts	₹47,20,639
Receipts under different methods of hedging	
Forward contract	₹47,01,457
Futures	₹47,20,639
No hedge	
US$ 1,00,000/0.02133	₹46,88,233
The most advantageous option would have been to hedge with futures.	

Question 29

EFD Ltd. is an export business house. The company prepares invoice in customers' currency. Its debtors of US$. 10,000,000 is due on April 1, 2015.

Market information as at January 1, 2015 is:

Exchange rates US$/INR		***Currency Futures US$/INR***	
Spot	*0.016667*	*Contract size: ₹ 24,816,975*	
1-month forward	*0.016529*	*1-month*	*0.016519*
3-months forward	*0.016129*	*3-month*	*0.016118*

	Initial Margin	***Interest rates in India***
1-Month	*₹17,500*	*6.5%*
3-Months	*₹22,500*	*7%*

On April 1, 2015 the spot rate US$/INR is 0.016136 and currency future rate is 0.016134.

Which of the following methods would be most advantageous to EFD Ltd?

(i) Using forward contract

(ii) Using currency futures

(iii) Not hedging the currency risk

Answer

Receipts using a forward contract = $10,000,000/0.016129	=	₹	620,001,240
Receipts using currency futures			
The number of contracts needed is ($10,000,000/0.016118)/24,816,975 = 25			
Initial margin payable is 25 contracts x ₹ 22,500	=	₹	5,62,500
On April 1,2015Close at 0.016134			
Receipts = US$10,000,000/0.016136	=	₹	619,732,276
Variation Margin =			
[(0.016134 – 0.016118) x 25 x 24,816,975/-]/0.016136			
OR (0.000016x 25 x 24,816,975)/.016136 = 9926.79/0.016136	=	₹	615,195
Less: Interest Cost – ₹ 5,62,500x 0.07 x 3/12	=	₹	9,844
Net Receipts		₹	620,337,627
Receipts under different methods of hedging			
Forward contract		₹	620,001,240

Futures	₹	620,337,627
No hedge (US$ 10,000,000/0.016136)	₹	619,732,276

The most advantageous option would have been to hedge with futures.

Question 30

Spot rate 1 US $ = ₹48.0123

180 days Forward rate for 1 US $ = ₹48.8190

Annualised interest rate for 6 months – Rupee = 12%

Annualised interest rate for 6 months – US $ = 8%

Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow ₹ 40,00,000 or US $83,312.

Answer

Spot Rate = ₹40,00,000 /US$83,312 = 48.0123

Forward Premium on US$ = [(48.8190 – 48.0123)/48.0123] x 12/6 x 100

= 3.36%

Interest rate differential = 12% - 8%

= 4% (Negative Interest rate differential)

Since the negative Interest rate differential is greater than forward premium there is a possibility of arbitrage inflow into India.

The advantage of this situation can be taken in the following manner:

1. Borrow US$ 83,312 for 6 months

   Amount to be repaid after 6 months

   = US $ 83,312 (1+0.08 x 6/12) = US$86,644.48

2. Convert US$ 83,312 into Rupee and get the principal i.e. ₹40,00,000

   Interest on Investments for 6 months – ₹40,00,000/- x 0.06= ₹2,40,000/-

   Total amount at the end of 6 months = ₹(40,00,000 + 2,40,000) = ₹42,40,000/-

   Converting the same at the forward rate

   = ₹42,40,000/ ₹48.8190= US$ 86,851.43

Hence the gain is US $ (86,851.43 – 86,644.48) = US$ 206.95 OR

₹10,103 i.e., ($206.95 x ₹48.8190)

Question 31

Given the following information:

Exchange rate – Canadian dollar 0.665 per DM (spot)

Canadian dollar 0.670 per DM (3 months)

Interest rates – DM 7% p.a.

Canadian Dollar – 9% p.a.

What operations would be carried out to take the possible arbitrage gains?

Answer

In this case, DM is at a premium against the Can$.

Premium = [(0.67 – 0.665) /0.665] x (12/3) x 100 = 3.01 per cent

Interest rate differential = 9% - 7% = 2 per cent.

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

(i) Borrow Can$ 1000 at 9 per cent for 3- months;

(ii) Change this sum into DM at the spot rate to obtain DM
= (1000/0.665) = 1503.76

(iii) Place DM 1503.76 in the money market for 3 months to obtain a sum of DM

Principal:	1503.76
Add: Interest @ 7% for 3 months =	26.32
Total	1530.08

(iv) Sell DM at 3-months forward to obtain Can$= (1530.08x0.67) = 1025.15

(v) Refund the debt taken in Can$ with the interest due on it, i.e.,

	Can$
Principal	1000.00
Add: Interest @9% for 3 months	22.50
Total	1022.50

Net arbitrage gain = 1025.15 – 1022.50 = Can$ 2.65

Question 32

An Indian exporting firm, Rohit and Bros., would be cover itself against a likely depreciation of pound sterling. The following data is given:

Receivables of Rohit and Bros	:	*£500,000*
Spot rate	:	*₹ 56.00/£*
Payment date	:	*3-months*
3 months interest rate	:	*India : 12 per cent per annum*
	:	*UK : 5 per cent per annum*

What should the exporter do?

Answer

The only thing lefts Rohit and Bros to cover the risk in the money market. The following steps are required to be taken:

(i) Borrow pound sterling for 3- months. The borrowing has to be such that at the end of three months, the amount becomes £ 500,000. Say, the amount borrowed is £ x. Therefore

$$x\left[1+0.05\times\frac{3}{12}\right]=500{,}000 \text{ or } x = £493{,}827$$

(ii) Convert the borrowed sum into rupees at the spot rate. This gives: £493,827 × ₹ 56 = ₹ 27,654,312

(iii) The sum thus obtained is placed in the money market at 12 per cent to obtain at the end of 3- months:

$$S = ₹\ 27{,}654{,}312 \times \left[1+0.12\times\frac{3}{12}\right] = ₹\ 28{,}483{,}941$$

(iv) The sum of £500,000 received from the client at the end of 3- months is used to refund the loan taken earlier.

From the calculations. It is clear that the money market operation has resulted into a net gain of ₹ 483,941 (₹ 28,483,941 – ₹ 500,000 × 56).

If pound sterling has depreciated in the meantime. The gain would be even bigger.

Question 33

An exporter is a UK based company. Invoice amount is $3,50,000. Credit period is three months. Exchange rates in London are :

Spot Rate *($/£) 1.5865 – 1.5905*
3-month Forward Rate *($/£) 1.6100 – 1.6140*
Rates of interest in Money Market :

	Deposit	*Loan*
$	*7%*	*9%*
£	*5%*	*8%*

Compute and show how a money market hedge can be put in place. Compare and contrast the outcome with a forward contract.

Answer

Identify: Foreign currency is an asset. Amount $ 3,50,000.

Create: $ Liability.

Borrow: In $. The borrowing rate is 9% per annum or 2.25% per quarter.

Amount to be borrowed: 3,50,000 / 1.0225 = $ 3,42,298.29

Convert: Sell $ and buy £. The relevant rate is the Ask rate, namely, 1.5905 per £,

(**Note:** This is an indirect quote). Amount of £s received on conversion is 2,15,214.27 (3,42,298.29/1.5905).

Invest: £ 2,15,214.27 will be invested at 5% for 3 months and get £ 2,17,904.45

Settle: The liability of $3,42,298.29 at interest of 2.25 per cent quarter matures to $3,50,000 receivable from customer.

Using forward rate, amount receivable is = 3,50,000 / 1.6140 = £2,16,852.54

Amount received through money market hedge = £2,17,904.45

Gain = 2,17,904.45 – 2,16,852.54 = £1,051.91

So, money market hedge is beneficial for the exporter

Question 34

The rate of inflation in India is 8% per annum and in the U.S.A. it is 4%. The current spot rate for USD in India is ₹ 46. What will be the expected rate after 1 year and after 4 years applying the Purchasing Power Parity Theory.

Answer

The differential inflation is 4%. Hence the rate will keep changing adversely by 4% every year. Assuming that the change is reflected at the end of each year, the rates will be:

End of Year	₹	₹ /USD
1	₹ 46.00 x 1.04	47.84
2	₹ 47.84 x 1.04	49.75
3	₹ 49.75 x 1.04	51.74
4	₹ 51.74 x 1.04	53.81

Alternative Answer

End of Year	₹	₹ /USD
1	₹ 46.00 x $\frac{(1+0.08)}{(1+0.04)}$	47.77

2	₹ 47.77 x $\frac{(1+0.08)}{(1+0.04)}$	49.61
3	₹ 49.61 x $\frac{(1+0.08)}{(1+0.04)}$	51.52
4	₹ 51.52 x $\frac{(1+0.08)}{(1+0.04)}$	53.50

Question 35

(i) The rate of inflation in USA is likely to be 3% per annum and in India it is likely to be 6.5%. The current spot rate of US $ in India is ₹ 43.40. Find the expected rate of US $ in India after one year and 3 years from now using purchasing power parity theory.

(ii) On April 1, 3 months interest rate in the UK £ and US $ are 7.5% and 3.5% per annum respectively. The UK £/US $ spot rate is 0.7570. What would be the forward rate for US $ for delivery on 30th June?

Answer

(i) According to Purchasing Power Parity forward rate is

$$\text{Spot rate} \left[\frac{1+{}^{r}H}{1+{}^{r}F}\right]^{t}$$

So spot rate after one year

$$= ₹\ 43.40 \left[\frac{1+0.065}{1+\ 0.03}\right]^{1}$$

= ₹ 43.4 (1.03399)

= ₹ 44.8751

After 3 years

$$₹\ 43.40 \left[\frac{1+0.065}{1+0.03}\right]^{3}$$

= ₹ 43.40 $(1.03398)^3$

= ₹ 43.40 (1.10544) = ₹ 47.9761

(ii) As per interest rate parity

$$S_1 = S_0 \left[\frac{1+\text{in A}}{1+\text{in B}}\right]$$

$$S_1 = £0.7570 \left[\frac{1+(0.075)\times 3/12}{1+(0.035)\times 3/12}\right]$$

$$= £0.7570 \left[\frac{1.01875}{1.00875}\right]$$

= £0.7570 × 1.0099 = £0.7645

= UK £0.7645 / US$

Question 36

Shoe Company sells to a wholesaler in Germany. The purchase price of a shipment is 50,000 deutsche marks with term of 90 days. Upon payment, Shoe Company will convert the DM to dollars. The present spot rate for DM per dollar is 1.71, whereas the 90-day forward rate is 1.70.

You are required to calculate and explain:

(i) If Shoe Company were to hedge its foreign-exchange risk, what would it do? What transactions are necessary?

(ii) Is the deutsche mark at a forward premium or at a forward discount?

(iii) What is the implied differential in interest rates between the two countries?

(Use interest-rate parity assumption).

Answer

(i) If Shoe Company were to hedge its foreign exchange risk, it would enter into forward contract of selling deutsche marks 90 days forward. It would sell 50,000 deutsche marks 90 days forward. Upon delivery of 50,000 DM 90 days hence, it would receive US $ 29,412 i.e. 50,000 DM/1.70. If it were to receive US $ payment today it would receive US $ 29,240 i.e. 50,000 DM/1.71. Hence, Shoe Company will be better off by $ 172 if it hedges its foreign exchange risk.

(ii) The deutsche mark is at a forward premium. This is because the 90 days forward rate of deutsche marks per dollar is less than the current spot rate of deutsche marks per dollar. This implies that deutsche mark is expected to be strengthen i.e. Fewer deutsche mark will be required to buy dollars.

(iii) The interest rate parity assumption is that high interest rates on a currency are offset by forward discount and low interest rate on a currency is offset by forward premiums.

Further, the spot and forward exchange rates move in tandem, with the link between them based on interest differential. The movement between two currencies to take advantage of interest rates differential is a major determinant of the spread between forward and spot rates. The forward discount or premium is approximately equal to interest differential between the currencies i.e.

$$\frac{F_{(DM/US\$)} - S_{(DM/US\$)}}{S_{(DM/US\$)}} \times \frac{365}{90} = r_{DM} - r_{US\$}$$

$$\text{or } \frac{1.70 - 1.71}{1.71} \times \frac{365}{90} = r_{DM} - r_{US\$}$$

$$0r\ -0.0237 = r_{DM} - r_{US\$}$$

Therefore, the differential in interest rate is –2.37%, which means if interest rate parity holds, interest rate in the US should be 2.37% higher than in Germany.

Question 37

The following table shows interest rates for the United States dollar and French francs. The spot exchange rate is 7.05 francs per dollars. Complete the missing entries:

	3 Months	*6 Months*	*1 Year*
Dollar interest rate (annually compounded)	*11½%*	*12¼%*	*?*
Franc interest rate (annually compounded)	*19½*	*?*	*20%*
Forward franc per dollar	*?*	*?*	*7.5200*
Forward discount per franc per cent per year	*?*	*–6.3%*	

Answer

Computation of Missing Entries in the Table: For computing the missing entries in the table we will use interest rates parity theorem (IRP). This theorem states that the exchange rate of two countries will be affected by their interest rate differential. In other words, the currency of one country with a lower interest rate should be at a forward premium in terms of currency of country with higher interest rates and vice versa. This implies that the exchange rate (forward and spot) differential will be equal to the interest rate differential between the two countries i.e.

Interest rate differential = Exchange rate differential

$$\text{or } \frac{(1+r_f)}{(1+r_d)} = \frac{S_{f/d}}{F_{f/d}}$$

Where r_f is the rate of interest of country F (say the foreign country), r_d is rate of interest of country D (say domestic country), $S_{f/d}$ is the spot rate between the two countries F and D and $F_{f/d}$ is the forward rate between the two countries F and D.

3 months

Dollar interest rate = $11\frac{1}{2}\%$

(annually compounded)

Franc interest rate = $19\frac{1}{2}\%$

(annually compounded)

Now, Differential in interest rate = Differential between forward and spot rate

i.e. $\frac{1+.115}{1+.195}$ = Differential between forward and spot rate

Or Differential between forward and spot rate = 93.3%

Therefore, Forward discount on franc per cent per year =93.3% – 100% = – 6.7%

Forward discount on franc per cent for 3 months = – 6.7/4 or – 1.675%

Forward franc = Today's spot rate (Difference between forward and Spot rate)

= 0.141844 dollar (100% – 1.675%)

Forward franc = 0.1394681 dollar

Forward franc per dollar = 1/.1394681 = 7.17

6 months

Dollar interest rate = $12\frac{1}{4}\%$

(annually compounded)

Forward discount on franc % per year = – 6.3% or – 3.15% for 6 months

Hence 6 months Forward rate = 0.141844 dollar (Spot rate) (100% – 3.15)

= 0.13737 dollars

Forward francs per dollar = 1/0.13737

or Forward francs per dollar = 7.28 francs

Again, Differential in interest rate between the two countries = Differential between forward and spot rate

Now, $\frac{1+\text{Dollar interest rate}}{1+\text{Franc interest rate}} = \text{Differential between forward and spot rate}$

$$\text{Or } \frac{1+.1225}{1+\text{Franc interest rate}} = (100\% - 6.3\%)$$

$$\text{Or } \frac{1+.1225}{1+\text{Franc interest rate}} = 93.7\%$$

$$\text{Or } 1+\text{France interest rate} = \frac{1.1225}{93.7\%}$$

Or Franc interest rate = 1.19797 – 1

Or = 0.19797

Or = 19.8%

1 Year

Franc interest rate = 20%

(annually compounded)

Forward franc per dollar = 7.5200

Today's spot rate is 7.05 (given) francs per dollar i.e. 1 Franc	=	0.141844 dollar
Forward francs is 7.52 francs per dollar i.e. franc	=	0.132978 dollar
Difference		0.008866 dollar

Forward discount on Francs per cent per year $= \frac{0.008866}{0.141844} \times 100$

$= -6.25\%$ or -6.3% (rounded off)

Again, Differential in interest rates = Differential between forward

Between the two countries rate and spot rate

$$\text{i.e. } \frac{1+\text{Dollar interest rate}}{1+0.20} = \frac{7.05}{7.52}$$

Or Dollar interest rate = $1.20 \times 0.9374 - 1 = 1.125 - 1 = 0.125$ or 12.5%

Question 38

An importer requests his bank to extend the forward contract for US$ 20,000 which is due for maturity on 30th October, 2010, for a further period of 3 months. He agrees to pay the required margin money for such extension of the contract.

Contracted Rate – US$ 1= ₹ 42.32

The US Dollar quoted on 30-10-2010:-

Spot – 41.5000/41.5200

3 months' Premium -0.87% /0.93%

Margin money for buying and selling rate is 0.075% and 0.20% respectively.

Compute:

(i) The cost to the importer in respect of the extension of the forward contract, and

(ii) The rate of new forward contract.

Answer

(i) The contract is to be cancelled on 30-10-2010 at the spot buying rate of US$ 1 = ₹ 41.5000

Less: Margin Money 0.075%	= ₹ 0.0311
	= ₹ 41.4689 or ₹ 41.47
US$ 20,000 @ ₹ 41.47	= ₹ 8,29,400
US$ 20,000 @ ₹ 42.32	= ₹ 8,46,400
The difference in favour of the Bank/Cost to the importer	₹ 17,000

(ii) The Rate of New Forward Contract

Spot Selling Rate US$ 1	= ₹ 41.5200
Add: Premium @ 0.93%	= ₹ 0.3861
	= ₹ 41.9061
Add: Margin Money 0.20%	= ₹ 0.0838
	= ₹ 41.9899 or ₹ 41.99

Question 39

XYZ, an Indian firm, will need to pay JAPANESE YEN (JY) 5,00,000 on 30th June. In order to hedge the risk involved in foreign currency transaction, the firm is considering two alternative methods i.e. forward market cover and currency option contract.

On 1st April, following quotations (JY/INR) are made available:

Spot	*3 months forward*
1.9516/1.9711.	*1.9726./1.9923*

The prices for forex currency option on purchase are as follows:

Strike Price	*JY 2.125*
Call option (June)	*JY 0.047*
Put option (June)	*JY 0.098*

For excess or balance of JY covered, the firm would use forward rate as future spot rate.

You are required to recommend cheaper hedging alternative for XYZ.

Answer

(i) Forward Cover

3-month Forward Rate = $\frac{1}{1.9726}$ = ₹ 0.5070/JY

Accordingly, INR required for JY 5,00,000 (5,00,000 X ₹ 0.5070) ₹ 2,53,500

(ii) Option Cover

To purchase JY 5,00,000, XYZ shall enter into a Put Option @ JY 2.125/INR

Accordingly, outflow in INR $\left(\frac{\text{JY } 5,00,000}{2.125}\right)$	₹ 2,35,294
Premium $\left(\frac{\text{INR } 2,35,294 \times 0.098}{1.9516}\right)$	₹ 11,815
	₹ 2,47,109

Since outflow of cash is least in case of Option same should be opted for. Further if price of INR goes above JY 2.125/INR the outflow shall further be reduced.

Question 40

ABC Technologic is expecting to receive a sum of US$ 4,00,000 after 3 months. The company decided to go for future contract to hedge against the risk. The standard size of future contract available in the market is $1000. As on date spot and futures $ contract are quoting at ₹ 44.00 & ₹ 45.00 respectively. Suppose after 3 months the company closes out its position futures are quoting at ₹ 44.50 and spot rate is also quoting at ₹ 44.50. You are required to calculate effective realization for the company while selling the receivable. Also calculate how company has been benefitted by using the future option.

Answer

The company can hedge position by selling future contracts as it will receive amount from outside.

Number of Contracts = $\frac{\$4,00,000}{\$1,000}$ = 400 contracts

Gain by trading in futures = (₹ 45 – ₹ 44.50) 4,00,000= ₹ 2,00,000

Net Inflow after after 3 months = ₹ 44.50 x ₹ 4,00,000+ 2,00,000 = ₹ 1,80,00,000

Effective Price realization = $\frac{₹\,1,80,00,000}{\$4,00,000}$ = ₹ 45 Per US$

Question 41

Gibralater Limited has imported 5000 bottles of shampoo at landed cost in Mumbai, of US $ 20 each. The company has the choice for paying for the goods immediately or in 3 months' time. It has a clean overdraft limited where 14% p.a. rate of interest is charged.

Calculate which of the following method would be cheaper to Gibralter Limited.

(i) Pay in 3 months' time with interest @ 10% and cover risk forward for 3 months.

(ii) Settle now at a current spot rate and pay interest of the over draft for 3 months.

The rates are as follows:

Mumbai ₹/$ spot	*:*	*60.25-60.55*
3 months swap	*:*	*35/25*

Answer

Option - I

$20 x 5000 = $ 1,00,000

Repayment in 3 months time = $1,00,000 x (1 + 0.10/4) = $ 1,02,500

3-months outright forward rate = ₹ 59.90/ ₹ 60.30

Repayment obligation in ₹ ($1,02,500 X ₹ 60.30) = ₹ 61,80,750

Option -II

Overdraft ($1,00,000 x ₹ 60.55)	₹ 60,55,000
Interest on Overdraft (₹ 60,55,000 x 0.14/4)	₹ 2,11,925
	₹ 62,66,925

Option I should be preferred as it has lower outflow.

Question 42

Suppose you are a treasurer of XYZ plc in the UK. XYZ have two overseas subsidiaries, one based in Amsterdam and one in Switzerland. The Dutch subsidiary has surplus Euros in the amount of 725,000 which it does not need for the next three months but which will be needed at the end of that period (91 days). The Swiss subsidiary has a surplus of Swiss Francs in the amount of 998,077 that, again, it will need on day 91. The XYZ plc in UK has a net balance of £75,000 that is not needed for the foreseeable future.

Given the rates below, what is the advantage of swapping Euros and Swiss Francs into Sterling?

Spot Rate (€) *£0.6858- 0.6869*

91 day Pts *0.0037 0.0040*

Spot Rate(£) *CHF 2.3295- 2.3326*

91 day Pts *0.0242 0.0228*

Interest rates for the Deposits

Amount of Currency	***91 day Interest Rate % pa***		
	£	**€**	***CHF***
0 – 100,000	*1*	*¼*	*0*
100,001 – 500,000	*2*	*1 ½*	*¼*
500,001 – 1,000,000	*4*	*2*	*½*
Over 1,000,000	*5.375*	*3*	*1*

Answer

Individual Basis

	Interest	**Amt. after 91 days**	**Conversion in £**
Holland			£502,414.71
€ 725,000 x 0.02 x 91/360 =	€ 3,665.28	€ 728,665.28	(728,665.28 x 0.6895)
Switzerland			£432,651.51
CHF 998,077 x 0.005 x 91/360 =	CHF 1,261.46	CHF 999,338.46	(999,338.46÷2.3098)
UK			
£ 75,000 x 0.01 x 91/360 =	£ 189.58	£ 75,189.58	£ 75,189.58
Total GBP at 91 days			£ 1,010,255.80

Swap to Sterling

Sell € 7,25,000 (Spot at 0.6858) buy £	£ 4,97,205.00
Sell CHF 9,98,077(Spot at 2.3326) buy £	£ 4,27,881.76
Independent GBP amount	£ 75,000.00
	£ 1,000,086.76
Interest (£ 1,000,086.76 x 0.05375 x 91/360)	£ 13,587.98
Total GBP at 91 days	£ 1,013,674.74
Less: Total GBP at 91 days as per individual basis	£ 1,010,255.80
Net Gain	£ 3,418.94

Question 43

An American firm is under obligation to pay interests of Can$ 1010000 and Can$ 705000 on 31st July and 30th September respectively. The Firm is risk averse and its policy is to hedge the risks involved in all foreign currency transactions. The Finance Manager of the firm is thinking of hedging the risk considering two methods i.e. fixed forward or option contracts.

It is now June 30. Following quotations regarding rates of exchange, US$ per Can$, from the firm's bank were obtained:

Spot	1 Month Forward	3 Months Forward
0.9284-0.9288	0.9301	0.9356

Price for a Can$ /US$ option on a U.S. stock exchange (cents per Can$, payable on purchase of the option, contract size Can$ 50000) are as follows:

Strike Price	Calls		Puts	
(US$/Can$)	July	Sept.	July	Sept.
0.93	1.56	2.56	0.88	1.75
0.94	1.02	NA	NA	NA
0.95	0.65	1.64	1.92	2.34

According to the suggestion of finance manager if options are to be used, one month option should be bought at a strike price of 94 cents and three month option at a strike price of 95 cents and for the remainder uncovered by the options the firm would bear the risk itself. For this, it would use forward rate as the best estimate of spot. Transaction costs are ignored.

Recommend, which of the above two methods would be appropriate for the American firm to hedge its foreign exchange risk on the two interest payments.

Answer

Forward Market Cover

Hedge the risk by buying Can$ in 1 and 3 months time will be:

July - 1010000 X 0.9301 = US $ 939401

Sept. - 705000 X 0.9356 = US $ 659598

Option Contracts

July Payment = 1010000/ 50,000 = 20.20

September Payment = 705000/ 50,000 = 14.10

Company would like to take out 20 contracts for July and 14 contracts for September respectively. Therefore costs, if the options were exercised, will be:-

	July		Sept.	
	Can $	US $	Can $	US $
Covered by Contracts	1000000	940000	700000	665000
Balance bought at spot rate	10000	9301	5000	4678
Option Costs:				
Can $ 50000 x 20 x 0.0102		10200	---	
Can $ 50000 x 14 x 0.0164	---			11480
Total cost in US $ of using Option Contract		959501		681158

Decision: As the firm is stated as risk averse and the money due to be paid is certain, a fixed forward contract, being the cheapest alternative in the both the cases, would be recommended.

Question 44

Zaz plc, a UK Company is in the process of negotiating an order amounting €2.8 million with a large German retailer on 6 month's credit. If successful, this will be first time for Zaz has exported goods into the highly competitive German Market. The Zaz is considering following 3 alternatives for managing the transaction risk before the order is finalized.

(a) Mr. Peter the Marketing head has suggested that in order to remove transaction risk completely Zaz should invoice the German firm in Sterling using the current €/£ average spot rate to calculate the invoice amount.

(b) Mr. Wilson, CE is doubtful about Mr. Peter's proposal and suggested an alternative of invoicing the German firm in € and using a forward exchange contract to hedge the transaction risk.

(c) Ms. Karen, CFO is agreed with the proposal of Mr. Wilson to invoice the German first in €, but she is of opinion that Zaz should use sufficient 6 month sterling further contracts (to the nearest whole number) to hedge the transaction risk.

Following data is available

Sport Rate	*€ 1.1960 - €1.1970/£*
6 months forward premium	*0.60 – 0.55 Euro Cents.*
6 month further contract is currently trading at	*€ 1.1943/£*
6 month future contract size is	*£62,500*
After 6 month Spot rate and future rate	*€ 1.1873/£*

You are required to

(a) Calculate (to the nearest £) the £ receipt for Zaz plc, under each of 3 above proposals.

(b) In your opinion which alternative you consider to be most appropriate.

Answer

(i) Receipt under three proposals

(a) Proposal of Mr. Peter

Invoicing in £ will produce = $\frac{€\,2.8 \text{ million}}{1.1965}$ = £ 2.340 million

(b) Proposal of Mr. Wilson

Forward Rate = €1.1970-0.0055 = 1.1915

Using Forward Market hedge Sterling receipt would be $\frac{€\,2.8 \text{million}}{1.1915}$ = £ 2.35 million

(c) Proposal of Ms. Karen

The equivalent sterling of the order placed based on future price (€1.1943)

= $\frac{€\,2.8 \text{million}}{1.1943}$ = £ 2,344,470 (rounded off)

Number of Contracts = $\frac{£2{,}344{,}470}{62{,}500}$ = 37 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 37 × £62,500 = £23,12,500

Buy Future at	€1.1943
Sell Future at	€1.1873
	€0.0070

Total loss on Future Contracts = 37 × £62,500 × €0.0070 =€16,188

After 6 months

Amount Received	€28,00,000
Less: Loss on Future Contracts	€ 16,188
	€ 27,83,812

Sterling Receipts

On sale of € at spot = $\frac{€\,27{,}83{,}812}{1.1873}$ = £ 2.3446 million

(ii) Proposal of option (b) is preferable because the option (a) & (c) produces least receipts. Further, in case of proposal (a) there must be a doubt as to whether this would be acceptable to German firm as it is described as a competitive market and Zaz is moving into it first time.

Question 45

Columbus Surgicals Inc. is based in US, has recently imported surgical raw materials from the UK and has been invoiced for £ 480,000, payable in 3 months. It has also exported surgical goods to India and France.

The Indian customer has been invoiced for £ 138,000, payable in 3 months, and the French customer has been invoiced for € 590,000, payable in 4 months.

Current spot and forward rates are as follows:

£ / US$	
Spot:	*0.9830 – 0.9850*
Three months forward:	*0.9520 – 0.9545*
US$ / €	
Spot:	*1.8890 – 1.8920*
Four months forward:	*1.9510 – 1.9540*

Current money market rates are as follows:

UK:	*10.0% – 12.0% p.a.*
France:	*14.0% – 16.0% p.a.*
USA:	*11.5% – 13.0% p.a.*

You as Treasury Manager are required to show how the company can hedge its foreign exchange exposure using Forward markets and Money markets hedge and suggest which the best hedging technique is.

Answer

£ Exposure

Since Columbus has a £ receipt (£ 138,000) and payment of (£ 480,000) maturing at the same time i.e. 3 months, it can match them against each other leaving a net liability of £ 342,000 to be hedged.

(i) Forward market hedge

Buy 3 months' forward contract accordingly, amount payable after 3 months will be

£ 342,000 / 0.9520 = US$ 359,244

(ii) Money market hedge

To pay £ after 3 months' Columbus shall requires to borrow in US$ and translate to £ and then deposit in £.

For payment of £ 342,000 in 3 months (@2.5% interest) amount required to be deposited now (£ 342,000 ÷ 1.025) = £ 333,658

With spot rate of 0.9830 the US$ loan needed will be = US$ 339,429

Loan repayable after 3 months (@3.25% interest) will be = US$ 350,460

In this case the money market hedge is a cheaper option.

€ Receipt

Amount to be hedged = € 590,000

(i) Forward market hedge

Sell 4 months' forward contract accordingly, amount receivable after 4 months will be

(€ 590,000 x1.9510) = US$ 1,151,090

(ii) Money market hedge

For money market hedge Columbus shall borrow in € and then translate to US$ and deposit in US$

For receipt of € 590,000 in 4 months (@ 5.33% interest) amount required to be borrowed now (€590,000 ÷ 1.0533) = € 560,144

With spot rate of 1.8890 the US$ deposit will be = US$ 1,058,113

Deposit amount will increase over 3 months (@3.83% interest) will be = US$ 1,098,639

In this case, more will be received in US$ under the forward hedge.

Question 46

XYZ Ltd. a US firm will need £ 3,00,000 in 180 days. In this connection, the following information is available:

Spot rate 1 £ = $ 2.00

180 days forward rate of £ as of today = $1.96

Interest rates are as follows:

	U.K.	*US*
180 days deposit rate	*4.5%*	*5%*
180 days borrowing rate	*5%*	*5.5%*

A call option on £ that expires in 180 days has an exercise price of $ 1.97 and a premium of $ 0.04.

XYZ Ltd. has forecasted the spot rates 180 days hence as below:

Future rate	*Probability*
$ 1.91	*25%*
$ 1.95	*60%*
$ 2.05	*15%*

Which of the following strategies would be most preferable to XYZ Ltd.?

(a) A forward contract;

(b) A money market hedge;

(c) An option contract;

(d) No hedging.

Show calculations in each case

Answer

(a) Forward contract: Dollar needed in 180 days = £3,00,000 x $ 1.96 = $5,88,000/-

(b) Money market hedge: Borrow $, convert to £, invest £, repay $ loan in 180 days

Amount in £ to be invested = 3,00,000/1.045 = £ 2,87,081

Amount of $ needed to convert into £ = 2,87,081 x 2 = $ 5,74,162

Interest and principal on $ loan after 180 days = $5,74,162 x 1.055 = $ 6,05,741

(c) Call option:

Expected Spot rate in 180 days	*Prem./unit*	*Exercise Option*	*Total price per unit*	*Total price for £3,00,000xi*	*Prob. Pi*	*pixi*
1.91	0.04	No	1.95	5,85,000	0.25	1,46,250
1.95	0.04	No	1.99	5,97,000	0.60	3,58,200
2.05	0.04	Yes	2.01*	6,03,000	0.15	90,450
						5,94,900
Add: Interest on Premium @ 5.5% (12,000 x 5.5%)						660
						5,95,560

* ($1.97 + $0.04)

(d) No hedge option:

Expected Future spot rate	*Dollar needed Xi*	*Prob. Pi*	*Pi xi*
1.91	5,73,000	0.25	1,43,250
1.95	5,85,000	0.60	3,51,000
2.05	6,15,000	0.15	92,250
			5,86,500

The probability distribution of outcomes for no hedge strategy appears to be most preferable because least number of $ are needed under this option to arrange £3,00,000.

Question 47

A Ltd. of U.K. has imported some chemical worth of USD 3,64,897 from one of the U.S. suppliers. The amount is payable in six months time. The relevant spot and forward rates are:

Spot rate	*USD 1.5617-1.5673*
6 months' forward rate	*USD 1.5455 –1.5609*

The borrowing rates in U.K. and U.S. are 7% and 6% respectively and the deposit rates are 5.5% and 4.5% respectively.

Currency options are available under which one option contract is for GBP 12,500. The option premium for GBP at a strike price of USD 1.70/GBP is USD 0.037 (call option) and USD 0.096 (put option) for 6 months period.

The company has 3 choices:

(i) Forward cover

(ii) Money market cover, and

(iii) Currency option

Which of the alternatives is preferable by the company?

Answer

In the given case, the exchange rates are indirect. These can be converted into direct rates as follows:

Spot rate

$$GBP = \frac{1}{USD\,1.5617} \quad \text{to} \quad \frac{1}{USD\,1.5673}$$

USD = GBP 0.64033 - GBP 0.63804

6 months' forward rate

$$GBP = \frac{1}{USD\,1.5455} \quad \text{to} \quad \frac{1}{USD\,1.5609}$$

USD = GBP 0.64704 - GBP 0.64066

Payoff in 3 alternatives

i. Forward Cover

Amount payable	USD 3,64,897
Forward rate	GBP 0.64704
Payable in GBP	GBP 2,36,103

ii. Money market Cover

Amount payable	USD 3,64,897
PV @ 4.5% for 6 months i.e. $\frac{1}{1.0225} = 0.9779951$	USD 3,56,867
Spot rate purchase	GBP 0.64033
Borrow GBP 3,56,867 x 0.64033	GBP 2,28,512
Interest for 6 months @ 7 %	7,998
	-
Payable after 6 months	GBP 2,36,510

iii. Currency options

Amount payable	USD 3,64,897
Unit in Options contract	GBP 12,500
Value in USD at strike rate of 1.70 (GBP 12,500 x 1.70)	USD 21,250
Number of contracts USD 3,64,897/ USD 21,250	17.17
Exposure covered USD 21,250 x 17	USD 3,61,250
Exposure to be covered by Forward (USD 3,64,897 – USD 3,61,250)	USD 3,647
Options premium 17 x GBP 12,500 x 0.096	USD 20,400
Premium in GBP (USD 20,400 x 0.64033)	GBP 13,063
Total payment in currency option	
Payment under option (17 x 12,500)	GBP 2,12,500
Premium payable	GBP 13,063
Payment for forward cover (USD 3,647 x 0.64704)	GBP 2,360
	GBP 2,27,923

Thus total payment in:

(i)	Forward Cover	2,36,103 GBP
(ii)	Money Market	2,36,510 GBP
(iii)	Currency Option	2,27,923 GBP

The company should take currency option for hedging the risk.

Note: Even interest on Option Premium can also be considered in the above solution.

Question 48

Nitrogen Ltd, a UK company is in the process of negotiating an order amounting to €4 million with a large German retailer on 6 months credit. If successful, this will be the first time that Nitrogen Ltd has exported goods into the highly competitive German market. The following three alternatives are being considered for managing the transaction risk before the order is finalized.

(i) Invoice the German firm in Sterling using the current exchange rate to calculate the invoice amount.

(ii) Alternative of invoicing the German firm in € and using a forward foreign exchange contract to hedge the transaction risk.

(iii) Invoice the German first in € and use sufficient 6 months sterling future contracts (to the nearly whole number) to hedge the transaction risk.

Following data is available:

Spot Rate	*€ 1.1750 - €1.1770/£*
6 months forward premium	*0.60-0.55 Euro Cents*
6 months future contract is currently trading at	*€1.1760/£*
6 months future contract size is	*£62500*
Spot rate and 6 months future rate	*€1.1785/£*

Required:

(a) Calculate to the nearest £ the receipt for Nitrogen Ltd, under each of the three proposals.

(b) In your opinion, which alternative would you consider to be the most appropriate and the reason thereof.

Answer

(i) Receipt under three proposals

(a) Invoicing in Sterling

Invoicing in £ will produce = $\frac{€\,4\,\text{million}}{1.1770}$ = £3398471

(b) Use of Forward Contract

Forward Rate = €1.1770+0.0055 = 1.1825

Using Forward Market hedge Sterling receipt would be $\frac{€\,4\,\text{million}}{1.1825}$ = £ 3382664

(c) Use of Future Contract

The equivalent sterling of the order placed based on future price (€1.1760) = $\frac{€4.00 \text{ million}}{1.1760}$ = £ 3401360

Number of Contracts = $\frac{£3401360}{62,500}$ = 54 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 54 × £62,500 = £3375000

Buy Future at	€1.1760
Sell Future at	€1.1785
	€0.0025

Total profit on Future Contracts = 54 × £62,500 × €0.0025 = €8438

After 6 months	
Amount Received	€4000000
Add: Profit on Future Contracts	€ 8438
	€ 4008438

Sterling Receipts

On sale of € at spot = $\frac{€4008438}{1.1785}$ = €3401305

(ii) Proposal of option (c) is preferable because the option (a) & (b) produces least receipts.

Alternative solution:

Assuming that 6 month forward premium is considered as discount, because generally premium is mentioned in ascending order and discount is mentioned in descending order.

(i) Receipt under three proposals

(a) Invoicing in Sterling

Invoicing in £ will produce = $\frac{€4 \text{ million}}{1.1770}$ = £3398471

(b) Use of Forward Contract

Forward Rate = €1.1770-0.0055 = 1.1715

Using Forward Market hedge Sterling receipt would be $\frac{€4 \text{ million}}{1.1715}$ = £ 3414426

(c) Use of Future Contract

The equivalent sterling of the order placed based on future price (€1.1760) = $\frac{€4.00 \text{ million}}{1.1760}$ = £ 3401360

Number of Contracts = $\frac{£3401360}{62,500}$ = 54 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 54 × £62,500 = £3375000

Buy Future at	€1.1760
Sell Future at	€1.1785
	€0.0025

Total profit on Future Contracts = 54 × £62,500 × €0.0025 = €8438

After 6 months

Amount Received	€4000000
Add: Profit on Future Contracts	€ 8438
	€ 4008438

Sterling Receipts

On sale of € at spot = $\frac{€4008438}{1.1785}$ = €3401305

(ii) Proposal of option (b) is preferable because the option (a) & (c) produces least receipts.

Question 49

Sun Ltd. is planning to import equipment from Japan at a cost of 3,400 lakh yen. The company may avail loans at 18 percent per annum with quarterly rests with which it can import the equipment. The company has also an offer from Osaka branch of an India based bank extending credit of 180 days at 2 percent per annum against opening of an irrecoverable letter of credit.

Additional information:

Present exchange rate	*₹ 100 = 340 yen*
180 day's forward rate	*₹ 100 = 345 yen*

Commission charges for letter of credit at 2 per cent per 12 months.

Advice the company whether the offer from the foreign branch should be accepted.

Answer

Option I (To finance the purchases by availing loan at 18% per annum):

Cost of equipment	*₹ in lakhs*
3400 lakh yen at ₹100 = 340 yen	1,000

Add: Interest at 4.5% I Quarter	45
Add: Interest at 4.5% II Quarter (on ₹1045 lakhs)	47.03
Total outflow in Rupees	1,092.03
Alternatively, interest may also be calculated on compounded basis, i.e., ₹1000 × [1.045]²	₹1092.03

Option II (To accept the offer from foreign branch):

Cost of letter of credit	*₹ in lakhs*
At 1 % on 3400 lakhs yen at ₹100 = 340 yen	10.00
Add: Interest I Quarter	0.45
Add: Interest II Quarter	0.47
(A)	10.92

Payment at the end of 180 days:

Cost	3400.00 lakhs yen
Interest at 2% p.a. [3400 × 2/100 × 180/365]	33.53 lakhs yen
	3433.53 lakhs yen

Conversion at ₹100 = 345 yen [3433.53 / 345 × 100] (B) = ₹995.23

Total Cost: (A) + (B) = 1006.15 lakhs

Advise: Option 2 is cheaper by (1092.03 – 1006.15) lakh or 85.88 lakh. Hence, the offer may be accepted.

Question 50

NP and Co. has imported goods for US $ 7,00,000. The amount is payable after three months. The company has also exported goods for US $ 4,50,000 and this amount is receivable in two months. For receivable amount a forward contract is already taken at ₹ 48.90.

The market rates for Rupee and Dollar are as under:

Spot	*₹ 48.50/70*
Two months	*25/30 points*
Three months	*40/45 points*

The company wants to cover the risk and it has two options as under :

(A) To cover payables in the forward market and

(B) To lag the receivables by one month and cover the risk only for the net amount. No interest for delaying the receivables is earned. Evaluate both the options if the cost of Rupee Funds is 12%. Which option is preferable?

Answer

(A) To cover payable and receivable in forward Market

Amount payable after 3 months	$7,00,000
Forward Rate	₹ 48.45
Thus Payable Amount (₹) (A)	₹ 3,39,15,000
Amount receivable after 2 months	$ 4,50,000
Forward Rate	₹ 48.90
Thus Receivable Amount (₹) (B)	₹ 2,20,05,000
Interest @ 12% p.a. for 1 month (C)	₹2,20,050
Net Amount Payable in (₹) (A) – (B) – (C)	₹ 1,16,89,950

(B) Assuming that since the forward contract for receivable was already booked it shall be cancelled if we lag the receivables. Accordingly any profit/ loss on cancellation of contract shall also be calculated and shall be adjusted as follows:

Amount Payable ($)	$7,00,000
Amount receivable after 3 months	$ 4,50,000
Net Amount payable	$2,50,000
Applicable Rate	₹ 48.45
Amount payable in (₹) (A)	₹ 1,21,12,500
Profit on cancellation of Forward cost (48.90 – 48.30) × 4,50,000 (B)	₹ 2,70,000
Thus net amount payable in (₹) (A) + (B)	₹ 1,18,42,500

Since net payable amount is least in case of first option, hence the company should cover payable and receivables in forward market.

Note: In the question it has not been clearly mentioned that whether quotes given for 2 and 3 months (in points terms) are premium points or direct quotes. Although above solution is based on the assumption that these are direct quotes, but students can also consider them as premium points and solve the question accordingly.

Question 51

On January 28, 2010 an importer customer requested a bank to remit Singapore Dollar (SGD) 25,00,000 under an irrevocable LC. However, due to bank strikes, the bank could effect the remittance only on February 4, 2010. The interbank market rates were as follows:

	January, 28	*February 4*
Bombay US$1	*= ₹ 45.85/45.90*	*45.91/45.97*
London Pound 1	*= US$ 1.7840/1.7850*	*1.7765/1.7775*

Pound 1 = SGD 3.1575/3.1590 3.1380/3.1390

The bank wishes to retain an exchange margin of 0.125%. How much does the customer stand to gain or lose due to the delay?

(Calculate rate in multiples of .0001)

Answer

On January 28, 2010 the importer customer requested to remit SGD 25 lakhs.

To consider sell rate for the bank:

US $ = ₹ 45.90

Pound 1 = US$ 1.7850

Pound 1 = SGD 3.1575

Therefore, SGD 1 = $\frac{₹ 45.90 * 1.7850}{SGD\ 3.1575}$

SGD 1 = ₹ 25.9482

Add: Exchange margin (0.125%) ₹ 0.0324

₹ 25.9806

On February 4, 2010 the rates are

US $ = ₹ 45.97

Pound 1 = US$ 1.7775

Pound 1 = SGD 3.1380

Therefore, SGD 1 = $\frac{₹ 45.97 * 1.7775}{SGD\ 3.1380}$

SGD 1 = ₹ 26.0394

Add: Exchange margin (0.125%) ₹ 0.0325

₹ 26.0719

Hence, loss to the importer

= SGD 25,00,000 (₹26.0719 – ₹25.9806)= ₹ 2,28,250

Question 52

A customer with whom the Bank had entered into 3 months' forward purchase contract for Swiss Francs 10,000 at the rate of ₹ 27.25 comes to the bank after 2 months and requests cancellation of the contract. On this date, the rates, prevailing, are:

Spot CHF 1 = ₹ 27.30 27.35

One month forward *₹ 27.45* *27.52*

What is the loss/gain to the customer on cancellation?

Answer

The contract would be cancelled at the one month forward sale rate of ₹ 27.52.

	₹
Francs bought from customer under original forward contract at:	27.25
It is sold to him on cancellation at:	27.52
Net amount payable by customer per Franc	0.27

At ₹ 0.27 per Franc, exchange difference for CHF 10,000 is ₹ 2,700.

Loss to the Customer:

Exchange difference (Loss) ₹ 2,700

Note: The exchange commission and other service charges are ignored.

Question 53

A bank enters into a forward purchase TT covering an export bill for Swiss Francs 1,00,000 at ₹ 32.4000 due 25th April and covered itself for same delivery in the local inter bank market at ₹ 32.4200. However, on 25th March, exporter sought for cancellation of the contract as the tenor of the bill is changed.

In Singapore market, Swiss Francs were quoted against dollars as under:

Spot	*USD 1 = Sw. Fcs.*	*1.5076/1.5120*
One month forward		*1.5150/ 1.5160*
Two months forward		*1.5250 / 1.5270*
Three months forward		*1.5415/ 1.5445*

and in the interbank market US dollars were quoted as under:

Spot	*USD 1 = ₹*	*49.4302/.4455*
Spot / April		*.4100/.4200*
Spot/May		*.4300/.4400*
Spot/June		*.4500/.4600*

Calculate the cancellation charges, payable by the customer if exchange margin required by the bank is 0.10% on buying and selling.

Answer

First the contract will be cancelled at TT Selling Rate

USD/ Rupee Spot Selling Rate	₹ 49.4455	
Add: Premium for April	₹ 0.4200	
	₹ 49.8655	
Add: Exchange Margin @ 0.10%	₹ 0.04987	
	₹ 49.91537	Or 49.9154
USD/ Sw. Fcs One Month Buying Rate	Sw. Fcs. 1.5150	
Sw. Fcs. Spot Selling Rate (₹49.91537/1.5150)	₹ 32.9474	
Rounded Off	₹ 32.9475	
Bank buys Sw. Fcs. Under original contract	₹ 32.4000	
Bank Sells under Cancellation	₹ 32.9475	
Difference payable by customer	₹ 00.5475	

Exchange difference of Sw. Fcs. 1,00,000 payable by customer ₹ 54,750

(Sw. Fcs. 1,00,000 x ₹ 0.5475)

Question 54

An importer booked a forward contract with his bank on 10th April for USD 2,00,000 due on 10th June @ ₹ 64.4000. The bank covered its position in the market at ₹ 64.2800.

The exchange rates for dollar in the interbank market on 10th June and 20th June were:

	10th June	***20th June***
Spot USD 1=	*₹ 63.8000/8200*	*₹ 63.6800/7200*
Spot/June	*₹ 63.9200/9500*	*₹ 63.8000/8500*
July	*₹ 64.0500/0900*	*₹ 63.9300/9900*
August	*₹ 64.3000/3500*	*₹ 64.1800/2500*
September	*₹ 64.6000/6600*	*₹ 64.4800/5600*

Exchange Margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 20th June for extension of contract with due date on 10th August.

Rates rounded to 4 decimal in multiples of 0.0025.

On 10th June, Bank Swaps by selling spot and buying one month forward.

Calculate:

(i) Cancellation rate

(ii) Amount payable on $ 2,00,000

(iii) Swap loss

(iv) Interest on outlay of funds, if any

(v) New contract rate

(vi) Total Cost

Answer

(i) Cancellation Rate:

The forward sale contract shall be cancelled at Spot TT Purchase for $ prevailing on the date of cancellation as follows:

$/ ₹ Market Buying Rate	₹ 63.6800
Less: Exchange Margin @ 0.10%	₹ 0.0636
	₹ 63.6163

Rounded off to ₹ 63.6175

(ii) Amount payable on $ 2,00,000

Bank sells $2,00,000 @ ₹ 64.4000	₹ 1,28,80,000
Bank buys $2,00,000 @ ₹ 63.6163	₹ 1,27,23,260
Amount payable by customer	₹ 1,56,740

(iii) Swap Loss

On 10th June the bank does a swap sale of $ at market buying rate of ₹ 63.8300 and forward purchase for June at market selling rate of ₹ 63.9500.

Bank buys at	₹ 63.9500
Bank sells at	₹ 63.8000
Amount payable by customer	₹ 0.1500

Swap Loss for $ 2,00,000 in ₹ = ₹ 30,000

(iv) Interest on Outlay of Funds

On 10thApril, the bank receives delivery under cover contract at ₹ 64.2800 and sell spot at ₹ 63.8000.

Bank buys at	₹ 64.2800
Bank sells at	₹ 63.8000
Amount payable by customer	₹ 0.4800

Outlay for $ 2,00,000 in ₹ 96,000

Interest on ₹ 96,000 @ 12% for 10 days ₹ 320

(v) New Contract Rate

The contract will be extended at current rate

$/ ₹ Market forward selling Rate for August	₹ 64.2500
Add: Exchange Margin @ 0.10%	₹ 0.0643
	₹ 64.3143

Rounded off to ₹ 64.3150

(vi) Total Cost

Cancellation Charges	₹ 1,56,740.00
Swap Loss	₹ 30,000.00
Interest	₹ 320.00
	₹ 1,87,060.00

Question 55

Your forex dealer had entered into a cross currency deal and had sold US $ 10,00,000 against EURO at US $ 1 = EURO 1.4400 for spot delivery.

However, later during the day, the market became volatile and the dealer in compliance with his management's guidelines had to square – up the position when the quotations were:

Spot US $ 1	*INR 31.4300/4500*
1 month margin	*25/20*
2 months margin	*45/35*
Spot US $ 1	*EURO 1.4400/4450*
1 month forward	*1.4425/4490*
2 months forward	*1.4460/4530*

What will be the gain or loss in the transaction?

Answer

The amount of EURO bought by selling US$

US$ 10,00,000 * EURO 1.4400 = EURO 14,40,000

The amount of EURO sold for buying USD 10,00,000 * 1.4450 = EURO 14,45,000

Net Loss in the Transaction = EURO 5,000

To acquire EURO 5,000 from the market @

(a) USD 1 = EURO 1.4400 &

(b) USD1 = INR 31.4500

Cross Currency buying rate of EUR/INR is ₹ 31.4500 / 1.440 i.e. ₹ 21.8403

Loss in the Transaction ₹ 21.8403 * 5000 = ₹ 1,09,201.50

Question 56

AMK Ltd. an Indian based company has subsidiaries in U.S. and U.K.

Forecasts of surplus funds for the next 30 days from two subsidiaries are as below:

U.S.	*$12.5 million*
U.K.	*£ 6 million*

Following exchange rate information is obtained:

	$/₹	*£/₹*
Spot	*0.0215*	*0.0149*
30 days forward	*0.0217*	*0.0150*

Annual borrowing/deposit rates (Simple) are available.

₹	*6.4%/6.2%*
$	*1.6%/1.5%*
£	*3.9%/3.7%*

The Indian operation is forecasting a cash deficit of ₹500 million.

It is assumed that interest rates are based on a year of 360 days.

(i) Calculate the cash balance at the end of 30 days period in ₹ for each company under each of the following scenarios ignoring transaction costs and taxes:

(a) Each company invests/finances its own cash balances/deficits in local currency independently.

(b) Cash balances are pooled immediately in India and the net balances are invested/borrowed for the 30 days period.

(ii) Which method do you think is preferable from the parent company's point of view?

Answer

Cash Balances: **('000)**

Acting independently

	Capital	Interest	₹ in 30 days
India	-5,00,000	-2,666.67	-5,02,667
U.S.	12,500	15.63	5,76,757
U.K.	6,000	18.50	4,01,233
			4,75,323

Cash Balances:-

Immediate Cash pooling

			₹
India		–	5,00,000
U.S.	$\frac{12,500}{0.0215}$	=	5,81,395
U.K.	$\frac{6,000}{0.0149}$	=	4,02,685
			4,84,080

Immediate cash pooling is preferable as it maximizes interest earnings

Note: If the company decides to invest pooled amount of ₹4,84,080/- @ 6.2% p.a. for 30 days an interest of ₹2,501/- will accrue.

Question 57

On 19th April following are the spot rates

Spot EURO/USD 1.20000 USD/INR 44.8000

Following are the quotes of European Options:

Currency Pair	*Call/Put*	*Strike Price*	*Premium*	*Expiry date*
EUR/USD	*Call*	*1.2000*	*$ 0.035*	*July 19*
EUR/USD	*Put*	*1.2000*	*$ 0.04*	*July 19*
USD/INR	*Call*	*44.8000*	*₹0.12*	*Sep. 19*
USD/INR	*Put*	*44.8000*	*₹0.04*	*Sep. 19*

(i) A trader sells an at-the-money spot straddle expiring at three months (July 19). Calculate gain or loss if three months later the spot rate is EUR/USD 1.2900.

(ii) Which strategy gives a profit to the dealer if five months later (Sep. 19) expected spot rate is USD/INR 45.00. Also calculate profit for a transaction USD 1.5 million.

Answer

(i) Straddle is a portfolio of a CALL & a PUT option with identical Strike Price. A trader will be selling a Call option & a Put option with Strike Price of USD per EURO.

He will receive premium of $ 0.035 + $ 0.040 = $ 0.075

At the expiry of three months Spot rate is 1.2900 i.e. higher than Strike Price. Hence, buyer of the Call option will exercise the option, but buyer of Put option will allow the option to lapse.

Profit or Loss to a trader is

Premium received	$0.075	
Loss on call option exercised 1.2900 – 1.2000	$0.090	
Net Loss of	$ 0.015 per EURO	

(ii) Strategy i.e. either Call or Put

Price is expected to go up then buy call option is beneficial.

On 19th April to pay Premium US$ 15,00,000 @ ₹ 0.12 i.e.	INR 1,80,000
On 19th September exercise call option to gain US$15,00,000 @ ₹ 0.20	INR 3,00,000
Net Gain or Profit	INR 1,20,000

Or Sell of Put option will be beneficial.

On 19th April to receive Premium US$ 15,00,000 @ ₹ 0.04 i.e.	INR 60,000
On 19th September option buyer shall not exercise the option hence no loss	INR -
Net Gain or Profit	INR 60,000

Question 58

You have following quotes from Bank A and Bank B:

	Bank A	*Bank B*
SPOT	*USD/CHF 1.4650/55*	*USD/CHF 1.4653/60*
3 months	*5/10*	
6 months	*10/15*	
SPOT	*GBP/USD 1.7645/60*	*GBP/USD 1.7640/50*
3 months	*25/20*	
6 months	*35/25*	

Calculate :

(i) How much minimum CHF amount you have to pay for 1 Million GBP spot?

(ii) Considering the quotes from Bank A only, for GBP/CHF what are the Implied Swap points for Spot over 3 months?

Answer

(i) To Buy 1 Million GBP Spot against CHF

1. First to Buy USD against CHF at the cheaper rate i.e. from Bank A. 1 USD = CHF 1.4655
2. Then to Buy GBP against USD at a cheaper rate i.e. from Bank B 1 GBP=USD 1.7650

   By applying chain rule Buying rate would be

   1 GBP = 1.7650 * 1.4655 CHF

1 GBP = CHF 2.5866

Amount payable CHF 2.5866 Million or CHF 25,86,600

(ii) Spot rate Bid rate GBP 1 = CHF 1.4650 * 1.7645 = CHF 2.5850

Offer rate GBP 1 = CHF 1.4655 * 1.7660 = CHF 2.5881

GBP / USD 3 months swap points are at discount

Outright 3 Months forward rate GBP 1 = USD 1.7620 / 1.7640

USD / CHF 3 months swap points are at premium

Outright 3 Months forward rate USD 1 = CHF 1.4655 / 1.4665

Hence

Outright 3 Months forward rate GBP 1 = CHF 2.5822 / 2.5869

Spot rate GBP 1 = CHF 2.5850 / 2.5881

Therefore 3 month swap points are at discount of 28/12.

Question 59

M/s Omega Electronics Ltd. exports air conditioners to Germany by importing all the components from Singapore. The company is exporting 2,400 units at a price of Euro 500 per unit. The cost of imported components is S$ 800 per unit. The fixed cost and other variables cost per unit are ₹ 1,000 and ₹ 1,500 respectively. The cash flows in Foreign currencies are due in six months. The current exchange rates are as follows:

₹/Euro	51.50/55
₹/S$	27.20/25

After six months the exchange rates turn out as follows:

₹/Euro	52.00/05
₹/S$	27.70/75

(1) You are required to calculate loss/gain due to transaction exposure.

(2) Based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of air conditioners is ₹ 25,000 :

(i) the current exchange rate changes to

Rs/Euro	51.75/80
Rs/S$	27.10/15

(ii) Price elasticity of demand is estimated to be 1.5

(iii) Payments and receipts are to be settled at the end of six months.

Answer

(i) Profit at current exchange rates

2400 [€ 500 × ₹ 51.50 – (S$ 800 × ₹ 27.25 + ₹ 1,000 + ₹ 1,500)]

2400 [₹ 25,750 - ₹ 24,300] = ₹ 34,80,000

Profit after change in exchange rates

2400[€500× ₹ 52 – (S$ 800 × ₹ 27.75 + ₹ 1000 + ₹ 1500)]

2400[₹ 26,000 - ₹ 24,700] = ₹ 31,20,000

LOSS DUE TO TRANSACTION EXPOSURE

₹ 34,80,000 – ₹ 31,20,000 = ₹ 3,60,000

(ii) Profit based on new exchange rates

2400[₹ 25,000 - (800 × ₹ 27.15 + ₹ 1,000 + ₹ 1,500)]

2400[₹ 25,000 - ₹ 24,220] = ₹ 18,72,000

Profit after change in exchange rates at the end of six months

2400 [₹ 25,000 - (800 × ₹ 27.75 + ₹ 1,000 + ₹ 1,500)]

2400 [₹. 25,000 - ₹ 24,700] = ₹ 7,20,000

Decline in profit due to transaction exposure

₹ 18,72,000 - ₹ 7,20,000 = ₹ 11,52,000

Current price of each unit in € = $\frac{₹\ 25,000}{₹\ 51.50}$ = € 485.44

Price after change in Exch. Rate = $\frac{₹\ 25,000}{₹\ 51.75}$ = € 483.09

Change in Price due to change in Exch. Rate

€ 485.44 - € 483.09 = € 2.35

or (-) 0.48%

Price elasticity of demand = 1.5

Increase in demand due to fall in price 0.48 × 1.5 = 0.72%

Size of increased order = 2400 ×1.0072 = 2417 units

Profit = 2417 [₹ 25,000 – (800 × ₹ 27.75 + ₹ 1,000 + ₹ 1,500)]

= 2417 [₹ . 25,000 - ₹ 24,700] = ₹ 7,25,100

Therefore, decrease in profit due to operating exposure ₹ 18,72,000 – ₹ 7,25,100 = ₹ 11,46,900

Alternatively, if it is assumed that Fixed Cost shall not be changed with change in units then answer will be as follows:

Fixed Cost = 2400[₹ 1,000] = ₹ 24,00,000

Profit = 2417 [₹ 25,000 – (800 × ₹ 27.75 + ₹ 1,500)] – ₹ 24,00,000

= 2417 (₹ 1,300) – ₹ 24,00,000 = ₹ 7,42,100

Therefore, decrease in profit due to operating exposure ₹ 18,72,000 – ₹ 7,42,100 = ₹ 11,29,900

Question 60

Your bank's London office has surplus funds to the extent of USD 5,00,000/- for a period of 3 months. The cost of the funds to the bank is 4% p.a. It proposes to invest these funds in London, New York or Frankfurt and obtain the best yield, without any exchange risk to the bank. The following rates of interest are available at the three centres for investment of domestic funds there at for a period of 3 months.

London	*5 % p.a.*
New York	*8% p.a.*
Frankfurt	*3% p.a.*

The market rates in London for US dollars and Euro are as under:

London on New York	
Spot	*1.5350/90*
1 month	*15/18*
2 month	*30/35*
3 months	*80/85*
London on Frankfurt	
Spot	*1.8260/90*
1 month	*60/55*
2 month	*95/90*
3 month	*145/140*

At which centre, will be investment be made & what will be the net gain (to the nearest pound) to the bank on the invested funds?

Answer

(i) If investment is made at London

Convert US$ 5,00,000 at Spot Rate (5,00,000/1.5390)		= £ 3,24,886
Add: £ Interest for 3 months on £ 324,886 @ 5%		= £ 4,061
		= £ 3,28,947
Less: Amount Invested	$ 5,00,000	

Interest accrued thereon	$ 5,000	
	= $ 5,05,000	
Equivalent amount of £ required to pay the above sum ($ 5,05,000/1.5430)		= £ 3,27,285
Arbitrage Profit		= £ 1,662

(ii) If investment is made at New York

Gain $ 5,00,000 (8% - 4%) x 3/12	= $ 5,000
Equivalent amount in £ 3 months ($ 5,000/ 1.5475)	£ 3,231

(iii) If investment is made at Frankfurt

Convert US$ 500,000 at Spot Rate (Cross Rate) 1.8260/1.5390	= € 1.1865
Euro equivalent US$ 500,000	= € 5,93,250
Add: Interest for 3 months @ 3%	= € 4,449
	= € 5,97,699
3 month Forward Rate of selling € (1/1.8150)	= £ 0.5510
Sell € in Forward Market € 5,97,699 x £ 0.5510	= £ 3,29,332
Less: Amounted invested and interest thereon	= £ 3,27,285
Arbitrage Profit	= £ 2,047

Since out of three options the maximum profit is in case investment is made in New York. Hence it should be opted.

Question 61

Drilldip Inc. a US based company has a won a contract in India for drilling oil field. The project will require an initial investment of ₹ 500 crore. The oil field along with equipments will be sold to Indian Government for ₹ 740 crore in one year time. Since the Indian Government will pay for the amount in Indian Rupee (₹) the company is worried about exposure due exchange rate volatility.

You are required to:

(a) Construct a swap that will help the Drilldip to reduce the exchange rate risk.

(b) Assuming that Indian Government offers a swap at spot rate which is 1US$ = ₹ 50 in one year, then should the company should opt for this option or should it just do nothing. The spot rate after one year is expected to be 1US$ = ₹ 54. Further you may also assume that the Drilldip can also take a US$ loan at 8% p.a.

Answer

(a) The following swap arrangement can be entered by Drilldip.

(i) Swap a US$ loan today at an agreed rate with any party to obtain Indian Rupees (₹) to make initial investment.

(ii) After one year swap back the Indian Rupees with US$ at the agreed rate. In such case the company is exposed only on the profit earned from the project.

(b) With the swap

	Year 0 (Million US$)	Year 1 (Million US$)
Buy ₹ 500 crore at spot rate of 1US$ = ₹ 50	(100.00)	----
Swap ₹ 500 crore back at agreed rate of ₹ 50	----	100.00
Sell ₹ 240 crore at 1US$ = ₹ 54	----	44.44
Interest on US$ loan @8% for one year	----	(8.00)
	(100.00)	136.44

Net result is a net receipt of US$ 36.44 million.

Without the swap

	Year 0 (Million US$)	Year 1(Million US$)
Buy ₹ 500 crore at spot rate of 1US$ = ₹ 50	(100.00)	----
Sell ₹ 740 crore at 1US$ = ₹ 54	----	137.04
Interest on US$ loan @8% for one year	----	(8.00)
	(100.00)	129.04

Net result is a net receipt of US$ 29.04 million.

Decision: Since the net receipt is higher in swap option the company should opt for the same.

Question 62

You as a dealer in foreign exchange have the following position in Swiss Francs on 31st October, 2009:

	Swiss Francs
Balance in the Nostro A/c Credit	*1,00,000*
Opening Position Overbought	*50,000*
Purchased a bill on Zurich	*80,000*
Sold forward TT	*60,000*
Forward purchase contract cancelled	*30,000*
Remitted by TT	*75,000*
Draft on Zurich cancelled	*30,000*

What steps would you take, if you are required to maintain a credit Balance of Swiss Francs 30,000 in the Nostro A/c and keep as overbought position on Swiss Francs 10,000?

Answer

Exchange Position:

Particulars	*Purchase Sw. Fcs.*	*Sale Sw. Fcs.*
Opening Balance Overbought	50,000	
Bill on Zurich	80,000	
Forward Sales – TT		60,000
Cancellation of Forward Contract		30,000
TT Sales		75,000
Draft on Zurich cancelled	30,000	—
	1,60,000	1,65,000
Closing Balance Oversold	5,000	—
	1,65,000	1,65,000

Cash Position (Nostro A/c)

	Credit	**Debit**
Opening balance credit	1,00,000	—
TT sales	—	75,000
	1,00,000	75,000
Closing balance (credit)	—	25,000
	1,00,000	1,00,000

The Bank has to buy spot TT Sw. Fcs. 5,000 to increase the balance in Nostro account to Sw. Fcs. 30,000.

This would bring down the oversold position on Sw. Fcs. as Nil.

Since the bank requires an overbought position of Sw. Fcs. 10,000, it has to buy forward Sw. Fcs. 10,000.

13

Merger, Acquisition & Restructuring

BASIC CONCEPTS AND FORMULAE

1. Introduction

The terms 'mergers', 'acquisitions' and 'takeovers' are often used interchangeably in common parlance. However, there are differences. While merger means unification of two entities into one, acquisition involves one entity buying out another and absorbing the same. In India, in legal sense merger is known as 'Amalgamation'.

2. Reconstruction

Reconstruction involves the winding-up of an existing company and transfer of its asset and liabilities to a new company formed to take the place of the existing company. In the result, the same shareholders who agree to take equivalent shares in the new company carry on the same enterprise through the medium of a new company.

3. Amalgamation or Merger

"Generally, where only one company is involved in a scheme and the rights of the shareholders and creditors are varied, it amounts to *reconstruction* or *reorganisation* or *scheme of arrangement*. In an amalgamation, two or more companies are fused into one by merger or by one taking over the other. Amalgamation is a blending of two or more existing undertakings into one undertaking, the shareholders of each blending company become substantially the shareholder of the company which is to carry on the blended undertaking.

4. Types of Mergers

(i) **Horizontal Merger:** The two companies which have merged are in the same industry, normally the market share of the new consolidated company would be larger and it is possible that it may move closer to being a monopoly or a near monopoly to avoid competition.

(ii) **Vertical Merger:** This merger happens when two companies that have 'buyer-seller' relationship (or potential buyer-seller relationship) come together.

(iii) **Conglomerate Mergers:** Such mergers involve firms engaged in unrelated type of business operations. Such mergers are in fact, unification of different

kinds of businesses under one flagship company.

(iv) **Congeneric Merger:** In these mergers, the acquirer and the target companies are related through basic technologies, production processes or markets. The acquired company represents an extension of product-line, market participants or technologies of the acquirer. These mergers represent an outward movement by the acquirer from its current business scenario to other related business activities within the overarching industry structure

(v) **Reverse Merger:** This type of merger is also known as 'back door listing'. This kind of merger has been started as an alternative to go for public issue without incurring huge expenses and passing through cumbersome process. Thus, it can be said that reverse merger leads to the following benefits for acquiring company:

- Easy access to capital market.
- Increase in visibility of the company in corporate world.
- Tax benefits on carry forward losses acquired (public) company.
- Cheaper and easier route to become a public company.

5. Reasons and Rationale for Mergers and Acquisitions

The most common reasons for Mergers and Acquisition (M&A) are:

- Synergistic operating economies;
- Diversification;
- Taxation;
- Growth; and
- Consolidation of production capacities and increasing market power.

6. Gains from Mergers or Synergy

The first step in merger analysis is to identify the economic gains from the merger. There are gains, if the combined entity is more than the sum of its parts. That is, Combined value > (Value of acquirer + Stand alone value of target).

The difference between the combined value and the sum of the values of individual companies is usually attributed to *synergy*.

Value of acquirer + Stand alone value of target + Value of synergy = Combined value

7. Principal Steps in a Successful M & A Program

- Manage the pre-acquisition phase;
- Screen candidates;

- Eliminate those who do not meet the criteria and value the rest;
- Negotiate; and
- Post-merger integration.

8. Problems for M & A in India

- Indian corporates are largely promoter-controlled and managed.
- In some cases, the need for prior negotiations and concurrence of financial institutions and banks is an added rider, besides SEBI's rules and regulations.
- The reluctance of financial institutions and banks to fund acquisitions directly.
- The BIFR route, although tedious, is preferred for obtaining financial concessions.
- Lack of exit policy for restructuring/downsizing.
- Absence of efficient capital market system makes the market capitalisation not fair in some cases.
- Valuation is still evolving in India.

9. Mergers in Specific Sectors

The Companies Act, 2013 and the SEBI's Takeover Code are the general source of guidelines governing mergers. There are sector specific legislative provisions, which to a limited extent empower the regulator to promote competition. Mergers in the banking sector require approval from the RBI.

10. Acquisitions and Takeover

Acquisition: This refers to the purchase of controlling interest by one company in the share capital of an existing company. This may be by:

(i) an agreement with majority holder of Interest.

(ii) Purchase of new shares by private agreement.

(iii) Purchase of shares in open market (open offer)

(iv) Acquisition of share capital of a company by means of cash, issuance of shares.

(v) Making a buyout offer to general body of shareholders.

Takeover: Normally acquisitions are made friendly, however when the process of acquisition is unfriendly (i.e., hostile) such acquisition is referred to as 'takeover'). Hostile takeover arises when the Board of Directors of the acquiring company decide to approach the shareholders of the target company directly through a Public Announcement (Tender Offer) to buy their shares consequent to the rejection of the offer made to the Board of Directors of the target company.

Take Over Strategies: Other than Tender Offer the acquiring company can also use the following techniques:

- *Street Sweep*
- *Bear Hug*
- *Strategic Alliance*
- *Brand Power*

11. Takeover by Reverse Bid

In a 'reverse takeover', a smaller company gains control of a larger one. The concept of takeover by reverse bid, or of reverse merger, is thus not the usual case of amalgamation of a sick unit which is non-viable with a healthy or prosperous unit but is a case whereby the entire undertaking of the healthy and prosperous company is to be merged and vested in the sick company which is non-viable.

12. The Acquisition Process

The acquisition process involves the following essential stages:

(i) Defining the Acquisition Criteria

(ii) Competitive analysis;

(iii) Search and screen.

(iv) Strategy development.

(v) Financial evaluation.

(vi) Target contact and negotiation.

(vii) Due Diligence (in the case of a friendly acquisition

(viii) Arranging for finance for acquisition

(ix) Putting through the acquisition and Post merger integration

13. Defending a Company in a Takeover Bid

Due to the prevailing guidelines, the target company without the approval of the shareholder cannot resort to any issuance of fresh capital or sale of assets etc., and also due to the necessity of getting approvals from various authorities. Thus, the target company cannot refuse transfer of shares without the consent of shareholders in a general meeting.

A target company can adopt a number of tactics to defend itself from hostile takeover through a tender offer.

- Divestiture;
- Crown jewels;

- Poison pill;
- Poison Put;
- Greenmail;
- White knight;
- White squire;
- Golden parachutes; and
- Pac-man defense.

14. Legal Aspects of M & As

Merger control requirements in India are currently governed by the provisions of the Companies Act, 2013 and the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997. ("the takeover code"). Other statutes which govern merger proposals are the Industries (Development and Regulation) Act, 1951; the Foreign Exchange Management Act, 2000, the Income Tax Act, 1961 and the SEBI Act, 1992.

15. Due Diligence

Due diligence means research. Its purpose in M&A is to support the valuation process, arm negotiators, test the accuracy of representations and warranties contained in the merger agreement, fulfill disclosure requirements to investors, and inform the planners of post-merger integration.

A due diligence process should focus at least on the following issues:

- Legal issues;
- Financial and tax issues;
- Marketing issues;
- Cross-border issues; and
- Cultural and ethical issues.

16. Target Valuation for M & A

The value of a business is a function of the business logic driving the M&A and is based on bargaining powers of buyers and sellers. Thorough due diligence has to be exercised in deciding the valuation parameters since these parameters would differ from sector to sector and company to company. Some methods of valuation are:

(a) Earnings based valuation

(i) *Discounted Cash Flow/Free Cash Flow:* Being the most common technique takes into consideration the future earnings of the business and hence the appropriate value depends on projected revenues and costs in

future, expected capital outflows, number of years of projection, discounting rate and terminal value of business.

(ii) *Cost to Create Approach*: In this approach the cost for building up the business from scratch is taken into consideration and the purchase price is typically the cost plus a margin.

(iii) *Capitalised Earning Method:* The value of a business is estimated in the capitalized earnings method by capitalizing the net profits of the business of the current year or average of three years or a projected year at required rate of return.

(iv) *Chop-Shop Method:* This approach attempts to identify multi-industry companies that are undervalued and would have more value if separated from each other. In other words as per this approach an attempt is made to buy assets below their replacement value.

(b) Market based valuation

(i) *For Listed Companies:* It is same as Capitalized Earning Method except that here the basis is taken earning of similar type of companies.

(ii) *For Unlisted Companies:* The basics of valuation for listed and unlisted company stay the same. Only thing that is limited with a unlisted company is the ready-made price market perceives for its equity etc. In such cases we need to carry out an exhaustive/ disciplined "Benchmarking Analysis" and identify the most applicable "normalised" median multiples for company under consideration.

(c) Asset based valuation

(i) *Net Adjusted Asset Value or Economic Book Value:* Valuation of a 'going concern' business by computed by adjusting the value of its all assets and liabilities to the fair market value. This method allows for valuation of goodwill, inventories, real estate, and other assets at their current market value. In other words this method includes valuation of intangible assets and also allows assets to be adjusted to their current market value.

(ii) *Intangible Asset Valuation:* Acceptable methods for the valuation of identifiable intangible assets and intellectual property fall into three broad categories. They are market based, cost based, or based on estimates of past and future economic benefits.

(iii) *Liquidation Value:* This approach is similar to the book valuation method, except that the value of assets at liquidation are used instead of the book or market value of the assets. Using this approach, the liabilities of the business are deducted from the liquidation value of the assets to

determine the liquidation value of the business. The overall value of a business using this method should be lower than a valuation reached using the standard book or adjusted book methods.

17. Corporate Restructuring

Restructuring of business is an integral part of modern business enterprises. Restructuring usually involves major organizational changes such as shift in corporate strategies. Restructuring can be internally in the form of new investments in plant and machinery, Research and Development of products and processes, hiving off of non-core businesses, divestment, sell-offs, de-merger etc. Restructuring can also take place externally through mergers and acquisitions (M&A) and by forming joint-ventures and having strategic alliances with other firms. The aspects relating to expansion or contraction of a firm's operations or changes in its assets or financial or ownership structure are known as corporate re-structuring.

18. Financial Restructuring

Financial restructuring (also known as internal re-construction) is aimed at reducing the debt/payment burden of the corporate firm. This results into

(i) Reduction/Waiver in the claims from various stakeholders;

(ii) Real worth of various properties/assets by revaluing them timely;

(iii) utilizing profit accruing on account of appreciation of assets to write off accumulated losses and fictitious assets (such as preliminary expenses and cost of issue of shares and debentures) and creating provision for bad and doubtful debts.

19. Merger Failures or Potential Adverse Competitive Effects

The reasons for merger failures can be numerous. Some of the key reasons are:

- Acquirers generally overpay;
- The value of synergy is over-estimated;
- Poor post-merger integration; and
- Psychological barriers.

Most companies merge with the hope that the benefits of synergy will be realised. Synergy will be there only if the merged entity is managed better after the acquisition than it was managed before. Therefore, to make a merger successful, companies may follow the steps listed as under:

- Decide what tasks need to be accomplished in the post-merger period;
- Choose managers from both the companies (and from outside);
- Establish performance yardstick and evaluate the managers on that yardstick;

and

- Motivate them.

20. Acquiring for Shares

The acquirer can pay the target company in cash or exchange shares in consideration. The analysis of acquisition for shares is slightly different. The steps involved in the analysis are:

Estimate the value of acquirer's (self) equity;

Estimate the value of target company's equity;

Calculate the maximum number of shares that can be exchanged with the target company's shares; and

Conduct the analysis for pessimistic and optimistic scenarios.

Question 1

Explain the term "Demerger".

Answer

Demerger: The word 'demerger' is defined under the Income-tax Act, 1961. It refers to a situation where pursuant to a scheme for reconstruction/restructuring, an 'undertaking' is transferred or sold to another purchasing company or entity. The important point is that even after demerger; the transferring company would continue to exist and may do business.

Demerger is used as a suitable scheme in the following cases:

- Restructuring of an existing business
- Division of family-managed business
- Management 'buy-out'.

While under the Income tax Act there is recognition of demerger only for restructuring as provided for under sections 391 – 394 of the Companies Act, in a larger context, demerger can happen in other situations also.

Question 2

Explain synergy in the context of Mergers and Acquisitions.

Answer

Synergy May be defined as follows:

$$V(AB) > V(A) + V(B).$$

In other words the combined value of two firms or companies shall be more than their individual value. This may be result of complimentary services economics of scale or both.

A good example of complimentary activities can a company may have a good networking of branches and other company may have efficient production system. Thus the merged companies will be more efficient than individual companies.

On Similar lines, economics of large scale is also one of the reason for synergy benefits. The main reason is that, the large scale production results in lower average cost of production e.g. reduction in overhead costs on account of sharing of central services such as accounting and finances, Office executives, top level management, legal, sales promotion and advertisement etc.

These economics can be "real" arising out of reduction in factor input per unit of output, whereas pecuniary economics are realized from paying lower prices for factor inputs to bulk transactions.

Question 3

Explain the term 'Buy-Outs'.

Answer

A very important phenomenon witnessed in the Mergers and Acquisitions scene, in recent times is one of buy - outs. A buy-out happens when a person or group of persons gain control of a company by buying all or a majority of its shares. A buyout involves two entities, the acquirer and the target company. The acquirer seeks to gain controlling interest in the company being acquired normally through purchase of shares. There are two common types of buy-outs: Leveraged Buyouts (LBO) and Management Buy-outs (MBO). LBO is the purchase of assets or the equity of a company where the buyer uses a significant amount of debt and very little equity capital of his own for payment of the consideration for acquisition. MBO is the purchase of a business by its management, who when threatened with the sale of its business to third parties or frustrated by the slow growth of the company, step-in and acquire the business from the owners, and run the business for themselves. The majority of buy-outs is management buy-outs and involves the acquisition by incumbent management of the business where they are employed. Typically, the purchase price is met by a small amount of their own funds and the rest from a mix of venture capital and bank debt.

Internationally, the two most common sources of buy-out operations are divestment of parts of larger groups and family companies facing succession problems. Corporate groups may seek to sell subsidiaries as part of a planned strategic disposal programme or more forced reorganisation in the face of parental financing problems. Public companies have, however, increasingly sought to dispose of subsidiaries through an auction process partly to satisfy shareholder pressure for value maximisation.

In recessionary periods, buy-outs play a big part in the restructuring of a failed or failing businesses and in an environment of generally weakened corporate performance often represent the only viable purchasers when parents wish to dispose of subsidiaries.

Buy-outs are one of the most common forms of privatisation, offering opportunities for enhancing the performances of parts of the public sector, widening employee ownership and giving managers and employees incentives to make best use of their expertise in particular sectors.

Question 4

What is take over by reverse bid or Reverse Merger?

Answer

Generally, a big company takes over a small company. When the smaller company gains control of a larger one then it is called "Take-over by reverse bid". In case of reverse take-over, a small company takes over a big company. This concept has been successfully followed for revival of sick industries.

The acquired company is said to be big if any one of the following conditions is satisfied:

(i) The assets of the transferor company are greater than the transferee company;

(ii) Equity capital to be issued by the transferee company pursuant to the acquisition exceeds its original issued capital, and

(iii) The change of control in the transferee company will be through the introduction of minority holder or group of holders.

Reverse takeover takes place in the following cases:

(1) When the acquired company (big company) is a financially weak company

(2) When the acquirer (the small company) already holds a significant proportion of shares of the acquired company (small company)

(3) When the people holding top management positions in the acquirer company want to be relived off of their responsibilities.

The concept of take-over by reverse bid, or of reverse merger, is thus not the usual case of amalgamation of a sick unit which is non-viable with a healthy or prosperous unit but is a case whereby the entire undertaking of the healthy and prosperous company is to be merged and vested in the sick company which is non-viable.

Question 5

Write a short note on Financial restructuring

Answer

Financial restructuring, is carried out internally in the firm with the consent of its various stakeholders. Financial restructuring is a suitable mode of restructuring of corporate firms that have incurred accumulated sizable losses for / over a number of years. As a sequel, the share capital of such firms, in many cases, gets substantially eroded / lost; in fact, in some cases, accumulated losses over the years may be more than share capital, causing negative net worth. Given such a dismal state of financial affairs, a vast majority of such firms are likely to

have a dubious potential for liquidation. Can some of these Firms be revived? Financial restructuring is one such a measure for the revival of only those firms that hold promise/prospects for better financial performance in the years to come. To achieve the desired objective, 'such firms warrant / merit a restart with a fresh balance sheet, which does not contain past accumulated losses and fictitious assets and shows share capital at its real/true worth.

Question 6

What is an equity curve out? How does it differ from a spin off?

Answer

Equity Curve out can be defined as partial spin off in which a company creates its own new subsidiary and subsequently bring out its IPO. It should be however noted that parent company retains its control and only a part of new shares are issued to public.

On the other hand in Spin off parent company does not receive any cash as shares of subsidiary company are issued to existing shareholder in the form of dividend. Thus, shareholders in new company remain the same but not in case of Equity curve out.

Question 7

Write a short note on Horizontal Merger and Vertical Merger.

Answer

(i) Horizontal Merger: The two companies which have merged are in the same industry, normally the market share of the new consolidated company would be larger and it is possible that it may move closer to being a monopoly or a near monopoly to avoid competition.

(ii) Vertical Merger: This merger happens when two companies that have 'buyer-seller' relationship (or potential buyer-seller relationship) come together.

Question 8

B Ltd. is a highly successful company and wishes to expand by acquiring other firms. Its expected high growth in earnings and dividends is reflected in its PE ratio of 17. The Board of Directors of B Ltd. has been advised that if it were to take over firms with a lower PE ratio than it own, using a share-for-share exchange, then it could increase its reported earnings per share. C Ltd. has been suggested as a possible target for a takeover, which has a PE ratio of 10 and 1,00,000 shares in issue with a share price of ₹ 15. B Ltd. has 5,00,000 shares in issue with a share price of ₹ 12.

Calculate the change in earnings per share of B Ltd. if it acquires the whole of C Ltd. by issuing shares at its market price of ₹12. Assume the price of B Ltd. shares remains constant.

Answer

Total market value of C Ltd is = 1,00,000 x ₹ 15	= ₹ 15,00,000
PE ratio (given)	= 10
Therefore, earnings	= ₹ 15,00,000 /10
	= ₹ 1,50,000
Total market value of B Ltd. is = 5,00,000 x ₹ 12	= ₹ 60,00,000
PE ratio (given)	= 17
Therefore, earnings	= ₹ 60,00,000/17
	= ₹ 3,52,941

The number of shares to be issued by B Ltd.

₹ 15,00,000 ÷ 12	= 1,25,000
Total number of shares of B Ltd	= 5,00,000 + 1,25,000 = 6,25,000
The EPS of the new firm is	= (₹ 3,52,941+₹1,50,000)/6,25,000
	= ₹ 0.80
The present EPS of B Ltd is	= ₹ 3,52,941 /5,00,000
	= ₹ 0.71

So the EPS affirm B will increase from Re. 0.71 to ₹ 0.80 as a result of merger.

Question 9

ABC Company is considering acquisition of XYZ Ltd. which has 1.5 crores shares outstanding and issued. The market price per share is ₹ 400 at present. ABC's average cost of capital is 12%. Available information from XYZ indicates its expected cash accruals for the next 3 years as follows:

Year	*₹ Cr.*
1	*250*
2	*300*
3	*400*

Calculate the range of valuation that ABC has to consider. (PV factors at 12% for years 1 to 3 respectively: 0.893, 0.797 and 0.712).

Answer

VALUATION BASED ON MARKET PRICE

Market Price per share	₹ 400
Thus value of total business is (₹ 400 x 1.5 Cr.)	₹ 600 Cr.

VALUATION BASED ON DISCOUNTED CASH FLOW

Present Value of cash flows

(₹ 250 cr x 0.893) + (₹ 300 cr. X 0.797) + (₹ 400 cr. X 0.712) = ₹ 747.15 Cr.

Value of per share (₹ 747.15 Cr. / 1.5 Cr) ₹ 498.10 per share

RANGE OF VALUATION

	Per Share ₹	Total ₹ Cr.
Minimum	400.00	600.00
Maximum	498.10	747.15

Question 10

Elrond Limited plans to acquire Doom Limited. The relevant financial details of the two firms prior to the merger announcement are:

	Elrond Limited	*Doom Limited*
Market price per share	*₹ 50*	*₹ 25*
Number of outstanding shares	*20 lakhs*	*10 Lakhs*

The merger is expected to generate gains, which have a present value of ₹200 lakhs. The exchange ratio agreed to is 0.5.

What is the true cost of the merger from the point of view of Elrond Limited?

Answer

Shareholders of Doom Ltd. will get 5 lakh share of Elrond Limited, so they will get:

$= \frac{5 \text{ lakh}}{20 \text{ lakh} + 5 \text{ lakh}}$ = 20% of shares Elrond Limited

The value of Elrond Ltd. after merger will be:

= ₹ 50 x 20 lakh + ₹ 25 x 10 lakh + ₹ 200 lakh

= ₹ 1000 lakh + ₹ 250 lakh + ₹ 200 lakh = ₹ 1450 lakh

True Cost of Merger will be:

(₹ 1450 x 20%) ₹ 290 lakhs – ₹ 250 lakhs = ₹ 40 lakhs

Question 11

Eagle Ltd. reported a profit of ₹ 77 lakhs after 30% tax for the financial year 2011-12. An analysis of the accounts revealed that the income included extraordinary items of ₹ 8 lakhs and an extraordinary loss of ₹10 lakhs. The existing operations, except for the extraordinary items, are expected to continue in the future. In addition, the results of the launch of a new

product are expected to be as follows:

	₹ *In lakhs*
Sales	*70*
Material costs	*20*
Labour costs	*12*
Fixed costs	*10*

You are required to:

(i) Calculate the value of the business, given that the capitalization rate is 14%.

(ii) Determine the market price per equity share, with Eagle Ltd.'s share capital being comprised of 1,00,000 13% preference shares of ₹ 100 each and 50,00,000 equity shares of ₹ 10 each and the P/E ratio being 10 times.

Answer

(i) Computation of Business Value

			(₹ Lakhs)
Profit before tax $\frac{77}{1-0.30}$			110
Less: Extraordinary income			(8)
Add: Extraordinary losses			10
			112
Profit from new product		(₹ Lakhs)	
Sales		70	
Less: Material costs	20		
Labour costs	12		
Fixed costs	10	(42)	28
			140.00
Less: Taxes @30%			42.00
Future Maintainable Profit after taxes			98.00
Relevant Capitalisation Factor			0.14
Value of Business (₹98/0.14)			700

(ii) Determination of Market Price of Equity Share

Future maintainable profits (After Tax)	₹ 98,00,000
Less: Preference share dividends 1,00,000 shares of ₹ 100 @ 13%	₹ 13,00,000
Earnings available for Equity Shareholders	₹ 85,00,000
No. of Equity Shares	50,00,000

Earning per share = $\frac{₹\ 85,00,000}{50,00,000}$ =	₹ 1.70
PE ratio	10
Market price per share	₹ 17

Question 12

ABC Co. is considering a new sales strategy that will be valid for the next 4 years. They want to know the value of the new strategy. Following information relating to the year which has just ended, is available:

Income Statement	*₹*
Sales	*20,000*
Gross margin (20%)	*4,000*
Administration, Selling & distribution expense (10%)	*2,000*
PBT	*2,000*
Tax (30%)	*600*
PAT	*1,400*
Balance Sheet Information	
Fixed Assets	*8,000*
Current Assets	*4,000*
Equity	*12,000*

If it adopts the new strategy, sales will grow at the rate of 20% per year for three years. The gross margin ratio, Assets turnover ratio, the Capital structure and the income tax rate will remain unchanged.

Depreciation would be at 10% of net fixed assets at the beginning of the year.

The Company's target rate of return is 15%.

Determine the incremental value due to adoption of the strategy.

Answer

Projected Balance Sheet				
	Year 1	Year 2	Year 3	Year 4
Fixed Assets (40% of Sales)	9,600	11,520	13,824	13,824
Current Assets (20% of Sales)	4,800	5,760	6,912	6,912
Total Assets	14,400	17,280	20,736	20,736
Equity	14,400	17,280	20,736	20,736

Projected Cash Flows:-

	Year 1	Year 2	Year 3	Year 4
Sales	24,000	28,800	34,560	34,560
PBT (10% of sale)	2,400	2,880	3,456	3,456
PAT (70%)	1,680	2,016	2,419.20	2,419.20
Depreciation	800	960	1,152	1,382
Addition to Fixed Assets	2,400	2,880	3,456	1,382
Increase in Current Assets	800	960	1,152	-
Operating cash flow	(720)	(864)	(1,036.80)	2,419.20

Projected Cash Flows:-

Present value of Projected Cash Flows:-

Cash Flows	*PVF at 15%*	*PV*
-720	0.870	-626.40
-864	0.756	-653.18
-1,036.80	0.658	-682.21
		-1,961.79

Residual Value - 2419.20/0.15 = 16,128

Present value of Residual value	=	$16128/(1.15)^3$	
	=	16128/1.521 = 10603.55	
Total shareholders' value	=	10,603.55 – 1,961.79 =	8,641.76
Pre strategy value	=	1,400 / 0.15 = 9,333.33	
∴ Value of strategy	=	8,641.76 – 9,333.33 =	– 691.57

Conclusion: The strategy is not financially viable

Question 13

MK Ltd. is considering acquiring NN Ltd. The following information is available:

Company	*Earning after tax(₹)*	*No. of Equity Shares*	*Market Value Per Share(₹)*
MK Ltd.	*60,00,000*	*12,00,000*	*200.00*
NN Ltd.	*18,00,000*	*3,00,000*	*160.00*

Exchange of equity shares for acquisition is based on current market value as above. There is no synergy advantage available.

(i) Find the earning per share for company MK Ltd. after merger, and

(ii) Find the exchange ratio so that shareholders of NN Ltd. would not be at a loss.

Answer

(i) Earning per share of company MK Ltd after merger:-

Exchange ratio 160 : 200 = 4 : 5.

that is 4 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Total number of shares to be issued = 4/5 × 3,00,000 = 2,40,000 Shares.

∴ Total number of shares of MK Ltd. and NN Ltd.=12,00,000 (MK Ltd.)+2,40,000 (NN Ltd.)

= 14,40,000 Shares

Total profit after tax	= ₹ 60,00,000	MK Ltd.
	= ₹ 18,00,000	NN Ltd.
	= ₹ 78,00,000	

∴ EPS. (Earning Per Share) of MK Ltd. after merger

₹ 78,00,000/14,40,000 = ₹ 5.42 per share

(ii) To find the exchange ratio so that shareholders of NN Ltd. would not be at a Loss:

Present earning per share for company MK Ltd.

= ₹ 60,00,000/12,00,000 = ₹ 5.00

Present earning per share for company NN Ltd.

= ₹ 18,00,000/3,00,000 = ₹ 6.00

∴ Exchange ratio should be 6 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Shares to be issued to NN Ltd. = 3,00,000 × 6/5 = 3,60,000 shares

Now, total No. of shares of MK Ltd. and NN Ltd. =12,00,000 (MK Ltd.)+3,60,000 (NN Ltd.)

= 15,60,000 shares

∴ EPS after merger = ₹ 78,00,000/15,60,000 = ₹ 5.00 per share

Total earnings available to shareholders of NN Ltd. after merger = 3,60,000 shares × ₹ 5.00 = ₹ 18,00,000.

This is equal to earnings prior merger for NN Ltd.

∴ Exchange ratio on the basis of earnings per share is recommended.

Question 14

Cauliflower Limited is contemplating acquisition of Cabbage Limited. Cauliflower Limited has 5 lakh shares having market value of ₹ 40 per share while Cabbage Limited has 3 lakh shares

having market value of ₹ 25 per share. The EPS for Cabbage Limited and Cauliflower Limited are ₹ 3 per share and ₹ 5 per share respectively. The managements of both the companies are discussing two alternatives for exchange of shares as follows:

(i) In proportion to relative earnings per share of the two companies.

(ii) 1 share of Cauliflower Limited for two shares of Cabbage Limited.

Required:

(i) Calculate the EPS after merger under both the alternatives.

(ii) Show the impact on EPS for the shareholders of the two companies under both the alternatives.

Answer

(i) Exchange ratio in proportion to relative EPS

(in ₹)

Company	Existing No. of shares	EPS	Total earnings
Cauliflower Ltd.	5,00,000	5.00	25,00,000
Cabbage Ltd.	3,00,000	3.00	9,00,000
Total earnings			34,00,000

No. of shares after merger 5,00,000 + 1,80,000 = 6,80,000

Note: 1,80,000 may be calculated as $= \left(3,00,000 \times \frac{3.00}{5.00}\right)$

EPS for Cauliflower Ltd. after merger $= \frac{34,00,000}{6,80,000}$ = ₹ 5.00

Impact on EPS

	₹
Cauliflower Ltd. shareholders	
EPS before merger	5.00
EPS after merger	5.00
Increase/ Decrease in EPS	0.00
Cabbage Ltd.' Shareholders	
EPS before merger	3.00
EPS after the merger 5.00 x 3/5	3.00
Increase/ Decrease in EPS	0.00

(ii) Merger effect on EPS with share exchange ratio of 1 : 2

Total earnings after merger	₹ 34,00,000
No. of shares post merger 5,00,000 + 1,50,000 (0.5 × 3,00,000)	6,50,000
EPS (34,00,000 ÷ 6,50,000)	5.23

Impact on EPS

	₹
Cauliflower Ltd. shareholders	
EPS before merger	5.00
EPS after merger	5.23
Increase in EPS	0.23
Cabbage Ltd. shareholders	
EPS before merger	3.000
EPS after the merger 5.23 x 0.5	2.615
Decrease in EPS	0.385

Question 15

A Ltd. wants to acquire T Ltd. and has offered a swap ratio of 1:2 (0.5 shares for every one share of T Ltd.). Following information is provided:

	A Ltd.	*T. Ltd.*
Profit after tax	*₹18,00,000*	*₹3,60,000*
Equity shares outstanding (Nos.)	*6,00,000*	*1,80,000*
EPS	*₹3*	*₹2*
PE Ratio	*10 times*	*7 times*
Market price per share	*₹30*	*₹14*

Required:

(i) The number of equity shares to be issued by A Ltd. for acquisition of T Ltd.

(ii) What is the EPS of A Ltd. after the acquisition?

(iii) Determine the equivalent earnings per share of T Ltd.

(iv) What is the expected market price per share of A Ltd. after the acquisition, assuming its PE multiple remains unchanged?

(v) Determine the market value of the merged firm.

Answer

(i) **The number of shares to be issued by A Ltd.:**

The Exchange ratio is 0.5

So, new Shares = 1,80,000 x 0.5 = 90,000 shares.

(ii) **EPS of A Ltd. After a acquisition:**

Total Earnings	(₹ 18,00,000 + ₹ 3,60,000)	₹21,60,000
No. of Shares	(6,00,000 + 90,000)	6,90,000
EPS	(₹ 21,60,000)/6,90,000)	₹3.13

(iii) **Equivalent EPS of T Ltd.:**

No. of new Shares	0.5
EPS	₹3.13
Equivalent EPS (₹ 3.13 x 0.5)	₹1.57

(iv) **New Market Price of A Ltd. (P/E remaining unchanged):**

Present P/E Ratio of A Ltd.	10 times
Expected EPS after merger	₹3.13
Expected Market Price (₹3.13 x 10)	₹31.30

(v) **Market Value of merged firm:**

Total number of Shares	6,90,000
Expected Market Price	₹31.30
Total value (6,90,000 x 31.30)	₹2,15,97,000

Question 16

ABC Ltd. is intending to acquire XYZ Ltd. by merger and the following information is available in respect of the companies:

	ABC Ltd.	*XYZ Ltd.*
Number of equity shares	*10,00,000*	*6,00,000*
Earnings after tax (₹)	*50,00,000*	*18,00,000*
Market value per share (₹)	*42*	*28*

Required:

(i) What is the present EPS of both the companies?

(ii) If the proposed merger takes place, what would be the new earning per share for ABC Ltd.? Assume that the merger takes place by exchange of equity shares and the exchange ratio is based on the current market price.

(iii) What should be exchange ratio, if XYZ Ltd. wants to ensure the earnings to members are as before the merger takes place?

Answer

(i) Earnings per share = Earnings after tax /No. of equity shares

ABC Ltd. = ₹ 50,00,000/10,00,000 = ₹ 5

XYZ Ltd. = ₹ 18,00,000 / 6,00,000 = ₹ 3

(ii) Number of Shares XYZ limited's shareholders will get in ABC Ltd. based on market value per share = ₹ 28/ 42 × 6,00,000 = 4,00,000 shares

Total number of equity shares of ABC Ltd. after merger = 10,00,000 + 4,00,000 = 14,00,000 shares

Earnings per share after merger = ₹ 50,00,000 + 18,00,000/14,00,000 = ₹ 4.86

(iii) Calculation of exchange ratio to ensure shareholders of XYZ Ltd. to earn the same as was before merger:

Shares to be exchanged based on EPS = (₹ 3/₹ 5) × 6,00,000 = 3,60,000 shares

EPS after merger = (₹ 50,00,000 + 18,00,000)/13,60,000 = ₹ 5

Total earnings in ABC Ltd. available to shareholders of XYZ Ltd. = 3,60,000 × ₹ 5 = ₹ 18,00,000.

Thus, to ensure that Earning to members are same as before, the ratio of exchange should be 0.6 share for 1 share.

Question 17

The CEO of a company thinks that shareholders always look for EPS. Therefore he considers maximization of EPS as his company's objective. His company's current Net Profits are ₹ 80.00 lakhs and P/E multiple is 10.5. He wants to buy another firm which has current income of ₹ 15.75 lakhs & P/E multiple of 10.

What is the maximum exchange ratio which the CEO should offer so that he could keep EPS at the current level, given that the current market price of both the acquirer and the target company are ₹ 42 and ₹ 105 respectively?

If the CEO borrows funds at 15% and buys out Target Company by paying cash, how much should he offer to maintain his EPS? Assume tax rate of 30%.

Answer

(i)

	Acquirer Company	Target Company
Net Profit	₹ 80 lakhs	₹ 15.75 lakhs
PE Multiple	10.50	10.00
Market Capitalization	₹ 840 lakhs	₹ 157.50 lakhs

Market Price	₹ 42	₹ 105
No. of Shares	20 lakhs	1.50 lakhs
EPS	₹ 4	₹ 10.50

Maximum Exchange Ratio 4 : 10.50 or 1 : 2.625

Thus, for every one share of Target Company 2.625 shares of Acquirer Company.

(ii) Let x lakhs be the amount paid by Acquirer company to Target Company. Then to maintain same EPS i.e. ₹ 4 the number of shares to be issued will be:

$$\frac{(80 \text{ lakhs} + 15.75 \text{ lakhs}) - 0.70 \times 15\% \times x}{20 \text{ lakhs}} = 4$$

$$\frac{95.75 - 0.105x}{20} = 4$$

x = ₹ 150 lakhs

Thus, ₹ 150 lakhs shall be offered in cash to Target Company to maintain same EPS.

Question 18

XYZ Ltd., is considering merger with ABC Ltd. XYZ Ltd.'s shares are currently traded at ₹ 20. It has 2,50,000 shares outstanding and its earnings after taxes (EAT) amount to ₹ 5,00,000. ABC Ltd., has 1,25,000 shares outstanding; its current market price is ₹ 10 and its EAT are ₹ 1,25,000. The merger will be effected by means of a stock swap (exchange). ABC Ltd., has agreed to a plan under which XYZ Ltd., will offer the current market value of ABC Ltd.'s shares:

(i) What is the pre-merger earnings per share (EPS) and P/E ratios of both the companies?

(ii) If ABC Ltd.'s P/E ratio is 6.4, what is its current market price? What is the exchange ratio? What will XYZ Ltd.'s post-merger EPS be?

(iii) What should be the exchange ratio; if XYZ Ltd.'s pre-merger and post-merger EPS are to be the same?

Answer

(i) Pre-merger EPS and P/E ratios of XYZ Ltd. and ABC Ltd.

Particulars	*XYZ Ltd.*	*ABC Ltd.*
Earnings after taxes	5,00,000	1,25,000
Number of shares outstanding	2,50,000	1,25,000
EPS	2	1
Market Price per share	20	10
P/E Ratio (times)	10	10

(ii) Current Market Price of ABC Ltd. if P/E ratio is 6.4 = ₹ 1 × 6.4 = ₹ 6.40

Exchange ratio = $\frac{₹\ 20}{₹\ 6.40}$ = 3.125 or $\frac{₹\ 6.40}{₹\ 20} = 0.32$

Post merger EPS of XYZ Ltd.

$= \frac{₹\ 5,00,000 + ₹\ 1,25,000}{2,50,000 + (1,25,000/3.125)}$

$= \frac{₹\ 6,25,000}{2,90,000} = 2.16$

(iii) Desired Exchange Ratio

Total number of shares in post-merged company

$= \frac{\text{Post - merger earnings}}{\text{Pre - merger EPS of XYZ Ltd}} = \frac{₹\ 6,25,000}{2} = 3,12,500$

Number of shares required to be issued

= 3,12,500 – 2,50,000 = 62,500

Therefore, the exchange ratio is

62,500 : 1,25,000

$= \frac{62,500}{1,25,000} = 0.50$

Question 19

Company X is contemplating the purchase of Company Y. Company X has 3,00,000 shares having a market price of ₹ 30 per share, while Company Y has 2,00,000 shares selling at ₹ 20 per share. The EPS are ₹ 4.00 and ₹ 2.25 for Company X and Y respectively. Managements of both companies are discussing two alternative proposals for exchange of shares as indicated below:

(i) In proportion to the relative earnings per share of two companies.

(ii) 0.5 share of Company X for one share of Company Y (0.5 : 1).

You are required:

(i) To calculate the Earnings Per Share (EPS) after merger under two alternatives; and

(ii) To show the impact on EPS for the shareholders of two companies under both the alternatives.

Answer

(i) Exchange ratio in proportion to relative EPS *(in ₹)*

Company	*Existing No. of shares*	*EPS*	*Total earnings*
X	3,00,000	4.00	12,00,000
Y	2,00,000	2.25	4,50,000
		Total earnings	16,50,000

No. of shares after merger 3,00,000 + 1,12,500 = 4,12,500

Note: 1,12,500 may be calculated as $= \left(2,00,000 \times \frac{2.25}{4.00}\right)$

EPS for Co. X after merger $= \frac{16,50,000}{4,12,500}$ = ₹ 4.00

Impact on EPS

Equivalent EPS of Co. Y

Before merger ₹ 2.25

After merger (EPS before merger X Share exchange ratio on EPS basis)

₹ 4.00 X 0.5625 = ₹ 2.25

(ii) Merger effect on EPS with share exchange ratio of 0.5 : 1

Total earnings after merger	₹ 16,50,000
No. of shares post merger (3,00,000 + 1,00,000 (0.5 × 2,00,000)	4,00,000
EPS 16,50,000 ÷ 4,00,000	4.125

Impact on EPS

Co. X' shareholders	₹
EPS before merger	4.00
EPS after merger i.e. (16,50,000 ÷ 4,00,000)	4.125
Increase in EPS	0.125
Co. Y' Shareholders	
EPS before merger	2.2500
Equivalent EPS after the merger 4.125 x 0.5	2.0625
Decrease in EPS	0.1875

Question 20

K. Ltd. is considering acquiring N. Ltd., the following information is available :

Company	*Profit after Tax*	*Number of Equity shares*	*Market value per share*
K. Ltd.	*50,00,000*	*10,00,000*	*200.00*
N. Ltd.	*15,00,000*	*2,50,000*	*160.00*

Exchange of equity shares for acquisition is based on current market value as above. There is no synergy advantage available :

Find the earning per share for company K. Ltd. after merger.

Find the exchange ratio so that shareholders of N. Ltd. would not be at a loss.

Answer

(i) **Earning per share for company K. Ltd. after Merger:**

Exchange Ratio 160 : 200 = 4: 5

That is 4 shares of K. Ltd. for every 5 shares of N. Ltd.

$\therefore$ Total number of shares to be issued = $\frac{4}{5} \times 2,50,000$ = 2,00,000 shares

$\therefore$ Total number of shares of K. Ltd. and N. Ltd. = 10,00,000 K. Ltd.
+ 2,00,000 N. Ltd
12,00,000

Total profit after Tax = ₹ 50,00,000 K. Ltd.
₹ 15,00,000 N Ltd.
₹ 65,00,000

$\therefore$ E.P.S. (Earning per share) of K. Ltd. after Merger

$= \frac{₹\ 65,00,000}{12,00,000}$ = ₹ 5.42 Per Share

(ii) To find the Exchange Ratio so that shareholders of N. Ltd. would not be at a Loss:

Present Earnings per share for company K. Ltd.

$= \frac{₹\ 50,00,000}{₹\ 10,00,000} = ₹\ 5.00$

Present Earnings Per share for company N. Ltd.

$= \frac{₹\ 15,00,000}{₹\ 2,50,000} = ₹\ 6.00$

∴ Exchange Ratio should be 6 shares of K. Ltd. for every 5 shares of N Ltd.

∴ Shares to be issued to N. Ltd.

$= \frac{2,50,000 \times 6}{5}$ = 3,00,000 Shares

∴ Total No. of Shares of K.Ltd. and N. Ltd.

=	10,00,000	K. Ltd.
+	3,00,000	N. Ltd
	13,00,000	

∴ E.P.S. After Merger $\frac{65,00,000}{13,00,000}$ = ₹ 5.00 Per Share

Total Earnings Available to Shareholders of N. Ltd. after Merger

= ₹ 3,00,000 × ₹ 5.00 = ₹ 15,00,000

This is equal to Earnings prior Merger for N. Ltd.

∴ Exchange Ratio on the Basis of Earnings per Share is recommended.

Question 21

M Co. Ltd., is studying the possible acquisition of N Co. Ltd., by way of merger. The following data are available in respect of the companies:

Particulars	*M Co. Ltd.*	*N Co. Ltd.*
Earnings after tax (₹)	*80,00,000*	*24,00,000*
No. of equity shares	*16,00,000*	*4,00,000*
Market value per share (₹)	*200*	*160*

(i) If the merger goes through by exchange of equity and the exchange ratio is based on the current market price, what is the new earning per share for M Co. Ltd.?

(ii) N Co. Ltd. wants to be sure that the earnings available to its shareholders will not be diminished by the merger. What should be the exchange ratio in that case?

Answer

(i) Calculation of new EPS of M Co. Ltd.

No. of equity shares to be issued by M Co. Ltd. to N Co. Ltd.

= 4,00,000 shares × ₹ 160/₹ 200 = 3,20,000 shares

Total no. of shares in M Co. Ltd. after acquisition of N Co. Ltd.

= 16,00,000 + 3,20,000 = 19,20,000

Total earnings after tax [after acquisition]

= 80,00,000 + 24,00,000 = 1,04,00,000

$$\text{EPS} = \frac{₹\ 1{,}04{,}00{,}000}{19{,}20{,}000 \text{ equity shares}} = ₹\ 5.42$$

(ii) Calculation of exchange ratio which would not diminish the EPS of N Co. Ltd. after its merger with M Co. Ltd.

Current EPS:

$$\text{M Co. Ltd.} = \frac{₹\ 80{,}00{,}000}{16{,}00{,}000 \text{ equity shares}} = ₹\ 5$$

$$\text{N Co. Ltd.} = \frac{₹\ 24{,}00{,}000}{4{,}00{,}000 \text{ equity shares}} = ₹\ 6$$

Exchange ratio = 6/5 = 1.20

No. of new shares to be issued by M Co. Ltd. to N Co. Ltd.

= 4,00,000 × 1.20 = 4,80,000 shares

Total number of shares of M Co. Ltd. after acquisition

= 16,00,000 + 4,80,000 = 20,80,000 shares

$$\text{EPS [after merger]} = \frac{₹\ 1{,}04{,}00{,}000}{20{,}80{,}000 \text{ shares}} = ₹\ 5$$

Total earnings in M Co. Ltd. available to new shareholders of N Co. Ltd.

= 4,80,000 × ₹ 5 = ₹ 24,00,000

Recommendation: The exchange ratio (6 for 5) based on market shares is beneficial to shareholders of 'N' Co. Ltd.

Question 22

The following information is provided related to the acquiring Firm Mark Limited and the target Firm Mask Limited:

	Firm Mark Limited	*Firm Mask Limited*
Earning after tax (₹)	*2,000 lakhs*	*400 lakhs*
Number of shares outstanding	*200 lakhs*	*100 lakhs*
P/E ratio (times)	*10*	*5*

Required:

(i) What is the Swap Ratio based on current market prices?

(ii) What is the EPS of Mark Limited after acquisition?

(iii) What is the expected market price per share of Mark Limited after acquisition, assuming P/E ratio of Mark Limited remains unchanged?

(iv) Determine the market value of the merged firm.

(v) Calculate gain/loss for shareholders of the two independent companies after acquisition.

Answer

Particulars	Mark Ltd.	Mask Ltd.
EPS	₹ 2,000 Lakhs/ 200 lakhs	₹ 400 lakhs / 100 lakhs
	= ₹ 10	₹ 4
Market Price	₹ 10 × 10 = ₹ 100	₹ 4 × 5 = ₹ 20

(i) The Swap ratio based on current market price is

₹ 20 / ₹ 100 = 0.2 or 1 share of Mark Ltd. for 5 shares of Mask Ltd.

No. of shares to be issued = 100 lakh × 0.2 = 20 lakhs.

(ii) EPS after merger

$$= \frac{₹\ 2{,}000\ \text{lakhs} + ₹\ 400\ \text{lakhs}}{200\ \text{lakhs} + 20\ \text{lakhs}} = ₹\ 10.91$$

(iii) Expected market price after merger assuming P / E 10 times.

= ₹ 10.91 × 10 = ₹ 109.10

(iv) Market value of merged firm

= ₹ 109.10 market price × 220 lakhs shares = 240.02 crores

(v) Gain from the merger

Post merger market value of the merged firm	₹ 240.02 crores
Less: Pre-merger market value	
Mark Ltd. 200 Lakhs × ₹ 100 = 200 crores	
Mask Ltd. 100 Lakhs × ₹ 20 = 20 crores	₹ 220.00 crores
Gain from merger	₹ 20.02 crores

Appropriation of gains from the merger among shareholders:

	Mark Ltd.	*Mask Ltd.*
Post merger value	218.20 crores	21.82 crores
Less: Pre-merger market value	200.00 crores	20.00 crores
Gain to Shareholders	18.20 crores	1.82 crores

Question 23

XYZ Ltd. wants to purchase ABC Ltd. by exchanging 0.7 of its share for each share of ABC Ltd. Relevant financial data are as follows:

Equity shares outstanding	*10,00,000*	*4,00,000*
EPS (₹)	*40*	*28*
Market price per share (₹)	*250*	*160*

(i) Illustrate the impact of merger on EPS of both the companies.

(ii) The management of ABC Ltd. has quoted a share exchange ratio of 1:1 for the merger. Assuming that P/E ratio of XYZ Ltd. will remain unchanged after the merger, what will be the gain from merger for ABC Ltd.?

(iii) What will be the gain/loss to shareholders of XYZ Ltd.?

(iv) Determine the maximum exchange ratio acceptable to shareholders of XYZ Ltd.

Answer

Working Notes

(a)

	XYZ Ltd.	*ABC Ltd.*
Equity shares outstanding (Nos.)	10,00,000	4,00,000
EPS	₹ 40	₹ 28
Profit	₹ 400,00,000	₹ 112,00,000
PE Ratio	6.25	5.71
Market price per share	₹ 250	₹ 160

(b) EPS after merger

No. of shares to be issued (4,00,000 x 0.70)	2,80,000
Exiting Equity shares outstanding	10,00,000
Equity shares outstanding after merger	12,80,000
Total Profit (₹ 400,00,000 + ₹ 112,00,000)	₹ 512,00,000
EPS	₹ 40

(i) Impact of merger on EPS of both the companies

	XYZ Ltd.	*ABC Ltd.*
EPS after Merger	₹ 40	₹ 28
EPS before Merger	₹ 40	₹ 28*
	Nil	Nil

* ₹ 40 x 0.70

(ii) Gain from the Merger if exchange ratio is 1: 1

No. of shares to be issued	4,00,000
Exiting Equity shares outstanding	10,00,000
Equity shares outstanding after merger	14,00,000
Total Profit (₹ 400,00,000 + ₹ 112,00,000)	₹ 512,00,000
EPS	₹ 36.57
Market Price of Share (₹ 36.57 x 6.25)	₹ 228.56
Market Price of Share before Merger	₹ 160.00
Impact (Increase/ Gain)	₹ 68.56

(iii) Gain/ loss from the Merger to the shareholders of XYZ Ltd.

Market Price of Share	₹ 228.56
Market Price of Share before Merger	₹ 250.00
Loss from the merger (per share)	₹ 21.44

(iv) Maximum Exchange Ratio acceptable to XYZ Ltd. shareholders

	₹ Lakhs
Market Value of Merged Entity (₹ 228.57 x 1400000)	3199.98
Less: Value acceptable to shareholders of XYZ Ltd.	2500.00
Value of merged entity available to shareholders of ABC Ltd.	699.98
Market Price Per Share	250
No. of shares to be issued to the shareholders of ABC Ltd. (lakhs)	2.80

Thus maximum ratio of issue shall be 2.80 : 4.00 or 0.70 share of XYZ Ltd. for one share of ABC Ltd.

Question 24

Simple Ltd. and Dimple Ltd. are planning to merge. The total value of the companies are dependent on the fluctuating business conditions. The following information is given for the total value (debt + equity) structure of each of the two companies.

Business Condition	*Probability*	*Simple Ltd. ₹ Lacs*	*Dimple Ltd. ₹ Lacs*
High Growth	*0.20*	*820*	*1050*
Medium Growth	*0.60*	*550*	*825*
Slow Growth	*0.20*	*410*	*590*

The current debt of Dimple Ltd. is ₹ 65 lacs and of Simple Ltd. is ₹ 460 lacs.

Calculate the expected value of debt and equity separately for the merged entity.

Answer

Compute Value of Equity

Simple Ltd.

₹ in Lacs

	High Growth	**Medium Growth**	**Slow Growth**
Debit + Equity	820	550	410
Less: Debt	460	460	460
Equity	360	90	-50

Since the Company has limited liability the value of equity cannot be negative therefore the value of equity under slow growth will be taken as zero because of insolvency risk and the value of debt is taken at 410 lacs. The expected value of debt and equity can then be calculated as:

Simple Ltd.

₹ in Lacs

	High Growth		Medium Growth		Slow Growth		Expected Value
	Prob.	Value	Prob.	Value	Prob.	Value	
Debt	0.20	460	0.60	460	0.20	410	450
Equity	0.20	360	0.60	90	0.20	0	126
		820		550		410	576

Dimple Ltd.

₹ in Lacs

	High Growth		Medium Growth		Slow Growth		Expected Value
	Prob.	Value	Prob.	Value	Prob.	Value	
Equity	0.20	985	0.60	760	0.20	525	758
Debt	0.20	65	0.60	65	0.20	65	65
		1050		825		590	823

Expected Values

₹ in Lacs

Equity		Debt	
Simple Ltd.	126	Simple Ltd.	450
Dimple Ltd.	758	Dimple Ltd.	65
	884		515

Question 25

Longitude Limited is in the process of acquiring Latitude Limited on a share exchange basis. Following relevant data are available:

		Longitude Limited	*Latitude Limited*
Profit after Tax (PAT)	*₹ in Lakhs*	*140*	*60*
Number of Shares	*Lakhs*	*15*	*16*
Earning per Share (EPS)	*₹*	*8*	*5*
Price Earnings Ratio (P/E Ratio)		*15*	*10*
(Ignore Synergy)			

You are required to determine:

(i) Pre-merger Market Value per Share, and

(ii) The maximum exchange ratio Longitude Limited can offer without the dilution of

(1) EPS and

(2) Market Value per Share

Calculate Ratio/s up to four decimal points and amounts and number of shares up to two decimal points.

Answer

(i) Pre Merger Market Value of Per Share

P/E Ratio X EPS

Longitude Ltd. ₹ 8 X 15 = ₹ 120.00

Latitude Ltd. ₹ 5 X 10 = ₹ 50.00

(ii) (1) Maximum exchange ratio without dilution of EPS

Pre Merger PAT of Longitude Ltd.	₹ 140 Lakhs
Pre Merger PAT of Latitude Ltd.	₹ 60 Lakhs
Combined PAT	₹ 200 Lakhs
Longitude Ltd. 's EPS	₹ 8

Maximum number of shares of Longitude after merger (₹ 200 lakhs/₹ 8)	25 Lakhs
Existing number of shares	15 Lakhs
Maximum number of shares to be exchanged	10 Lakhs

Maximum share exchange ratio 10:16 or 5:8

(2) Maximum exchange ratio without dilution of Market Price Per Share

Pre Merger Market Capitalization of Longitude Ltd. (₹ 120 × 15 Lakhs)	₹ 1800 Lakhs
Pre Merger Market Capitalization of Latitude Ltd. (₹ 50 × 16 Lakhs)	₹ 800 Lakhs
Combined Market Capitalization	₹ 2600 Lakhs
Current Market Price of share of Longitude Ltd.	₹ 120
Maximum number of shares to be exchanged of Longitude (surviving company) (₹ 2600 Lakhs/₹ 120)	21.67 Lakhs
Current Number of Shares of Longitude Ltd.	15.00 Lakhs
Maximum number of shares to be exchanged (Lakhs)	6.67 Lakhs

Maximum share exchange ratio 6.67:16 or 0.4169:1

Note: Since in the question figures given of PAT of both companies are not matching with figures of EPS X Number of Shares. Hence, if students computed PAT by using this formula then alternative answer shall be as follows:

(1) Maximum exchange ratio without dilution of EPS

Pre Merger PAT of Longitude Ltd.	₹ 120 Lakhs
Pre Merger PAT of Latitude Ltd.	₹ 80 Lakhs
Combined PAT	₹ 200 Lakhs
Longitude Ltd. 's EPS	₹ 8
Maximum number of shares of Longitude after merger (₹ 200 lakhs/₹ 8)	25 Lakhs
Existing number of shares	15 Lakhs
Maximum number of shares to be exchanged	10 Lakhs

Maximum share exchange ratio 10:16 or 5:8

(2) Maximum exchange ratio without dilution of Market Price Per Share

Pre Merger Market Capitalization of Longitude Ltd. (₹ 120 × 15 Lakhs)	₹ 1800 Lakhs
Pre Merger Market Capitalization of Latitude Ltd. (₹ 50 × 16 Lakhs)	₹ 800 Lakhs

Combined Market Capitalization	₹ 2600 Lakhs
Current Market Price of share of Longitude Ltd.	₹ 120
Maximum number of shares to be exchanged of Longitude (surviving company) (₹ 2600 Lakhs/₹ 120)	21.67 Lakhs
Current Number of Shares of Longitude Ltd.	15.00 Lakhs
Maximum number of shares to be exchanged (Lakhs)	6.67 Lakhs

Maximum share exchange ratio 6.67:16 or 0.4169:1

Question 26

Following information is provided relating to the acquiring company Mani Ltd. and the target company Ratnam Ltd:

	Mani Ltd.	*Ratnam Ltd.*
Earnings after tax (₹ lakhs)	*2,000*	*4,000*
No. of shares outstanding (lakhs)	*200*	*1,000*
P/E ratio (No. of times)	*10*	*5*

Required:

(i) What is the swap ratio based on current market prices?

(ii) What is the EPS of Mani Ltd. after the acquisition?

(iii) What is the expected market price per share of Mani Ltd. after the acquisition, assuming its P/E ratio is adversely affected by 10%?

(iv) Determine the market value of the merged Co.

(v) Calculate gain/loss for the shareholders of the two independent entities, due to the merger.

Answer

(i) SWAP ratio based on current market prices:

EPS before acquisition:	
Mani Ltd. : ₹2,000 lakhs / 200 lakhs:	₹10
Ratnam Ltd.: ₹4,000 lakhs / 1,000 lakhs:	₹ 4
Market price before acquisition:	
Mani Ltd.: ₹10 × 10	₹100
Ratnam Ltd.: ₹4 × 5	₹ 20
SWAP ratio: 20/100 or 1/5 i.e.	0.20

(ii) EPS after acquisition:

$$\frac{₹(2,000+4,000)\ \text{Lakhs}}{(200+200)\ \text{Lakhs}} = ₹15.00$$

(iii) Market Price after acquisition:

EPS after acquisition :	₹15.00
P/E ratio after acquisition 10 × 0.9	9
Market price of share (₹ 15 X 9)	₹135.00

(iv) Market value of the merged Co.:

₹135 × 400 lakhs shares	₹ 540.00 Crores
	or ₹ 54,000 Lakhs

(v) Gain/loss per share:

₹ Crore

	Mani Ltd.	*Ratnam Ltd.*
Total value before Acquisition	200	200
Value after acquisition	270	270
Gain (Total)	70	70
No. of shares (pre-merger) (lakhs)	200	1,000
Gain per share (₹)	35	7

Question 27

P Ltd. is considering take-over of R Ltd. by the exchange of four new shares in P Ltd. for every five shares in R Ltd. The relevant financial details of the two companies prior to merger announcement are as follows:

	P Ltd	*R Ltd*
Profit before Tax (₹ Crore)	*15*	*13.50*
No. of Shares (Crore)	*25*	*15*
P/E Ratio	*12*	*9*
Corporate Tax Rate 30%		

You are required to determine:

(i) Market value of both the company.

(ii) Value of original shareholders.

(iii) Price per share after merger.

(iv) Effect on share price of both the company if the Directors of P Ltd. expect their own pre-merger P/E ratio to be applied to the combined earnings.

Answer

	P Ltd.	R Ltd.
Profit before Tax (₹ in crore)	15	13.50
Tax 30% (₹ in crore)	4.50	4.05
Profit after Tax (₹ in crore)	10.50	9.45
Earning per Share (₹)	$\frac{10.50}{25}$ = ₹ 0.42	$\frac{9.45}{15}$ = ₹ 0.63
Price of Share before Merger (EPS x P/E Ratio)	₹ 0.42 x 12 = ₹ 5.04	₹0.63 x 9 = ₹ 5.67

(i) ∴ Market Value of company

P Ltd. = ₹ 5.04 x 25 Crore = ₹ 126 crore

R Ltd. = ₹ 5.67 x 15 Crore = ₹ 85.05 crore

Combined = ₹ 126 + ₹ 85.05 = ₹ 211.05 Crores

After Merger

	P Ltd.	R Ltd.
No. of Shares	25 crores	$15x\frac{4}{5}$ = 12 crores
Combined	37 crores	
% of Combined Equity Owned	$\frac{25}{37}x100 = 67.57\%$	$\frac{12}{37}x100$ = 32.43%

(ii) ∴ Value of Original Shareholders

P Ltd.	R Ltd.
₹ 211.05 crore x 67.57%	₹ 211.05 crore x 32.43%
= ₹ 142.61	= ₹ 68.44

Alternatively, it can also be computed as follows:

Combined Value of Entity	211.05 crore
No. of shares after Merger	37 crore
Value of Per Share	₹ 5.70405
Value of P Ltd. Shareholders (25 crores x ₹ 5.70405)	₹ 142.60 crore
Value of R Ltd. Shareholders (12 crores x ₹ 5.70405)	₹ 68.45 crore

(iii) ∴ Price per Share after Merger

EPS = $\frac{₹19.95\,crore}{37\,crore}$ = ₹ 0.539 per share

P/E Ratio = 12

Market Value Per Share = ₹ 0.539 X 12 = ₹ 6.47

Total Market Value = ₹ 6.47 x 37 crore = ₹ 239.39 crore

$$\text{Price of Share} = \frac{\text{Market Value}}{\text{Number of Shares}} = \frac{239.39 \text{ crore}}{37 \text{ crore}} = ₹ 6.47$$

(iv) Effect on Share Price

P Ltd.

Gain/loss (-) per share = ₹ 6.47 – ₹ 5.04 = ₹ 1.43

i.e. $\frac{6.47 - 5.04}{5.04} \times 100 = 0.284$ or 28.4%

∴ Share price would rise by 28.4%

R Ltd.

6.47 x $\frac{4}{5}$ = ₹ 5.18

Gain/loss (-) per share = ₹ 5.18 – ₹ 5.67 = (-₹ 0.49)

i.e. $\frac{5.18 - 5.67}{5.67} \times 100$ (-) 0.0864 or (-) 8.64%

∴ Share Price would decrease by 8.64%.

Question 28

Yes Ltd. wants to acquire No Ltd. and the cash flows of Yes Ltd. and the merged entity are given below:

					(₹ In lakhs)
Year	*1*	*2*	*3*	*4*	*5*
Yes Ltd.	*175*	*200*	*320*	*340*	*350*
Merged Entity	*400*	*450*	*525*	*590*	*620*

Earnings would have witnessed 5% constant growth rate without merger and 6% with merger on account of economies of operations after 5 years in each case. The cost of capital is 15%.

The number of shares outstanding in both the companies before the merger is the same and the companies agree to an exchange ratio of 0.5 shares of Yes Ltd. for each share of No Ltd.

PV factor at 15% for years 1-5 are 0.870, 0.756; 0.658, 0.572, 0.497 respectively.

You are required to:

(i) Compute the Value of Yes Ltd. before and after merger.

(ii) Value of Acquisition and

(iii) Gain to shareholders of Yes Ltd.

Answer

(i) Working Notes:

Present Value of Cash Flows (CF) upto 5 years

Year End	CF of Yes Ltd. (₹ lakhs)	PVF @15%	PV of CF (₹ lakhs)	CF of Merged Entity (₹ lakhs)	PV of CF of Merged Entity (₹ lakhs)
1	175	0.870	152.25	400	348.00
2	200	0.756	151.20	450	340.20
3	320	0.658	210.56	525	345.45
4	340	0.572	194.48	590	337.48
5	350	0.497	173.95	620	308.14
			882.44		1679.27

PV of Cash Flows of Yes Ltd. after the forecast period

$$TV_5 = \frac{CF_5(1+g)}{K_e - g} = \frac{350(1+0.05)}{0.15-0.05} = \frac{367.50}{0.10} = ₹3675 \text{ lakhs}$$

PV of TV_5 = ₹3675 lakhs x 0.497 = ₹1826.475 lakhs

PV of Cash Flows of Merged Entity after the forecast period

$$TV_5 = \frac{CF_5(1+g)}{K_e - g} = \frac{620(1+0.06)}{0.15-0.06} = \frac{657.20}{0.09} = ₹7302.22 \text{ lakhs}$$

PV of TV_5 = ₹7302.22 lakhs x 0.497 = ₹3629.20 lakhs

Value of Yes Ltd.

	Before merger (₹lakhs)	After merger (₹lakhs)
PV of CF (1-5 years)	882.440	1679.27
Add: PV of TV_5	1826.475	3629.20
	2708.915	5308.47

(ii) Value of Acquisition

= Value of Merged Entity – Value of Yes Ltd.

= ₹5308.47 lakhs – ₹2708.915 lakhs = ₹2599.555 lakhs

(iii) Gain to Shareholders of Yes Ltd.

Share of Yes Ltd. in merged entity = ₹5308.47 lakhs x $\frac{1}{1.5}$ = ₹3538.98 lakhs

Gain to shareholder = Share of Yes Ltd. in merged entity – Value of Yes Ltd. before merger

= ₹3538.98 lakhs - ₹2708.915 = ₹830.065 lakhs

Question 29

The following information is provided relating to the acquiring company Efficient Ltd. and the target Company Healthy Ltd.

	Efficient Ltd.	*Healthy Ltd.*
No. of shares (F.V. ₹10 each)	*10.00 lakhs*	*7.5 lakhs*
Market capitalization	*500.00 lakhs*	*750.00 lakhs*
P/E ratio (times)	*10.00*	*5.00*
Reserves and Surplus	*300.00 lakhs*	*165.00 lakhs*
Promoter's Holding (No. of shares)	*4.75 lakhs*	*5.00 lakhs*

Board of Directors of both the Companies have decided to give a fair deal to the shareholders and accordingly for swap ratio the weights are decided as 40%, 25% and 35% respectively for Earning, Book Value and Market Price of share of each company:

(i) Calculate the swap ratio and also calculate Promoter's holding % after acquisition.

(ii) What is the EPS of Efficient Ltd. after acquisition of Healthy Ltd.?

(iii) What is the expected market price per share and market capitalization of Efficient Ltd. after acquisition, assuming P/E ratio of Firm Efficient Ltd. remains unchanged.

(iv) Calculate free float market capitalization of the merged firm.

Answer

Swap Ratio

	Efficient Ltd.	**Healthy Ltd.**
Market capitalisation	500 lakhs	750 lakhs
No. of shares	10 lakhs	7.5 lakhs

Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 50 lakh	₹ 150 lakh
Share capital	₹ 100 lakh	₹ 75 lakh
Reserves and surplus	₹ 300 lakh	₹ 165 lakh
Total	₹ 400 lakh	₹ 240 lakh
Book Value per share	₹ 40	₹ 32

(i) **Calculation of Swap Ratio**

EPS	1 : 4 i.e.	4.0 × 40%	1.6
Book value	1 : 0.8 i.e.	0.8 × 25%	0.2
Market price	1 : 2 i.e.	2.0 × 35%	0.7
		Total	2.5

Swap ratio is for every one share of Healthy Ltd., to issue 2.5 shares of Efficient Ltd. Hence, total no. of shares to be issued 7.5 lakh × 2.5 = 18.75 lakh shares

Promoter's holding = 4.75 lakh shares + (5 × 2.5 = 12.5 lakh shares) = 17.25 lakh i.e. Promoter's holding % is (17.25 lakh/28.75 lakh) × 100 = 60%.

Calculation of EPS, Market price, Market capitalization and free float market capitalization.

(ii) Total No. of shares: 10 lakh + 18.75 lakh = 28.75 lakh

Total capital: 100 lakh + 187.5 lakh = ₹ 287.5 lakh

EPS: $\frac{\text{Total profit}}{\text{No. of shares}} = \frac{50\text{ lakh} + 150\text{ lakh}}{28.75\text{ lakh}} = \frac{200}{28.75}$

= ₹ 6.956

(iii) Expected market price: EPS 6.956 × P/E 10 = ₹ 69.56

Market capitalization: = ₹ 69.56 per share × 28.75 lakh shares

= ₹ 1,999.85 lakh

(iv) Free float of market capitalization: = ₹ 69.56 per share × (28.75 lakh × 40%)

= ₹ 799.94 lakh

Question 30

Abhiman Ltd. is a subsidiary of Janam Ltd. and is acquiring Swabhiman Ltd. which is also a subsidiary of Janam Ltd.
The following information is given :

	Abhiman Ltd.	*Swabhiman Ltd.*
% Shareholding of promoter	*50%*	*60%*

Share capital	*₹ 200 lacs*	*100 lacs*
Free Reserves and surplus	*₹ 900 lacs*	*600 lacs*
Paid up value per share	*₹ 100*	*10*
Free float market capitalization	*₹ 500 lacs*	*156 lacs*
P/E Ratio (times)	*10*	*4*

Janam Ltd., is interested in doing justice to both companies. The following parameters have been assigned by the Board of Janam Ltd., for determining the swap ratio:

Book value	*25%*
Earning per share	*50%*
Market price	*25%*

You are required to compute

(i) The swap ratio.

(ii) The Book Value, Earning Per Share and Expected Market Price of Swabhiman Ltd., (assuming P/E Ratio of Abhiman ratio remains the same and all assets and liabilities of Swabhiman Ltd. are taken over at book value.)

Answer

SWAP RATIO

	Abhiman Ltd. (₹)	Swabhiman Ltd. (₹)
Share capital	200 lacs	100 lacs
Free reserves & surplus	900 lacs	600 lacs
Total	1100 lacs	700 lacs
No. of shares	2 lacs	10 lacs
Book value for share	₹ 550	₹ 70
Promoters Holding	50%	60%
Non promoters holding	50%	40%
Free float market capitalization (Public)	500 lacs	₹ 156 lacs
Total Market Cap	1000 lacs	390 lacs
No. of shares	2 lacs	10 lacs
Market Price	₹ 500	₹ 39
P/E ratio	10	4
EPS	₹ 50.00	₹ 9.75

Calculation of SWAP Ratio

Book Value	1:0.1273	0.1273 × 25%	0.031825

EPS	1:0.195	0.195 × 50%	0.097500
Market Price	1:0.078	0.078 × 25%	0.019500
Total			0.148825

(i) SWAP Ratio is 0.148825 shares of Abhiman Ltd. for every share of Swabhiman Ltd.

Total No. of shares to be issued = 10 lakh × 0.148825 = 148825 shares

(ii) Book value, EPS & Market Price.

Total No. shares = 200000 +148825=348825

Total capital = ₹200 lakh + ₹148.825 lac = ₹ 348.825 lac

Reserves = ₹ 900 lac + ₹ 551.175 lac = ₹ 1451.175 lac

$$\text{Book value Per Share} = \frac{₹\ 348.825\text{lac} + ₹\ 1451.175\ \text{lac}}{3.48825\ \text{lac}} = ₹\ 516.02$$

or ₹ 516.02 x 0.148825 = ₹ 76.80

$$\text{EPS} = \frac{\text{Total Profit}}{\text{No. of shares}} = \frac{₹100\ \text{lac} + ₹\ 97.50\ \text{lac}}{3.48825\text{lac}} = ₹\ 56.62$$

or ₹ 56.62 x 0.148825 = ₹ 8.43

Expected market price = ₹ 56.62 × PE Ratio= ₹ 56.62 × 10 = ₹ 566.20

or ₹ 566.20 x 0.148825 = ₹ 84.26

Question 31

The following information is provided relating to the acquiring company E Ltd., and the target company H Ltd:

Particulars	*E Ltd. (₹)*	*H Ltd. (₹)*
Number of shares (Face value ₹ 10 each)	*20 Lakhs*	*15 Lakhs*
Market Capitalization	*1000 Lakhs*	*1500 Lakhs*
P/E Ratio (times)	*10.00*	*5.00*
Reserves and surplus in ₹	*600.00 Lakhs*	*330.00 Lakhs*
Promoter's Holding (No. of shares)	*9.50 Lakhs*	*10.00 Lakhs*

The Board of Directors of both the companies have decided to give a fair deal to the shareholders. Accordingly, the weights are decided as 40%, 25% and 35% respectively for earnings, book value and market price of share of each company for swap ratio.

Calculate the following:

(i) Market price per share, earnings per share and Book Value per share;

(ii) Swap ratio;

(iii) Promoter's holding percentage after acquisition;

(iv) EPS of E Ltd. after acquisitions of H Ltd;

(v) Expected market price per share and market capitalization of E Ltd.; after acquisition, assuming P/E ratio of E Ltd. remains unchanged; and

(vi) Free float market capitalization of the merged firm.

Answer

(i)

	E Ltd.	H Ltd.
Market capitalisation	1000 lakhs	1500 lakhs
No. of shares	20 lakhs	15 lakhs
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 100 lakh	₹ 300 lakh
Share capital	₹ 200 lakh	₹ 150 lakh
Reserves and surplus	₹ 600 lakh	₹ 330 lakh
Total	₹ 800 lakh	₹ 480 lakh
Book Value per share	₹ 40	₹ 32

(ii) **Calculation of Swap Ratio**

EPS	1 : 4 i.e.	4.0 × 40%	1.6
Book value	1 : 0.8 i.e.	0.8 × 25%	0.2
Market price	1 : 2 i.e.	2.0 × 35%	0.7
		Total	2.5

Swap ratio is for every one share of H Ltd., to issue 2.5 shares of E Ltd. Hence, total no. of shares to be issued 15 lakh × 2.5 = 37.50 lakh shares

(iii) Promoter's holding = 9.50 lakh shares + (10× 2.5 = 25 lakh shares) = 34.50 lakh i.e. Promoter's holding % is (34.50 lakh/57.50 lakh) × 100 = 60%.

(iv) Calculation of EPS after merger

Total No. of shares 20 lakh + 37.50 lakh = 57.50 lakh

$$\text{EPS } \frac{\text{Total profit}}{\text{No. of shares}} = \frac{100 \text{ lakh} + 300 \text{ lakh}}{57.50 \text{ lakh}} = \frac{400}{57.50} = ₹ 6.956$$

(v) Calculation of Market price and Market capitalization after merger

Expected market price	EPS 6.956 × P/E 10 = ₹ 69.56
Market capitalization	= ₹ 69.56 per share ×57.50 lakh shares
	= ₹ 3,999.70 lakh or ₹ 4,000 lakh

(vi) Free float of market capitalization = ₹ 69.56 per share × (57.50 lakh × 40%) = ₹ 1599.88 lakh

Question 32

The following information relating to the acquiring Company Abhiman Ltd. and the target Company Abhishek Ltd. are available. Both the Companies are promoted by Multinational Company, Trident Ltd. The promoter's holding is 50% and 60% respectively in Abhiman Ltd. and Abhishek Ltd. :

	Abhiman Ltd.	*Abhishek Ltd.*
Share Capital (₹)	*200 lakh*	*100 lakh*
Free Reserve and Surplus (₹)	*800 lakh*	*500 lakh*
Paid up Value per share (₹)	*100*	*10*
Free float Market Capitalisation (₹)	*400 lakh*	*128 lakh*
P/E Ratio (times)	*10*	*4*

Trident Ltd. is interested to do justice to the shareholders of both the Companies. For the swap ratio weights are assigned to different parameters by the Board of Directors as follows:

Book Value	*25%*
EPS (Earning per share)	*50%*
Market Price	*25%*

(a) What is the swap ratio based on above weights?

(b) What is the Book Value, EPS and expected Market price of Abhiman Ltd. after acquisition of Abhishek Ltd. (assuming P.E. ratio of Abhiman Ltd. remains unchanged and all assets and liabilities of Abhishek Ltd. are taken over at book value).

(c) Calculate:

(i) Promoter's revised holding in the Abhiman Ltd.

(ii) Free float market capitalization.

(iii) Also calculate No. of Shares, Earning per Share (EPS) and Book Value (B.V.), if after acquisition of Abhishek Ltd., Abhiman Ltd. decided to :

(a) Issue Bonus shares in the ratio of 1 : 2; and

(b) Split the stock (share) as ₹ 5 each fully paid.

Answer

(a) Swap Ratio

	Abhiman Ltd.	Abhishek Ltd.
Share Capital	200 Lakh	100 Lakh
Free Reserves	800 Lakh	500 Lakh
Total	1000 Lakh	600 Lakh
No. of Shares	2 Lakh	10 Lakh
Book Value per share	₹ 500	₹ 60
Promoter's holding	50%	60%
Non promoter's holding	50%	40%
Free Float Market Cap. i.e. relating to Public's holding	400 Lakh	128 Lakh
Hence Total market Cap.	800 Lakh	320 Lakh
No. of Shares	2 Lakh	10 Lakh
Market Price	₹ 400	₹ 32
P/E Ratio	10	4
EPS	40	8
Profits (₹ 2 X 40 lakh)	₹ 80 lakh	-
(₹ 8 X 10 lakh)	-	₹ 80 lakh

Calculation of Swap Ratio			
Book Value	1 : 0.12 i.e.	0.12 x 25%	0.03
EPS	1 : 0.2	0.20 x 50%	0.10
Market Price	1 : 0.08	0.08 x 25%	0.02
		Total	0.15

Swap ratio is for every one share of Abhishek Ltd., to issue 0.15 shares of Abhiman Ltd. Hence total no. of shares to be issued.

10 Lakh x 0.15 = 1.50 lakh shares

(b) Book Value, EPS & Market Price

Total No of Shares	2 Lakh + 1.5 Lakh = 3.5 Lakh
Total Capital	₹ 200 Lakh + ₹ 150 Lakh = ₹ 350 Lakh
Reserves	₹ 800 Lakh + ₹ 450 Lakh = ₹ 1,250 Lakh
Book Value	$\frac{₹\ 350\ Lakh + ₹\ 1,250\ Lakh}{3.5\ Lakh}$ = ₹ 457.14 per share
EPS	$\frac{Total\ Profit}{No.\ of\ Share} = \frac{₹\ 80\ Lakh + ₹\ 80\ Lakh}{3.5\ Lakh} = \frac{₹\ 160\ Lakh}{3.5}$ = ₹ 45.71

Expected Market Price EPS (₹ 45.71) x P/E Ratio (10) = ₹ 457.10

(c) (1) Promoter's holding

Promoter's Revised	Abhiman 50% i.e.	1.00 Lakh shares
Holding	Abhishek 60% i.e.	0.90 Lakh shares
	Total	1.90 Lakh shares

Promoter's % = 1.90/3.50 x 100 = 54.29%

(2) Free Float Market Capitalisation

Free Float Market Capitalisation = (3.5 Lakh – 1.9 Lakh) x ₹ 457.10
= ₹ 731.36 Lakh

(3) (i) & (ii)

Revised Capital ₹ 350 Lakh + ₹ 175 Lakh = ₹ 525 Lakh

No. of shares before Split (F.V ₹ 100) 5.25 Lakh

No. of Shares after Split (F.V. ₹ 5) 5.25 x 20 = 105 Lakh

EPS 160 Lakh / 105 Lakh = 1.523

Book Value Cap. ₹ 525 Lakh + ₹ 1075 Lakh
No. of Shares =105 Lakh
= ₹ 15.238 per share

Question 33

You have been provided the following Financial data of two companies:

	Krishna Ltd.	*Rama Ltd.*
Earnings after taxes	*₹ 7,00,000*	*₹ 10,00,000*
Equity shares (outstanding)	*₹ 2,00,000*	*₹ 4,00,000*
EPS	*3.5*	*2.5*
P/E ratio	*10 times*	*14 times*
Market price per share	*₹ 35*	*₹ 35*

Company Rama Ltd. is acquiring the company Krishna Ltd., exchanging its shares on a one-to-one basis for company Krishna Ltd. The exchange ratio is based on the market prices of the shares of the two companies.

Required:

(i) What will be the EPS subsequent to merger?

(ii) What is the change in EPS for the shareholders of companies Rama Ltd. and Krishna Ltd.?

(iii) Determine the market value of the post-merger firm. PE ratio is likely to remain the same.

(iv) Ascertain the profits accruing to shareholders of both the companies.

Answer

(i)	Exchange Ratio	1:1
	New Shares to be issued	2,00,000
	Total shares of Rama Ltd. (4,00,000+2,00,000)	6,00,000
	Total earnings (₹ 10,00,000 + ₹ 7,00,000)	₹ 17,00,000
	New EPS (₹ 17,00,000/6,00,000)	₹ 2.83
(ii)	Existing EPS of Rama Ltd.	₹ 2.50
	Increase in EPS of Rama Ltd (₹ 2.83 – ₹ 2.50)	₹ 0.33
	Existing EPS of Krishna Ltd.	₹ 3.50
	Decrease in EPS of Krishna Ltd. (₹ 3.50 – ₹ 2.83)	₹ 0.67
(iii)	P/E ratio of new firm (expected to remain same)	14 times
	New market price (14 × ₹ 2.83)	₹ 39.62
	Total No. of Shares	6,00,000
	Total market Capitalization (6,00,000 × ₹ 39.62)	₹ 2,37,72,000
	Existing market capitalization (₹ 70,00,000 + ₹ 1,40,00,000)	₹ 2,10,00,000
	Total gain	₹ 27,72,000

(iv)

	Rama Ltd.	Krishna Ltd	Total
No. of shares after merger	4,00,000	2,00,000	6,00,000
Market price	₹ 39.62	₹ 39.62	₹ 39.62
Total Mkt. Values	₹ 1,58,48,000	₹ 79,24,000	₹ 2,37,72,000
Existing Mkt. values	₹ 1,40,00,000	₹ 70,00,000	₹ 2,10,00,000
Gain to share holders	₹ 18,48,000	₹ 9,24,000	₹ 27,72,000

or ₹ 27,72,000 ÷3 = ₹ 9,24,000 to Krishna Ltd. and ₹ 18,48,000 to Rama Ltd. (in 2: 1 ratio)

Question 34

T Ltd. and E Ltd. are in the same industry. The former is in negotiation for acquisition of the latter. Important information about the two companies as per their latest financial statements is given below:

	T Ltd.	*E Ltd.*
₹ 10 Equity shares outstanding	*12 Lakhs*	*6 Lakhs*

Debt:		
10% Debentures (₹ Lakhs)	*580*	*--*
12.5% Institutional Loan (₹ Lakhs)	*--*	*240*
Earning before interest, depreciation and tax (EBIDAT) (₹ Lakhs)	*400.86*	*115.71*
Market Price/share (₹)	*220.00*	*110.00*

T Ltd. plans to offer a price for E Ltd., business as a whole which will be 7 times EBIDAT reduced by outstanding debt, to be discharged by own shares at market price.

E Ltd. is planning to seek one share in T Ltd. for every 2 shares in E Ltd. based on the market price. Tax rate for the two companies may be assumed as 30%.

Calculate and show the following under both alternatives - T Ltd.'s offer and E Ltd.'s plan:

(i) Net consideration payable.

(ii) No. of shares to be issued by T Ltd.

(iii) EPS of T Ltd. after acquisition.

(iv) Expected market price per share of T Ltd. after acquisition.

(v) State briefly the advantages to T Ltd. from the acquisition.

Calculations (except EPS) may be rounded off to 2 decimals in lakhs.

Answer

As per T Ltd.'s Offer

		₹ in lakhs
(i)	**Net Consideration Payable**	
	7 times EBIDAT, i.e. 7 x ₹ 115.71 lakh	809.97
	Less: Debt	240.00
		569.97
(ii)	**No. of shares to be issued by T Ltd**	
	₹ 569.97 lakh/₹ 220 (rounded off) (Nos.)	2,59,000
(iii)	**EPS of T Ltd after acquisition**	
	Total EBIDT (₹ 400.86 lakh + ₹ 115.71 lakh)	516.57
	Less: Interest (₹ 58 lakh + ₹ 30 lakh)	88.00
		428.57
	Less: 30% Tax	128.57
	Total earnings (NPAT)	300.00
	Total no. of shares outstanding (12 lakh + 2.59 lakh)	14.59 lakh
	EPS (₹ 300 lakh/ 14.59 lakh)	₹ 20.56

(iv) Expected Market Price:

	₹ *in lakhs*
Pre-acquisition P/E multiple:	
EBIDAT	400.86
Less: Interest $(580 X \frac{10}{100})$	58.00
	342.86
Less: 30% Tax	102.86
	240.00
No. of shares (lakhs)	12.00
EPS	₹ 20.00
Hence, PE multiple $\frac{220}{20}$	11
Expected market price after acquisition (₹ 20.56 x 11)	₹ 226.16

As per E Ltd's Plan

		₹ *in lakhs*
(i)	**Net consideration payable**	
	6 lakhs shares x ₹ 110	660
(ii)	**No. of shares to be issued by T Ltd**	
	₹ 660 lakhs ÷ ₹ 220	3 lakh
(iii)	**EPS of T Ltd after Acquisition**	
	NPAT (as per earlier calculations)	300.00
	Total no. of shares outstanding (12 lakhs + 3 lakhs)	15 lakh
	Earning Per Share (EPS) ₹ 300 lakh/15 lakh	₹ 20.00
(iv)	**Expected Market Price** (₹ 20 x 11)	220.00

(v) Advantages of Acquisition to T Ltd

Since the two companies are in the same industry, the following advantages could accrue:

- Synergy, cost reduction and operating efficiency.
- Better market share.
- Avoidance of competition.

Question 35

The following information is relating to Fortune India Ltd. having two division, viz. Pharma Division and Fast Moving Consumer Goods Division (FMCG Division). Paid up share capital of Fortune India Ltd. is consisting of 3,000 Lakhs equity shares of Re. 1 each. Fortune India Ltd. decided to de-merge Pharma Division as Fortune Pharma Ltd. w.e.f. 1.4.2009. Details of Fortune India Ltd. as on 31.3.2009 and of Fortune Pharma Ltd. as on 1.4.2009 are given below:

Particulars	*Fortune Pharma Ltd.* ₹	*Fortune India Ltd.* ₹
Outside Liabilities		
Secured Loans	*400 lakh*	*3,000 lakh*
Unsecured Loans	*2,400 lakh*	*800 lakh*
Current Liabilities & Provisions	*1,300 lakh*	*21,200 lakh*
Assets		
Fixed Assets	*7,740 lakh*	*20,400 lakh*
Investments	*7,600 lakh*	*12,300 lakh*
Current Assets	*8,800 lakh*	*30,200 lakh*
Loans & Advances	*900 lakh*	*7,300 lakh*
Deferred tax/Misc. Expenses	*60 lakh*	*(200) lakh*

Board of Directors of the Company have decided to issue necessary equity shares of Fortune Pharma Ltd. of Re. 1 each, without any consideration to the shareholders of Fortune India Ltd. For that purpose following points are to be considered:

1. *Transfer of Liabilities & Assets at Book value.*
2. *Estimated Profit for the year 2009-10 is ₹ 11,400 Lakh for Fortune India Ltd. & ₹ 1,470 lakhs for Fortune Pharma Ltd.*
3. *Estimated Market Price of Fortune Pharma Ltd. is ₹ 24.50 per share.*
4. *Average P/E Ratio of FMCG sector is 42 & Pharma sector is 25, which is to be expected for both the companies.*

Calculate:

1. *The Ratio in which shares of Fortune Pharma are to be issued to the shareholders of Fortune India Ltd.*
2. *Expected Market price of Fortune India (FMCG) Ltd.*
3. *Book Value per share of both the Companies immediately after Demerger.*

Answer

Share holders' funds **(₹ Lakhs)**

Particulars	*Fortune India Ltd.*	*Fortune Pharma Ltd.*	*Fortune India (FMCG) Ltd.*
Assets	70,000	25,100	44,900
Outside liabilities	25,000	4,100	20,900
Net worth	45,000	21,000	24,000

1. Calculation of Shares of Fortune Pharma Ltd. to be issued to shareholders of Fortune India Ltd.

	Fortune Pharma Ltd.
Estimated Profit (₹ in lakhs)	1,470
Estimated market price (₹)	24.5
Estimated P/E	25
Estimated EPS (₹)	0.98
No. of shares lakhs	1,500

Hence, Ratio is 1 share of Fortune Pharma Ltd. for 2 shares of Fortune India Ltd.

OR 0.50 share of Fortune Pharma Ltd. for 1 share of Fortune India Ltd.

2. Expected market price of Fortune India (FMCG) Ltd.

	Fortune India (FMCG) Ltd.
Estimated Profit (₹ in lakhs)	11,400
No. of equity shares (₹ in lakhs)	3,000
Estimated EPS (₹)	3.8
Estimated P/E	42
Estimated market price (₹)	159.60

3. Book value per share

	Fortune Pharma Ltd.	*Fortune India (FMCG) Ltd.*
Net worth (₹in lakhs)	21,000	24,000
No. of shares (₹ in lakhs)	1,500	3,000
Book value of shares	₹ 14	₹ 8

Question 36

H Ltd. agrees to buy over the business of B Ltd. effective 1st April, 2012.The summarized Balance Sheets of H Ltd. and B Ltd. as on 31st March 2012 are as follows:

Balance sheet as at 31st March, 2012 (In Crores of Rupees)		
Liabilities:	***H. Ltd***	***B. Ltd.***
Paid up Share Capital		
-Equity Shares of ₹100 each	*350.00*	
-Equity Shares of ₹10 each		*6.50*
Reserve & Surplus	*950.00*	*25.00*
Total	***1,300.00***	***31.50***
Assets:		
Net Fixed Assets	*220.00*	*0.50*
Net Current Assets	*1,020.00*	*29.00*
Deferred Tax Assets	*60.00*	*2.00*
Total	***1,300.00***	***31.50***

H Ltd. proposes to buy out B Ltd. and the following information is provided to you as part of the scheme of buying:

(1) The weighted average post tax maintainable profits of H Ltd. and B Ltd. for the last 4 years are ₹ 300 crores and ₹ 10 crores respectively.

(2) Both the companies envisage a capitalization rate of 8%.

(3) H Ltd. has a contingent liability of ₹ 300 crores as on 31st March, 2012.

(4) H Ltd. to issue shares of ₹ 100 each to the shareholders of B Ltd. in terms of the exchange ratio as arrived on a Fair Value basis. (Please consider weights of 1 and 3 for the value of shares arrived on Net Asset basis and Earnings capitalization method respectively for both H Ltd. and B Ltd.)

You are required to arrive at the value of the shares of both H Ltd. and B Ltd. under:

(i) Net Asset Value Method

(ii) Earnings Capitalisation Method

(iii) Exchange ratio of shares of H Ltd. to be issued to the shareholders of B Ltd. on a Fair value basis (taking into consideration the assumption mentioned in point 4 above.)

Answer

(i) Net asset value

H Ltd.	$\frac{₹\ 1300\ Crores - ₹\ 300\ Crores}{3.50\ Crores} = ₹\ 285.71$
B Ltd.	$\frac{₹\ 31.50\ Crores}{0.65\ Crores} = ₹\ 48.46$

(ii) Earning capitalization value

H Ltd.	$\frac{₹\ 300\ \text{Crores} / 0.08}{3.50\ \text{Crores}} = ₹\ 1071.43$
B Ltd.	$\frac{₹\ 10\ \text{Crores} / 0.08}{0.65\ \text{Crores}} = ₹\ 192.31$

(iii) Fair value

H Ltd.	$\frac{₹\ 285.71 \times 1 + ₹\ 1071.43 \times 3}{4} = ₹\ 875$
B Ltd.	$\frac{₹\ 48.46 \times 1 + ₹\ 192.31 \times 3}{4} = ₹\ 156.3475$

Exchange ratio ₹156.3475/ ₹875 = 0.1787

H Ltd should issue its 0.1787 share for each share of B Ltd.

Note: In above solution it has been assumed that the contingent liability will materialize at its full amount.

Question 37

Reliable Industries Ltd. (RIL) is considering a takeover of Sunflower Industries Ltd. (SIL). The particulars of 2 companies are given below:

Particulars	*Reliable Industries Ltd*	*Sunflower Industries Ltd.*
Earnings After Tax (EAT)	*₹ 20,00,000*	*₹ 10,00,000*
Equity shares O/s	*10,00,000*	*10,00,000*
Earnings per share (EPS)	*2*	*1*
PE Ratio (Times)	*10*	*5*

Required:

(i) What is the market value of each Company before merger?

(ii) Assume that the management of RIL estimates that the shareholders of SIL will accept an offer of one share of RIL for four shares of SIL. If there are no synergic effects, what is the market value of the Post-merger RIL? What is the new price per share? Are the shareholders of RIL better or worse off than they were before the merger?

(iii) Due to synergic effects, the management of RIL estimates that the earnings will increase by 20%. What are the new post-merger EPS and Price per share? Will the shareholders be better off or worse off than before the merger?

Answer

(i) Market value of Companies before Merger

Particulars	*RIL*	*SIL*
EPS	₹ 2	Re.1
P/E Ratio	10	5
Market Price Per Share	₹ 20	₹ 5
Equity Shares	10,00,000	10,00,000
Total Market Value	2,00,00,000	50,00,000

(ii) Post Merger Effects on RIL

	₹
Post merger earnings	30,00,000
Exchange Ratio (1:4)	
No. of equity shares o/s (10,00,000 + 2,50,000)	12,50,000
EPS: 30,00,000/12,50,000	2.4
PE Ratio	10
Market Value 10 x 2.4	24
Total Value (12,50,000 x 24)	3,00,00,000
Gains From Merger:	₹
Post-Merger Market Value of the Firm	3,00,00,000
Less: Pre-Merger Market Value	
RIL 2,00,00,000	
SIL 50,00,000	2,50,00,000
Total gains from Merger	50,00,000

Apportionment of Gains between the Shareholders:

Particulars	*RIL(₹)*	*SIL(₹)*
Post Merger Market Value:		
10,00,000 x 24	2,40,00,000	--
2,50,000 x 24	-	60,00,000
Less: Pre-Merger Market Value	2,00,00,000	50,00,000
Gains from Merger:	40,00,000	10,00,000

Thus, the shareholders of both the companies (RIL + SIL) are better off than before

(iii) Post-Merger Earnings:

Increase in Earnings by 20%

New Earnings: ₹ 30,00,000 x (1+0.20) ₹ 36,00,000

No. of equity shares outstanding:	12,50,000
EPS (₹ 36,00,000/12,50,000)	₹ 2.88
PE Ratio	10
Market Price Per Share: = ₹2.88 x 10	₹ 28.80

∴ Shareholders will be better-off than before the merger situation.

Question 38

AFC Ltd. wishes to acquire BCD Ltd. The shares issued by the two companies are 10,00,000 and 5,00,000 respectively:

(i) Calculate the increase in the total value of BCD Ltd. resulting from the acquisition on the basis of the following conditions:

Current expected growth rate of BCD Ltd.		*7%*
Expected growth rate under control of AFC Ltd., (without any additional capital investment and without any change in risk of operations)		*8%*
Current Market price per share of AFC Ltd.	*₹*	*100*
Current Market price per share of BCD Ltd.	*₹*	*20*
Current Dividend per share of BCD Ltd.	*₹*	*0.60*

(ii) On the basis of aforesaid conditions calculate the gain or loss to shareholders of both the companies, if AFC Ltd. were to offer one of its shares for every four shares of BCD Ltd.

(iii) Calculate the gain to the shareholders of both the Companies, if AFC Ltd. pays ₹22 for each share of BCD Ltd., assuming the P/E Ratio of AFC Ltd. does not change after the merger. EPS of AFC Ltd. is ₹8 and that of BCD is ₹2.50. It is assumed that AFC Ltd. invests its cash to earn 10%.

Answer

(i) For BCD Ltd., before acquisition

The cost of capital of BCD Ltd. may be calculated by using the following formula:

$$\frac{\text{Dividend}}{\text{Price}} + \text{Growth}\%$$

Cost of Capital i.e., Ke = (0.60/20) + 0.07 = 0.10

After acquisition g (i.e. growth) becomes 0.08

Therefore, price per share after acquisition = 0.60/(0.10-0.08) = ₹30

The increase in value therefore is = ₹(30-20) x 5,00,000 = ₹50,00,000/-

(ii) To share holders of BCD Ltd. the immediate gain is ₹100 – ₹20x4 = ₹20 per share

The gain can be higher if price of shares of AFC Ltd. rise following merger which they should undertake.

To AFC Ltd. shareholders	(₹ (In lakhs)
Value of Company now	1,000
Value of BCD Ltd.	150
	1,150
No. of shares	11.25
∴ Value per share	1150/11.25= ₹102.22

Gain to shareholders of BCD Ltd. = ₹102.22 – ₹(4 x 20) = ₹22.22

Gain to shareholders of AFC Ltd. = ₹102.22 – ₹100.00 = ₹2.22

(iii) Gain to shareholders of AFC Ltd:-

Earnings of BCD Ltd. (5,00,000 x 2.50)	₹12,50,000/-
Less: Loss of earning in cash (5,00,000 x ₹ 22 x 0.10)	₹11,00,000/-
Net Earning	₹ 1,50,000/-
Number of shares	10,00,000
Net increase in earning per share	0.15

P/E ratio of AFC Ltd. = 100/8 = 12.50

Therefore, Gain per share of shareholders of AFC Ltd.

= 0.15x12.50 = ₹1.88

Gain to the shareholders of BCD Ltd. ₹ (22-20) = ₹2/- per share

Alternatively, it can also be computed as follows:

Post-Merger Earnings (10,00,000 x ₹ 8 + 5,00,000 x ₹ 2.5 – 11,00,000)	₹ 81,50,000
EPS after Merger $\left(\frac{81,50,000}{10,00,000}\right)$	₹ 8.15
PE Ratio	12.50
Post Merger Price of Share (₹ 8.15 x 12.50)	₹ 101.875
Less: Price before merger	₹ 100.00
	₹ 1.875
Say	₹ 1.88

Question 39

AB Ltd., is planning to acquire and absorb the running business of XY Ltd. The valuation is to be based on the recommendation of merchant bankers and the consideration is to be discharged in the form of equity shares to be issued by AB Ltd. As on 31.3.2006, the paid up capital of AB Ltd. consists of 80 lakhs shares of ₹10 each. The highest and the lowest market quotation during the last 6 months were ₹570 and ₹430. For the purpose of the exchange, the price per share is to be reckoned as the average of the highest and lowest market price during the last 6 months ended on 31.3.06.

XY Ltd.'s Balance Sheet as at 31.3.2006 is summarised below:

	₹ lakhs
Sources	
Share Capital	
20 lakhs equity shares of ₹10 each fully paid	200
10 lakhs equity shares of ₹10 each, ₹5 paid	50
Loans	100
Total	350
Uses	
Fixed Assets (Net)	150
Net Current Assets	200
	350

An independent firm of merchant bankers engaged for the negotiation, have produced the following estimates of cash flows from the business of XY Ltd.:

Year ended	By way of	₹ lakhs
31.3.07	after tax earnings for equity	105
31.3.08	do	120
31.3.09	Do	125
31.3.10	Do	120
31.3.11	Do	100
	terminal value estimate	200

It is the recommendation of the merchant banker that the business of XY Ltd. may be valued on the basis of the average of (i) Aggregate of discounted cash flows at 8% and (ii) Net assets value. Present value factors at 8% for years

1-5: 0.93 0.86 0.79 0.74 0.68

You are required to:

(i) Calculate the total value of the business of XY Ltd.

(ii) The number of shares to be issued by AB Ltd.; and

(iii) The basis of allocation of the shares among the shareholders of XY Ltd.

Answer

Price/share of AB Ltd. for determination of number of shares to be issued:

(₹ 570 + ₹ 430)/2	₹	500
Value of XY Ltd based on future cash flow capitalization (105x0.93)+(120x0.86)+(125x0.79)+(120x0.74)x(300x0.68)	₹ lakhs	592.40
Value of XY Ltd based on net assets	₹ lakhs	250.00
Average value (592.40+250)/2		421.20
No. of shares in AB Ltd to be issued ₹ 4,21,20,000/500	Nos.	84240
Basis of allocation of shares		
Fully paid equivalent shares in XY Ltd. (20+5) lakhs		2500000
Distribution to fully paid shareholders 84240x20/25		67392
Distribution to partly paid shareholders 84240-67392		16848

Question 40

R Ltd. and S Ltd. are companies that operate in the same industry. The financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	***R. Ltd. (₹)***	***S. Ltd (₹)***
Equity & Liabilities		
Shareholders Fund		
Equity Capital (₹ 10 each)	*20,00,000*	*16,00,000*
Retained earnings	*4,00,000*	*-*
Non-current Liabilities		
16% Long term Debt	*10,00,000*	*6,00,000*
Current Liabilities	*14,00,000*	*8,00,000*
Total	***48,00,000***	***30,00,000***
Assets		
Non-current Assets	*20,00,000*	*10,00,000*
Current Assets	*28,00,000*	*20,00,000*
Total	***48,00,000***	***30,00,000***

Income Statement

	Particulars	*R. Ltd. (₹)*	*S. Ltd. (₹)*
A.	*Net Sales*	*69,00,000*	*34,00,000*
B.	*Cost of Goods sold*	*55,20,000*	*27,20,000*
C.	***Gross Profit (A-B)***	*13,80,000*	*6,80,00*
D.	*Operating Expenses*	*4,00,000*	*2,00,000*
E.	*Interest*	*1,60,000*	*96,000*
F.	***Earnings before taxes [C-(D+E)]***	*8,20,000*	*3,84,000*
G.	*Taxes @ 35%*	*2,87,000*	*1,34,400*
H.	*Earnings After Tax (EAT)*	*5,33,000*	*2,49,600*

Additional Information:

No. of equity shares	*2,00,000*	*1,60,000*
Dividend payment Ratio (D/P)	*20%*	*30%*
Market price per share	*₹ 50*	*₹ 20*

Assume that both companies are in the process of negotiating a merger through exchange of Equity shares:

You are required to:

(i) Decompose the share price of both the companies into EPS & P/E components. Also segregate their EPS figures into Return On Equity (ROE) and Book Value/Intrinsic Value per share components.

(ii) Estimate future EPS growth rates for both the companies.

(iii) Based on expected operating synergies, R Ltd. estimated that the intrinsic value of S Ltd. Equity share would be ₹ 25 per share on its acquisition. You are required to develop a range of justifiable Equity Share Exchange ratios that can be offered by R Ltd. to the shareholders of S Ltd. Based on your analysis on parts (i) and (ii), would you expect the negotiated terms to be closer to the upper or the lower exchange ratio limits and why?

Answer

(i) Determination of EPS, P/E Ratio, ROE and BVPS of R Ltd.& S Ltd.

	R Ltd.	S Ltd.
EAT (₹)	5,33,000	2,49,600
N	200000	160000

EPS (EAT÷N)	2.665	1.56
Market Price Per Share	50	20
PE Ratio (MPS/EPS)	18.76	12.82
Equity Fund (Equity Value)	2400000	1600000
BVPS (Equity Value ÷ N)	12	10
ROE (EAT÷ EF) or	0.2221	0.156
ROE (EAT ÷ EF)	22.21%	15.60%

(ii) Determination of Growth Rate of EPS of R Ltd.& S Ltd.

	R Ltd.	S Ltd.
Retention Ratio (1-D/P Ratio)	0.80	0.70
Growth Rate (ROE x Retention Ratio) or	0.1777	0.1092
Growth Rate (ROE x Retention Ratio)	17.77%	10.92%

(iii) Justifiable equity share exchange ratio

(a) Market Price Based = MPS_S/MPS_R = ₹ 20/ ₹ 50 = 0.40:1 (lower limit)

(b) Intrinsic Value Based = ₹ 25/ ₹ 50 = 0.50:1 (max. limit)

Since R Ltd. has higher EPS, PE, ROE and higher growth expectations the negotiated term would be expected to be closer to the lower limit, based on existing share price.

Question 41

BA Ltd. and DA Ltd. both the companies operate in the same industry. The Financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	***BA Ltd. (₹)***	***DA Ltd. (₹)***
Current Assets	*14,00,000*	*10,00,000*
Fixed Assets (Net)	*10,00,000*	*5,00,000*
Total (₹)	***24,00,000***	***15,00,000***
Equity capital (₹10 each)	*10,00,000*	*8,00,000*
Retained earnings	*2,00,000*	--
14% long-term debt	*5,00,000*	*3,00,00*
Current liabilities	*7,00,000*	*4,00,000*
Total (₹)	***24,00,000***	***15,00,000***

Income Statement

	BA Ltd. (₹)	***DA Ltd. (₹)***
Net Sales	*34,50,000*	*17,00,000*
Cost of Goods sold	*27,60,000*	*13,60,000*
Gross profit	*6,90,000*	*3,40,000*
Operating expenses	*2,00,000*	*1,00,000*
Interest	*70,000*	*42,000*
Earnings before taxes	*4,20,000*	*1,98,00*
Taxes @ 50%	*2,10,000*	*99,000*
Earnings after taxes (EAT)	***2,10,000***	***99,000***
Additional Information :		
No. of Equity shares	*1,00,000*	*80,000*
Dividend payment ratio (D/P)	*40%*	*60%*
Market price per share	*₹40*	*₹15*

Assume that both companies are in the process of negotiating a merger through an exchange of equity shares. You have been asked to assist in establishing equitable exchange terms and are required to:

(i) Decompose the share price of both the companies into EPS and P/E components; and also segregate their EPS figures into Return on Equity (ROE) and book value/intrinsic value per share components.

(ii) Estimate future EPS growth rates for each company.

(iii) Based on expected operating synergies BA Ltd. estimates that the intrinsic value of DA's equity share would be ₹20 per share on its acquisition. You are required to develop a range of justifiable equity share exchange ratios that can be offered by BA Ltd. to the shareholders of DA Ltd. Based on your analysis in part (i) and (ii), would you expect the negotiated terms to be closer to the upper, or the lower exchange ratio limits and why?

(iv) Calculate the post-merger EPS based on an exchange ratio of 0.4: 1 being offered by BA Ltd. and indicate the immediate EPS accretion or dilution, if any, that will occur for each group of shareholders.

(v) Based on a 0.4: 1 exchange ratio and assuming that BA Ltd.'s pre-merger P/E ratio will continue after the merger, estimate the post-merger market price. Also show the resulting accretion or dilution in pre-merger market prices.

Answer

Market price per share (MPS) = EPS X P/E ratio or P/E ratio = MPS/EPS

(i) Determination of EPS, P/E ratio, ROE and BVPS of BA Ltd. and DA Ltd.

		BA Ltd.	DA Ltd.
Earnings After Tax	(EAT)	₹ 2,10,000	₹ 99,000
No. of Shares	(N)	100000	80000
EPS	(EAT/N)	₹ 2.10	₹ 1.2375
Market price per share	(MPS)	40	15
P/E Ratio	(MPS/EPS)	19.05	12.12
Equity Funds	(EF)	₹ 12,00,000	₹ 8,00,000
BVPS	(EF/N)	12	10
ROE	(EAT/EF) × 100	17.50%	12.37%

(ii) Estimation of growth rates in EPS for BA Ltd. and DA Ltd.

Retention Ratio	(1-D/P ratio)	0.6	0.4
Growth Rate	(ROE × Retention Ratio)	10.50%	4.95%

(iii) Justifiable equity shares exchange ratio

(a) Intrinsic value based = ₹20 / ₹40 = 0.5:1 (upper limit)

(b) Market price based = MPS_{DA}/MPS_{BA} = ₹15 / ₹40 =0.375:1(lower limit)

Since, BA Ltd. has a higher EPS, ROE, P/E ratio and even higher EPS growth expectations, the negotiable terms would be expected to be closer to the lower limit, based on the existing share prices.

(iv) Calculation of post merger EPS and its effects

Particulars			BA Ltd.	DA Ltd.	Combined
EAT	(₹)	(i)	2,10,000	99,000	3,09,000
Share outstanding		(ii)	100000	80000	132000*
EPS	(₹)	(i) / (ii)	2.1	1.2375	2.341
EPS Accretion (Dilution)	(Re.)		0.241	(0.301**)	

(v) Estimation of Post merger Market price and other effects

Particulars			BA Ltd.	DA Ltd.	Combined
EPS	(₹)	(i)	2.1	1.2375	2.341
P/E Ratio		(ii)	19.05	12.12	19.05
MPS	(₹)	(i) / (ii)	40	15	44.6
MPS Accretion	(₹)		4.6	2.84***	

* Shares outstanding (combined) = 100000 shares + (.40 × 80000)= 132000 shares

** EPS claim per old share = ₹2.34 × 0.4 ₹ 0.936

EPS dilution	= ₹1.2375 – ₹ 0.936	₹ 0.3015
***S claim per old share	(₹ 44.60 × 0.4)	₹ 17.84
Less: MPS per old share		₹ 15.00
		₹ 2.84

Question 42

Bank 'R' was established in 2005 and doing banking in India. The bank is facing DO OR DIE situation. There are problems of Gross NPA (Non Performing Assets) at 40% & CAR/CRAR (Capital Adequacy Ratio/ Capital Risk Weight Asset Ratio) at 4%. The net worth of the bank is not good. Shares are not traded regularly. Last week, it was traded @₹ 8 per share.

RBI Audit suggested that bank has either to liquidate or to merge with other bank.

Bank 'P' is professionally managed bank with low gross NPA of 5%.It has Net NPA as 0% and CAR at 16%. Its share is quoted in the market @ ₹ 128 per share. The board of directors of bank 'P' has submitted a proposal to RBI for take over of bank 'R' on the basis of share exchange ratio.

The Balance Sheet details of both the banks are as follows:

	Bank 'R' ***Amt. in ₹ lacs***	***Bank 'P'*** ***Amt. In ₹ lacs***
Paid up share capital	*140*	*500*
Reserves & Surplus	*70*	*5,500*
Deposits	*4,000*	*40,000*
Other liabilities	*890*	*2,500*
Total Liabilities	***5,100***	***48,500***
Cash in hand & with RBI	*400*	*2,500*
Balance with other banks	*-*	*2,000*
Investments	*1,100*	*15,000*
Advances	*3,500*	*27,000*
Other Assets	*100*	*2,000*
Total Assets	***5,100***	***48,500***

It was decided to issue shares at Book Value of Bank 'P' to the shareholders of Bank 'R'. All assets and liabilities are to be taken over at Book Value.

For the swap ratio, weights assigned to different parameters are as follows:

Gross NPA	*30%*
CAR	*20%*

Market price	*40%*
Book value	*10%*

(a) What is the swap ratio based on above weights?

(b) How many shares are to be issued?

(c) Prepare Balance Sheet after merger.

(d) Calculate CAR & Gross NPA % of Bank 'P' after merger.

Answer

(a) Swap Ratio

Gross NPA	5 : 40	i.e.	5/40 x 30% =	0.0375
CAR	4 : 16	i.e.	4/16 x 20% =	0.0500
Market Price	8 : 128	i.e.	8/128 x 40% =	0.025
Book Value Per Share	15 : 120	i.e.	15/120 x 10% =	0.0125
				0.125

Thus for every share of Bank 'R' 0.125 share of Bank 'P' shall be issued.

(b) No. of equity shares to be issued:

$$\frac{₹\ 140\ \text{lac}}{₹\ 10} \times 0.125 = 1.75\ \text{lac shares}$$

(c) Balance Sheet after Merger

Calculation of Capital Reserve

Book Value of Shares	₹ 210.00 lac
Less: Value of Shares issued	₹ 17.50 lac
Capital Reserve	₹ 192.50 lac

Balance Sheet

	₹ lac		₹ lac
Paid up Share Capital	517.50	Cash in Hand & RBI	2900.00
Reserves & Surplus	5500.00	Balance with other banks	2000.00
Capital Reserve	192.50	Investment	16100.00
Deposits	44000.00	Advances	30500.00
Other Liabilities	3390.00	Other Assets	2100.00
	53600.00		53600.00

(d) Calculation CAR & Gross NPA % of Bank 'P' after merger

$$\text{CAR/CRWAR} = \frac{\text{Total Capital}}{\text{Risky Weighted Assets}}$$

	Bank 'R'	Bank 'P'	Merged
	4%	16%	
Total Capital	₹ 210 lac	₹ 6000 lac	₹ 6210 lac
Risky Weighted Assets	₹ 5250 lac	₹ 37500 lac	₹ 42750 lac

$$\text{CAR} = \frac{₹\ 6210\ \text{lac}}{₹\ 42750\ \text{lac}} = 14.53\%$$

$$\text{GNPA Ratio} = \frac{\text{Gross NPA}}{\text{Gross Deposits}} \times 100$$

	Bank 'R'	Bank 'P'	Merged
GNPA (Given)	0.40	0.05	
	$0.40 = \frac{\text{GNPA}_R}{₹\ 3500\ \text{lac}}$	$0.05 = \frac{\text{GNPA}_S}{₹\ 27000\ \text{lac}}$	
Gross NPA	₹ 1400 lac	₹ 1350 lac	₹ 2750 lac

Question 43

A valuation done of an established company by a well-known analyst has estimated a value of ₹ 500 lakhs, based on the expected free cash flow for next year of ₹ 20 lakhs and an expected growth rate of 5%.

While going through the valuation procedure, you found that the analyst has made the mistake of using the book values of debt and equity in his calculation. While you do not know the book value weights he used, you have been provided with the following information:

(i) Company has a cost of equity of 12%,

(ii) After tax cost of debt is 6%,

(iii) The market value of equity is three times the book value of equity, while the market value of debt is equal to the book value of debt.

You are required to estimate the correct value of the company.

Answer

Cost of capital by applying Free Cash Flow to Firm (FCFF) Model is as follows:-

Value of Firm = $V_0 = \frac{FCFF_1}{K_c - g_n}$

Where –

$FCFF_1$ = Expected FCFF in the year 1

K_c = Cost of capital

g_n = Growth rate forever

Thus, ₹ 500 lakhs = ₹ 20 lakhs /(K_c-g)

Since g = 5%, then K_c = 9%

Now, let X be the weight of debt and given cost of equity = 12% and cost of debt = 6%, then 12% (1 – X) + 6% X = 9%

Hence, X = 0.50, so book value weight for debt was 50%

∴ Correct weight should be 150% of equity and 50% of debt.

∴ Cost of capital = K_c = 12% (0.75) + 6% (0.25) = 10.50%

and correct firm's value = ₹ 20 lakhs/(0.105 – 0.05) = ₹ 363.64 lakhs.

Question 44

The valuation of Hansel Limited has been done by an investment analyst. Based on an expected free cash flow of ₹ 54 lakhs for the following year and an expected growth rate of 9 percent, the analyst has estimated the value of Hansel Limited to be ₹ 1800 lakhs. However, he committed a mistake of using the book values of debt and equity.

The book value weights employed by the analyst are not known, but you know that Hansel Limited has a cost of equity of 20 percent and post tax cost of debt of 10 percent. The value of equity is thrice its book value, whereas the market value of its debt is nine-tenths of its book value. What is the correct value of Hansel Ltd?

Answer

Cost of capital by applying Free Cash Flow to Firm (FCFF) Model is as follows:-

Value of Firm = $V_0 = \frac{FCFF_1}{K_c - g_n}$

Where –

$FCFF_1$ = Expected FCFF in the year 1

K_c= Cost of capital

g_n = Growth rate forever

Thus, ₹ 1800 lakhs = ₹ 54 lakhs /(K_c-g)

Since g = 9%, then K_c = 12%

Now, let X be the weight of debt and given cost of equity = 20% and cost of debt = 10%, then 20% (1 – X) + 10% X = 12%

Hence, X = 0.80, so book value weight for debt was 80%

∴ Correct weight should be 60 of equity and 72 of debt.

∴ Cost of capital = K_c = 20% (60/132) + 10% (72/132) = 14.5455% and correct firm's value

= ₹ 54 lakhs/(0.1454 – 0.09) = ₹ 974.73 lakhs.

Question 45

Following informations are available in respect of XYZ Ltd. which is expected to grow at a higher rate for 4 years after which growth rate will stabilize at a lower level:

Base year information:

Revenue	*- ₹2,000 crores*
EBIT	*- ₹300 crores*
Capital expenditure	*- ₹280 crores*
Depreciation	*- ₹200 crores*

Information for high growth and stable growth period are as follows:

	High Growth	*Stable Growth*
Growth in Revenue & EBIT	*20%*	*10%*
Growth in capital expenditure and depreciation	*20%*	*Capital expenditure are offset by depreciation*
Risk free rate	*10%*	*9%*
Equity beta	*1.15*	*1*
Market risk premium	*6%*	*5%*
Pre tax cost of debt	*13%*	*12.86%*
Debt equity ratio	*1 : 1*	*2 : 3*

For all time, working capital is 25% of revenue and corporate tax rate is 30%.

What is the value of the firm?

Answer

High growth phase :

k_e = 0.10 + 1.15 x 0.06 = 0.169 or 16.9%.

k_d = 0.13 x (1-0.3) = 0.091 or 9.1%.

Cost of capital = 0.5 x 0.169 + 0.5 x 0.091 = 0.13 or 13%.

Stable growth phase :

k_e = 0.09 + 1.0 x 0.05 = 0.14 or 14%.

k_d = 0.1286 x (1 - 0.3) = 0.09 or 9%.

Cost of capital = 0.6 x 0.14 + 0.4 x 0.09 = 0.12 or 12%.

Determination of forecasted Free Cash Flow of the Firm (FCFF)

(₹ in crores)

	Yr. 1	Yr. 2	Yr 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Capital Expenditure	96	115.20	138.24	165.89	-
Less Depreciation					
Δ Working Capital	100.00	120.00	144.00	172.80	103.68
Free Cash Flow (FCF)	56.00	67.20	80.64	96.77	375.32

Alternatively, it can also be computed as follows:

(₹ in crores)

	Yr. 1	Yr. 2	Yr 3	Yr. 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
EAT	252	302.40	362.88	435.46	479.00
Add: Depreciation	240	288	345.60	414.72	456.19
	492	590.40	708.48	850.18	935.19
Less: Capital Exp.	336	403.20	483.84	580.61	456.19
Δ WC	100.00	120.00	144.00	172.80	103.68
	56.00	67.20	80.64	96.77	375.32

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 13%	PV (₹ in crores)
56.00	0.885	49.56
67.20	0.783	52.62

80.64	0.693	55.88
96.77	0.613	59.32
		₹ 217.38

Terminal Value of Cash Flow

$$\frac{375.32}{0.12 - 0.10} = ₹\,18{,}766.00\,\text{Crores}$$

PV of the terminal, value is:

$$₹\,18{,}766.00\,\text{Crores} \times \frac{1}{(1.13)^4} = ₹\,18{,}766.00\,\text{Crores} \times 0.613 = ₹\,11{,}503.56\,\text{Crores}$$

The value of the firm is :

₹ 217.38 Crores + ₹ 11,503.56 Crores = ₹ 11,720.94 Crores

Question 46

Following information is given in respect of WXY Ltd., which is expected to grow at a rate of 20% p.a. for the next three years, after which the growth rate will stabilize at 8% p.a. normal level, in perpetuity.

	For the year ended March 31, 2014
Revenues	*₹ 7,500 Crores*
Cost of Goods Sold (COGS)	*₹ 3,000 Crores*
Operating Expenses	*₹ 2,250 Crores*
Capital Expenditure	*₹ 750 Crores*
Depreciation (included in COGS & Operating Expenses)	*₹ 600 Crores*

During high growth period, revenues & Earnings before Interest & Tax (EBIT) will grow at 20% p.a. and capital expenditure net of depreciation will grow at 15% p.a. From year 4 onwards, i.e. normal growth period revenues and EBIT will grow at 8% p.a. and incremental capital expenditure will be offset by the depreciation. During both high growth & normal growth period, net working capital requirement will be 25% of revenues.

The Weighted Average Cost of Capital (WACC) of WXY Ltd. is 15%.

Corporate Income Tax rate will be 30%.

Required:

Estimate the value of WXY Ltd. using Free Cash Flows to Firm (FCFF) & WACC methodology.

The PVIF @ 15 % for the three years are as below:

Year	t_1	t_2	t_3
PVIF	0.8696	0.7561	0.6575

Answer

Determination of forecasted Free Cash Flow of the Firm (FCFF)

(₹ in crores)

	Yr. 1	Yr. 2	Yr 3	Terminal Year
Revenue	9000.00	10800.00	12960.00	13996.80
COGS	3600.00	4320.00	5184.00	5598.72
Operating Expenses	1980.00	2376.00	2851.20	3079.30
Depreciation	720.00	864.00	1036.80	1119.74
EBIT	2700.00	3240.00	3888.00	4199.04
Tax @30%	810.00	972.00	1166.40	1259.71
EAT	1890.00	2268.00	2721.60	2939.33
Capital Exp. – Dep.	172.50	198.38	228.13	-
∆ Working Capital	375.00	450.00	540.00	259.20
Free Cash Flow (FCF)	1342.50	1619.62	1953.47	2680.13

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 15%	PV (₹ in crores)
1342.50	0.8696	1167.44
1619.62	0.7561	1224.59
1953.47	0.6575	1284.41
		3676.44

PV of the terminal, value is:

$$\frac{2680.13}{0.15 - 0.08} \times \frac{1}{(1.15)^3} = ₹\ 38287.57 \text{ Crore} \times 0.6575 = ₹\ 25174.08 \text{ Crore}$$

The value of the firm is :

₹ 3676.44 Crores + ₹ 25174.08 Crores = ₹ 28,850.52 Crores

Question 47

ABC, a large business house is planning to sell its wholly owned subsidiary KLM. Another large business entity XYZ has expressed its interest in making a bid for KLM. XYZ expects that after acquisition the annual earning of KLM will increase by 10%.

Following information, ignoring any potential synergistic benefits arising out of possible acquisitions, are available:

(i) Profit after tax for KLM for the financial year which has just ended is estimated to be ₹ 10 crore.

(ii) KLM's after tax profit has an increasing trend of 7% each year and the same is expected to continue.

(iii) Estimated post tax market return is 10% and risk free rate is 4%. These rates are expected to continue.

(iv) Corporate tax rate is 30%.

	XYZ	*ABC*	*Proxy entity for KLM in the same line of business*
No. of shares	*100 lakhs*	*80 lakhs*	*--*
Current share price	*₹ 287*	*₹ 375*	*--*
Dividend pay out	*40%*	*50%*	*50%*
Debt : Equity at market values	*1 : 2*	*1 : 3*	*1 : 4*
P/E ratio	*10*	*13*	*12*
Equity beta	*1*	*1. 1*	*1.1*

Assume gearing level of KLM to be the same as for ABC and a debt beta of zero.

You are required to calculate:

(a) Appropriate cost of equity for KLM based on the data available for the proxy entity.

(b) A range of values for KLM both before and after any potential synergistic benefits to XYZ of the acquisition.

Answer

a. β ungreared for the proxy company = 1.1 X 4 / [4 + (1 – 0.3)] = 0.9362

0.9362 = β equity greared X 3/ [3 + (1 - 0.3)]

β equity geared = 1.1546

Cost of equity = 0.04 + 1.1546 X (0.1 – 0.04) = 10.93%

b. P/E valuation

(Based on earning of ₹ 10 Crore)

	Using proxy Entity's P/E	Using XYZ's P/E
Pre synergistic value	12 X ₹ 10 Crore = ₹ 120 Crore	10 X ₹ 10 Crore = ₹ 100 Crore
Post synergistic value	12 X ₹ 10 Crore X 1.1 = ₹ 132 Crore	10 X ₹ 10 Crore X 1.1 = ₹ 110 Crore

Dividend valuation model

	Based on 50% payout	Based on 40% payout
Pre synergistic value	$\frac{0.5 \times 10 \times 1.07}{0.1093 - 0.07}$ = ₹ 136.13 Crore	$\frac{0.4 \times 10 \times 1.07}{0.1093 - 0.07}$ =₹ 108.91 Crore
Post synergistic value	$\frac{0.5 \times 10 \times 1.1 \times 1.07}{0.1093 - 0.07}$ = ₹ 149.75 Crore	$\frac{0.4 \times 10 \times 1.1 \times 1.07}{0.1093 - 0.07}$ = ₹ 119.79 Crore

Market Price

Although no information is available about the value of KLM, it may be possible to calculate a market value based on proportion of earnings of ABC that is generated by KLM.

Market value of ABC = 80 Lakh Shares X ₹ 375 = ₹ 300 Crore

Post Tax earnings of ABC = ₹ 300/13 = ₹ 23.08 Crore

If market value of ABC is allocated to KLM in the proportion of relative earning of KLM to that of ABC, KLM would have a market value of ₹ 300 crore X [10/23.08] = ₹ 130 Crore.

KLM's Post Tax earning = ₹ 10 Crore.

If ABC's P/E ratio is applied to it, the market value of KLM becomes ₹ 10 Crore X 13 = ₹ 130 Crore.

Therefore, it assumes that KLM has the same P/E ratio as that of ABC.

Range of valuation

Pre synergistic	₹ 100 Crore	₹ 136.13 Crore
Post synergistic	₹ 110 Crore	₹ 149.75 Crore

Question 48

Using the chop-shop approach (or Break-up value approach), assign a value for Cranberry Ltd. whose stock is currently trading at a total market price of €4 million. For Cranberry Ltd, the accounting data set forth three business segments: consumer wholesale, retail and general centers. Data for the firm's three segments are as follows:

Business Segment	*Segment Sales*	*Segment Assets*	*Segment Operating Income*
Wholesale	*€225,000*	*€600,000*	*€75,000*
Retail	*€720,000*	*€500,000*	*€150,000*
General	*€ 2,500,000*	*€4,000,000*	*€700,000*

Industry data for "pure-play" firms have been compiled and are summarized as follows:

Business Segment	*Capitalization/Sales*	*Capitalization/Assets*	*Capitalization/Operating Income*
Wholesale	*0.85*	*0.7*	*9*
Retail	*1.2*	*0.7*	*8*
General	*0.8*	*0.7*	*4*

Answer

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Wholesale	0.85	€225000	€191250
Retail	1.2	€720000	€864000
General	0.8	€2500000	€2000000
Total value			€3055250

Business Segment	Capital-to-Assets	Segment Assets	Theoretical Values
Wholesale	0.7	€600000	€420000
Retail	0.7	€500000	€350000
General	0.7	€4000000	€2800000
Total value			€3570000

Business Segment	Capital-to-Operating Income	Operating Income	Theoretical Values
Wholesale	9	€75000	€675000
Retail	8	€150000	€1200000
General	4	€700000	€2800000
Total value			€4675000

$$\text{Average theoretical value} = \frac{3055250 + 3570000 + 4675000}{3} = 3766750$$

Average theoretical value of Cranberry Ltd. = €3766750

Question 49

The following is the Balance-sheet of Grape Fruit Company Ltd as at March 31st, 2011.

Liabilities	(₹ in lakhs)	Assets	(₹ in lakhs)
Equity shares of ₹ 100 each	600	Land and Building	200
14% preference shares of ₹ 100/- each	200	Plant and Machinery	300
13% Debentures	200	Furniture and Fixtures	50
Debenture interest accrued and payable	26	Inventory	150

Loan from bank	74	Sundry debtors	70
Trade creditors	340	Cash at bank	130
		Preliminary expenses	10
		Cost of issue of debentures	5
		Profit and Loss account	525
	1440		1440

The Company did not perform well and has suffered sizable losses during the last few years. However, it is felt that the company could be nursed back to health by proper financial restructuring. Consequently the following scheme of reconstruction has been drawn up :

(i) Equity shares are to be reduced to ₹ 25/- per share, fully paid up;

(ii) Preference shares are to be reduced (with coupon rate of 10%) to equal number of shares of ₹ 50 each, fully paid up.

(iii) Debenture holders have agreed to forgo the accrued interest due to them. In the future, the rate of interest on debentures is to be reduced to 9 percent.

(iv) Trade creditors will forego 25 percent of the amount due to them.

(v) The company issues 6 lakh of equity shares at ₹ 25 each and the entire sum was to be paid on application. The entire amount was fully subscribed by promoters.

(vi) Land and Building was to be revalued at ₹ 450 lakhs, Plant and Machinery was to be written down by ₹ 120 lakhs and a provision of ₹15 lakhs had to be made for bad and doubtful debts.

Required:

(i) Show the impact of financial restructuring on the company's activities.

(ii) Prepare the fresh balance sheet after the reconstructions is completed on the basis of the above proposals.

Answer

Impact of Financial Restructuring

(i) Benefits to Grape Fruit Ltd.

(a) *Reduction of liabilities payable*

	₹ in lakhs
Reduction in equity share capital (6 lakh shares x ₹75 per share)	450
Reduction in preference share capital (2 lakh shares x ₹50 per share)	100
Waiver of outstanding debenture Interest	26
Waiver from trade creditors (₹340 lakhs x 0.25)	85
	661

(b)	*Revaluation of Assets*	
	Appreciation of Land and Building (₹450 lakhs - ₹200 lakhs)	250
	Total (A)	911

(ii) Amount of ₹911 lakhs utilized to write off losses, fictious assets and over- valued assets.

Writing off profit and loss account	525
Cost of issue of debentures	5
Preliminary expenses	10
Provision for bad and doubtful debts	15
Revaluation of Plant and Machinery (₹300 lakhs – ₹180 lakhs)	120
Total (B)	675
Capital Reserve (A) – (B)	236

(ii) Balance sheet of Grape Fruit Ltd as at 31st March 2011 (after re-construction)

(₹ in lakhs)

Liabilities	Amount	Assets		Amount
12 lakhs equity shares of ₹ 25/- each	300	Land & Building		450
10% Preference shares of ₹ 50/- each	100	Plant & Machinery		180
Capital Reserve	236	Furnitures & Fixtures		50
9% debentures	200	Inventory		150
Loan from Bank	74	Sundry debtors	70	
Trade Creditors	255	Prov. for Doubtful Debts	-15	55
		Cash-at-Bank (Balancing figure)*		280
	1165			1165

*Opening Balance of ₹130/- lakhs + Sale proceeds from issue of new equity shares ₹150/- lakhs.

Question 50

M/s Tiger Ltd. wants to acquire M/s. Leopard Ltd. The balance sheet of Leopard Ltd. as on 31st March, 2012 is as follows:

Liabilities	*₹*	*Assets*	*₹*
Equity Capital (70,000 shares)		*Cash*	*50,000*
Retained earnings	*3,00,000*	*Debtors*	*70,000*
12% Debentures	*3,00,000*	*Inventories*	*2,00,000*
Creditors and other liabilities	*3,20,000*	*Plants & Eqpt.*	*13,00,000*
	16,20,000		*16,20,000*

Additional Information:

(i) Shareholders of Leopard Ltd. will get one share in Tiger Ltd. for every two shares. External liabilities are expected to be settled at ₹ 5,00,000. Shares of Tiger Ltd. would be issued at its current price of ₹ 15 per share. Debentureholders will get 13% convertible debentures in the purchasing company for the same amount. Debtors and inventories are expected to realize ₹ 2,00,000.

(ii) Tiger Ltd. has decided to operate the business of Leopard Ltd. as a separate division. The division is likely to give cash flows (after tax) to the extent of ₹ 5,00,000 per year for 6 years. Tiger Ltd. has planned that, after 6 years, this division would be demerged and disposed of for ₹ 2,00,000.

(iii) The company's cost of capital is 16%.

Make a report to the Board of the company advising them about the financial feasibility of this acquisition.

Net present values for 16% for ₹ 1 are as follows:

Years	*1*	*2*	*3*	*4*	*5*	*6*
PV	*.862*	*.743*	*.641*	*.552*	*.476*	*.410*

Answer

Calculation of Purchase Consideration

	₹
Issue of Share 35000 x ₹15	5,25,000
External Liabilities settled	5,00,000
13% Debentures	3,00,000
	13,25,000
Less: Realization of Debtors and Inventories	2,00,000
Cash	50,000
	10,75,000

Net Present Value = PV of Cash Inflow + PV of Demerger of Leopard Ltd. – Cash Outflow

= ₹ 5,00,000 PVAF(16%,6) + ₹ 2,00,000 PVF(16%, 6) – ₹ 10,75,000

= ₹ 5,00,000 x 3.684 + ₹ 2,00,000 x 0.410 – ₹ 10,75,000

= ₹ 18,42,000 + ₹ 82,000 – ₹ 10,75,000

= ₹ 8,49,000

Since NPV of the decision is positive it is advantageous to acquire Leopard Ltd.

Question 51

The equity shares of XYZ Ltd. are currently being traded at ₹ 24 per share in the market. XYZ Ltd. has total 10,00,000 equity shares outstanding in number; and promoters' equity holding in the company is 40%.

PQR Ltd. wishes to acquire XYZ Ltd. because of likely synergies. The estimated present value of these synergies is ₹ 80,00,000.

Further PQR feels that management of XYZ Ltd. has been over paid. With better motivation, lower salaries and fewer perks for the top management, will lead to savings of ₹ 4,00,000 p.a. Top management with their families are promoters of XYZ Ltd. Present value of these savings would add ₹ 30,00,000 in value to the acquisition.

Following additional information is available regarding PQR Ltd.:

Earnings per share : ₹ 4

Total number of equity shares outstanding : 15,00,000

Market price of equity share : ₹ 40

Required:

(i) What is the maximum price per equity share which PQR Ltd. can offer to pay for XYZ Ltd.?

(ii) What is the minimum price per equity share at which the management of XYZ Ltd. will be willing to offer their controlling interest?

Answer

(a) Calculation of maximum price per share at which PQR Ltd. can offer to pay for XYZ Ltd.'s share

Market Value (10,00,000 x ₹ 24)	₹ 2,40,00,000
Synergy Gain	₹ 80,00,000
Saving of Overpayment	₹ 30,00,000
	₹ 3,50,00,000
Maximum Price (₹ 3,50,00,000/10,00,000)	₹ 35

Alternatively, it can also be computed as follows:

Let ER be the swap ratio then,

$$40=\frac{24\times10,00,000+40\times15,00,000+80,00,000+30,00,000}{15,00,000+10,00,000\times ER}$$

ER = 0.875

MP = PE x EPS x ER = $\frac{40}{4}$ x ₹ 4 x 0.875 = ₹ 35

(b) Calculation of minimum price per share at which the management of XYZ Ltd.'s will be willing to offer their controlling interest

Value of XYZ Ltd.'s Management Holding (40% of 10,00,000 x ₹ 24)	₹ 96,00,000
Add: PV of loss of remuneration to top management	₹ 30,00,000
	₹ 1,26,00,000
No. of Shares	4,00,000
Minimum Price (₹ 1,26,00,000/4,00,000)	₹ 31.50

Question 52

With the help of the following information of Jatayu Limited compute the Economic Value Added:

Capital Structure	*Equity capital ₹ 160 Lakhs* *Reserves and Surplus ₹ 140 lakhs* *10% Debentures ₹ 400 lakhs*
Cost of equity	*14%*
Financial Leverage	*1.5 times*
Income Tax Rate	*30%*

Answer

Financial Leverage = PBIT/PBT

1.5 = PBIT / (PBIT – Interest)

1.5 = PBIT / (PBIT – 40)

1.5 (PBIT – 40) = PBIT

1.5 PBIT – 60 = PBIT

1.5 PBIT – PBIT = 60

0.5 PBIT = 60

or $PBIT = \frac{60}{0.5}$ = ₹120 lakhs

NOPAT = PBIT – Tax = ₹120 lakhs (1 – 0.30) = ₹84 lakhs.

Weighted Average Cost of Capital (WACC)

= 14% × (300 / 700) + (1 – 0.30) × (10%) × (400 / 700) = 10%

EVA = NOPAT – (WACC × Total Capital)

EVA = ₹84 lakhs – 0.10 × ₹ 700 lakhs

EVA = ₹ 14 lakhs

Question 53

RST Ltd.'s current financial year's income statement reported its net income as ₹ 25,00,000. The applicable corporate income tax rate is 30%.

Following is the capital structure of RST Ltd. at the end of current financial year:

	₹
Debt (Coupon rate = 11%)	*40 lakhs*
Equity (Share Capital + Reserves & Surplus)	*125 lakhs*
Invested Capital	*165 lakhs*

Following data is given to estimate cost of equity capital:

	₹
Beta of RST Ltd.	*1.36*
Risk –free rate i.e. current yield on Govt. bonds	*8.5%*
Average market risk premium (i.e. Excess of return on market portfolio over risk-free rate)	*9%*

Required:

(i) Estimate Weighted Average Cost of Capital (WACC) of RST Ltd.; and

(ii) Estimate Economic Value Added (EVA) of RST Ltd.

Answer

Cost of Equity as per CAPM

$k_e = R_f + \beta$ x Market Risk Premium

= 8.5% + 1.36 x 9%

= 8.5% + 12.24% = 20.74%

Cost of Debt $k_d = 11\%(1 - 0.30) = 7.70\%$

WACC $(k_o) = k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D}$

$= 20.74 \times \frac{125}{165} + 7.70 \times \frac{40}{165}$

= 15.71 + 1.87 = 17.58%

Taxable Income = ₹ 25,00,000/(1 - 0.30)

= ₹ 35,71,429 or ₹ 35.71 lakhs

Operating Income = Taxable Income + Interest

= ₹ 35,71,429 + ₹ 4,40,000

= ₹ 40,11,429 or ₹ 40.11 lacs

EVA = EBIT (1-Tax Rate) – WACC x Invested Capital

= ₹ 40,11,429 (1 – 0.30) – 17.58% x ₹ 1,65,00,000

= ₹ 28,08,000 – ₹ 29,00,700 = - ₹ 92,700

Question 54

Tender Ltd has earned a net profit of ₹ 15 lacs after tax at 30%. Interest cost charged by financial institutions was ₹ 10 lacs. The invested capital is ₹ 95 lacs of which 55% is debt. The company maintains a weighted average cost of capital of 13%. Required,

(a) Compute the operating income.

(b) Compute the Economic Value Added (EVA).

(c) Tender Ltd. has 6 lac equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining?

Answer

Taxable Income = ₹ 15 lac/(1-0.30)

= ₹ 21.43 lacs or ₹ 21,42,857

Operating Income = Taxable Income + Interest

= ₹ 21,42,857 + ₹ 10,00,000

= ₹ 31,42,857 or ₹ 31.43 lacs

EVA = EBIT (1-Tax Rate) – WACC x Invested Capital

= ₹ 31,42,857(1 – 0.30) – 13% x ₹ 95,00,000

= ₹ 22,00,000 – ₹ 12,35,000 = ₹ 9,65,000

EVA Dividend = $\frac{₹\ 9,65,000}{₹\ 6,00,000}$ = ₹ 1.6083

Question 55

The following information is given for 3 companies that are identical except for their capital structure:

	Orange	*Grape*	*Apple*
Total invested capital	*1,00,000*	*1,00,000*	*1,00,000*

Debt/assets ratio	*0.8*	*0.5*	*0.2*
Shares outstanding	*6,100*	*8,300*	*10,000*
Pre tax cost of debt	*16%*	*13%*	*15%*
Cost of equity	*26%*	*22%*	*20%*
Operating Income (EBIT)	*25,000*	*25,000*	*25,000*
Net Income	*8,970*	*12,350*	*14,950*

The tax rate is uniform 35% in all cases.

(i) Compute the Weighted average cost of capital for each company.

(ii) Compute the Economic Valued Added (EVA) for each company.

(iii) Based on the EVA, which company would be considered for best investment? Give reasons.

(iv) If the industry PE ratio is 11x, estimate the price for the share of each company.

(v) Calculate the estimated market capitalisation for each of the Companies.

Answer

(i) Working for calculation of WACC

	Orange	Grape	Apple
Total debt	80,000	50,000	20,000
Post tax Cost of debt	10.4%	8.45%	9.75%
Equity Fund	20,000	50,000	80,000

WACC

Orange: (10.4 x 0.8) + (26 x 0.2) = 13.52%

Grape: (8.45 x 0.5) + (22 x 0.5) = 15.225%

Apple: (9.75 x 0.2) + (20 x 0.8) = 17.95%

(ii)

	Orange	Grape	Apple
WACC	13.52	15.225	17.95
EVA [EBIT (1-T)-(WACC x Invested Capital)]	2,730	1,025	-1,700

(iii) Orange would be considered as the best investment since the EVA of the company is highest and its weighted average cost of capital is the lowest

(iv) Estimated Price of each company shares

	Orange	Grape	Apple
EBIT (₹)	25,000	25,000	25,000

Interest (₹)	12,800	6,500	3,000
Taxable Income (₹)	12,200	18,500	22,000
Tax 35% (₹)	4,270	6,475	7,700
Net Income (₹)	7,930	12,025	14,300
Shares	6,100	8,300	10,000
EPS (₹)	1.3	1.448795	1.43
Stock Price (EPS x PE Ratio) (₹)	14.30	15.94	15.73

Since the three entities have different capital structures they would be exposed to different degrees of financial risk. The PE ratio should therefore be adjusted for the risk factor.

Alternative Answer

	Orange	Grape	Apple
Net Income (Given) (₹)	8,970	12,350	14,950
Shares	6,100	8,300	10,000
EPS (₹)	1.4705	1.488	1.495
Stock Price (EPS x PE Ratio) (₹)	16.18	16.37	16.45

(v) Market Capitalisation

Estimated Stock Price (₹)	14.30	15.94	15.73
No. of shares	6,100	8,300	10,000
Estimated Market Cap (₹)	87,230	1,32,302	1,57,300

Alternative Answer

Estimated Stock Price (₹)	16.18	16.37	16.45
No. of shares	6,100	8,300	10,000
Estimated Market Cap (₹)	98,698	1,35,871	1,64,500

Question 56

Delta Ltd.'s current financial year's income statement reports its net income as ₹ 15,00,000. Delta's marginal tax rate is 40% and its interest expense for the year was ₹ 15,00,000. The company has ₹ 1,00,00,000 of invested capital, of which 60% is debt. In addition, Delta Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.

(i) *Compute the operating income or EBIT earned by Delta Ltd. in the current year.*

(ii) What is Delta Ltd.'s Economic Value Added (EVA) for the current year?

(iii) Delta Ltd. has 2,50,000 equity shares outstanding. According to the EVA you computed in (ii), how much can Delta pay in dividend per share before the value of the company

would start to decrease? If Delta does not pay any dividends, what would you expect to happen to the value of the company?

Answer

(i) Taxable income = Net Income /(1 – 0.40)

or, Taxable income = ₹ 15,00,000/(1 – 0.40) = ₹ 25,00,000

Again, taxable income = EBIT – Interest

or, EBIT = Taxable Income + Interest

= ₹ 25,00,000 + ₹ 15,00,000 = ₹ 40,00,000

(ii) EVA = EBIT (1 – T) – (WACC × Invested capital)

= ₹ 40,00,000 (1 – 0.40) – (0.126 × ₹ 1,00,00,000)

= ₹ 24,00,000 – ₹ 12,60,000 = ₹ 11,40,000

(iii) EVA Dividend = ₹ 11,40,000/2,50,000 = ₹ 4.56

If Delta Ltd. does not pay a dividend, we would expect the value of the firm to increase because it will achieve higher growth, hence a higher level of EBIT. If EBIT is higher, then all else equal, the value of the firm will increase.

Question 57

The following data pertains to XYZ Inc. engaged in software consultancy business as on 31 December 2010

($ Million)

Income from consultancy	*935.00*
EBIT	*180.00*
Less: Interest on Loan	*18.00*
EBT	*162.00*
Tax @ 35%	*56.70*
	105.30

Balance Sheet

($ Million)

Liabilities	*Amount*	*Assets*		*Amount*
Equity Stock (10 million share @ $ 10 each)	*100*	*Land and Building*		*200*
		Computers & Softwares		*295*
Reserves & Surplus	*325*	*Current Assets:*		
Loans	*180*	*Debtors*	*150*	
Current Liabilities	*180*	*Bank*	*100*	

	785	Cash 40	290 785

With the above information and following assumption you are required to compute

(a) Economic Value Added®

(b) Market Value Added.

Assuming that:

(i) WACC is 12%.

(ii) The share of company currently quoted at $ 50 each

Answer

(a) Determination of Economic value added (EVA)

	$ Million
EBIT	180.00
Less: Taxes @ 35%	63.00
Net Operating Profit after Tax	117.00
Less: Cost of Capital Employed [W. No.1]	72.60
Economic Value Added	44.40

(b)

	$ Million
Market value of Equity Stock [W. No. 2]	500
Equity Fund [W. No. 3]	425
Market Value Added	75

Working Notes:

(1)	Total Capital Employed	
	Equity Stock	$ 100 Million
	Reserve and Surplus	$ 325 Million
	Loan	$ 180 Million
		$ 605 Million
	WACC	12%
	Cost of Capital employed $ 605 Million x 12%	$ 72.60 Million
(2)	Market Price per equity share (A)	$ 50
	No. of equity share outstanding (B)	10 Million

	Market value of equity stock (A) x (B)	$ 500 Million
(3)	Equity Fund	
	Equity Stock	$ 100 Million
	Reserves & Surplus	$ 325 Million
		$ 425 Million

Question 58

Herbal Gyan is a small but profitable producer of beauty cosmetics using the plant Aloe Vera. This is not a high-tech business, but Herbal's earnings have averaged around ₹ 12 lakh after tax, largely on the strength of its patented beauty cream for removing the pimples.

The patent has eight years to run, and Herbal has been offered ₹ 40 lakhs for the patent rights. Herbal's assets include ₹ 20 lakhs of working capital and ₹ 80 lakhs of property, plant, and equipment. The patent is not shown on Herbal's books. Suppose Herbal's cost of capital is 15 percent. What is its Economic Value Added (EVA)?

Answer

EVA = Income earned – (Cost of capital x Total Investment)

Total Investments

Particulars	Amount
Working capital	₹ 20 lakhs
Property, plant, and equipment	₹ 80 lakhs
Patent rights	₹ 40 lakhs
Total	**₹ 140 lakhs**

Cost of Capital 15%

EVA= ₹ 12 lakh – (0.15 x ₹ 140 lakhs) = ₹ 12 lakh – ₹ 21 lakh = -₹ 9 lakh

Thus Herbal Gyan has a negative EVA of ₹ 9 lakhs.

Question 59

Personal Computer Division of Distress Ltd., a computer hardware manufacturing company has started facing financial difficulties for the last 2 to 3 years. The management of the division headed by Mr. Smith is interested in a buyout on 1 April 2013. However, to make this buy-out successful there is an urgent need to attract substantial funds from venture capitalists.

Ven Cap, a European venture capitalist firm has shown its interest to finance the proposed buy-out. Distress Ltd. is interested to sell the division for ₹ 180 crore and Mr. Smith is of opinion that an additional amount of ₹ 85 crore shall be required to make this division viable. The expected financing pattern shall be as follows:

Source	*Mode*	*Amount (₹ Crore)*
Management	*Equity Shares of ₹ 10 each*	*60.00*
VenCap VC	*Equity Shares of ₹ 10 each*	*22.50*
	9% Debentures with attached warrant of ₹ 100 each	*22.50*
	8% Loan	*160.00*
Total		*265.00*

The warrants can be exercised any time after 4 years from now for 10 equity shares @ ₹ 120 per share.

The loan is repayable in one go at the end of 8th year. The debentures are repayable in equal annual installment consisting of both principal and interest amount over a period of 6 years.

Mr. Smith is of view that the proposed dividend shall not be kept more than 12.5% of distributable profit for the first 4 years. The forecasted EBIT after the proposed buyout is as follows:

Year	*2013-14*	*2014-15*	*2015-16*	*2016-17*
EBIT (₹ crore)	*48*	*57*	*68*	*82*

Applicable tax rate is 35% and it is expected that it shall remain unchanged at least for 5-6 years. In order to attract VenCap, Mr. Smith stated that book value of equity shall increase by 20% during above 4 years. Although, VenCap has shown their interest in investment but are doubtful about the projections of growth in the value as per projections of Mr. Smith. Further VenCap also demanded that warrants should be convertible in 18 shares instead of 10 as proposed by Mr. Smith.

You are required to determine whether or not the book value of equity is expected to grow by 20% per year. Further if you have been appointed by Mr. Smith as advisor then whether you would suggest to accept the demand of VenCap of 18 shares instead of 10 or not.

Answer

Working Notes

Calculation of Interest Payment on 9% Debentures

PVAF (9%,6) = 4.486

$$\text{Annual Installment} = \frac{₹\ 22.50 \text{ crore}}{4.486} = ₹\ 5.0156 \text{ crore}$$

Year	Balance Outstanding (₹ Crore)	Interest (₹ Crore)	Installment (₹ Crore)	Principal Repayment (₹ Crore)	Balance (₹ Crore)
1	22.5000	2.025	5.0156	2.9906	19.5094

2	19.5094	1.756	5.0156	3.2596	16.2498
3	16.2498	1.462	5.0156	3.5536	12.6962
4	12.6962	1.143	5.0156	3.8726	8.8236

Statement showing Value of Equity

Particulars	2013-14 (₹ Crore)	2014-15 (₹ Crore)	2015-16 (₹ Crore)	2016-17 (₹ Crore)
EBIT	48.0000	57.0000	68.0000	82.0000
Interest on 9% Debentures	2.0250	1.7560	1.4620	1.1430
Interest on 8% Loan	12.8000	12.8000	12.8000	12.8000
EBT	33.1750	42.4440	53.7380	68.0570
Tax* @35%	11.6110	14.8550	18.8080	23.8200
EAT	21.5640	27.5890	34.9300	44.2370
Dividend @12.5% of EAT*	2.6955	3.4490	4.3660	5.5300
	18.8685	24.1400	30.5640	38.7070
Balance b/f	Nil	18.8685	43.0085	73.5725
Balance c/f	18.8685	43.0085	73.5725	112.2795
Share Capital	82.5000	82.5000	82.5000	82.5000
	101.3685	125.5085	156.0725	194.7795

*Figures have been rounded off.

In the beginning of 2013-14 equity was ₹ 82.5000crore which has been grown to ₹ 194.7795 over a period of 4 years. In such case the compounded growth rate shall be as follows:

$(194.7795/82.5000)^{¼} - 1 = 23.96\%$

This growth rate is slightly higher than 20% as projected by Mr. Smith.

If the condition of VenCap for 18 shares is accepted the expected share holding after 4 years shall be as follows:

No. of shares held by Management	6.00 crore
No. of shares held by VenCap at the starting stage	2.25 crore
No. of shares held by VenCap after 4 years	4.05 crore
Total holding	6.30 crore

Thus, it is likely that Mr. Smith may not accept this condition of VenCap as this may result in losing their majority ownership and control to VenCap. Mr. Smith may accept their condition if management has further opportunity to increase their ownership through other forms.

Question 60

BRS Inc deals in computer and IT hardwares and peripherals. The expected revenue for the next 8 years is as follows:

Years	Sales Revenue ($ Million)
1	8
2	10
3	15
4	22
5	30
6	26
7	23
8	20

Summarized financial position as on 31 March 2012 was as follows:

$ Million

Liabilities	Amount	Assets	Amount
Equity Stocks	12	Fixed Assets (Net)	17
12% Bonds	8	Current Assets	3
	20		20

Additional Information:

(a) *Its variable expenses is 40% of sales revenue and fixed operating expenses (cash) are estimated to be as follows:*

Period	Amount ($ Million)
1- 4 years	1.6
5-8 years	2

(b) *An additional advertisement and sales promotion campaign shall be launched requiring expenditure as per following details:*

Period	Amount ($ Million)
1 year	0.50
2-3 years	1.50
4-6 years	3.00
7-8 years	1.00

(c) *Fixed assets are subject to depreciation at 15% as per WDV method.*

(d) The company has planned additional capital expenditures (in the beginning of each year) for the coming 8 years as follows:

Period	*Amount ($ Million)*
1	*0.50*
2	*0.80*
3	*2.00*
4	*2.50*
5	*3.50*
6	*2.50*
7	*1.50*
8	*1.00*

(e) Investment in Working Capital is estimated to be 20% of Revenue.

(f) Applicable tax rate for the company is 30%.

(g) Cost of Equity is estimated to be 16%.

(h) The Free Cash Flow of the firm is expected to grow at 5% per annuam after 8 years.

With above information you are require to determine the:

(i) Value of Firm

(ii) Value of Equity

Answer

Working Notes:

(a) Determination of Weighted Average Cost of Capital

Sources of funds	Cost (%)	Proportions	Weights	Weighted Cost
Equity Stock	16	12/20	0.60	9.60
12% Bonds	12%(1-0.30) = 8.40	8/20	0.40	3.36
				12.96 say 13

(b) Schedule of Depreciation

$ Million

Year	Opening Balance of Fixed Assets	Addition during the year	Total	Depreciation @ 15%
1	17.00	0.50	17.50	2.63
2	14.87	0.80	15.67	2.35

3	13.32	2.00	15.32	2.30
4	13.02	2.50	15.52	2.33
5	13.19	3.50	16.69	2.50
6	14.19	2.50	16.69	2.50
7	14.19	1.50	15.69	2.35
8	13.34	1.00	14.34	2.15

(c) Determination of Investment

$ Million

Year	Investment Required			Existing Investment in CA	Additional Investment required
	For Capital Expenditure	CA (20% of Revenue)	Total		
1	0.50	1.60	2.10	3.00	0.00
2	0.80	2.00	2.80	2.50*	0.30
3	2.00	3.00	5.00	2.00**	3.00
4	2.50	4.40	6.90	3.00	3.90
5	3.50	6.00	9.50	4.40	5.10
6	2.50	5.20	7.70	6.00	1.70
7	1.50	4.60	6.10	5.20	0.90
8	1.00	4.00	5.00	4.60	0.40

* Balance of CA in Year 1 ($3 Million) – Capital Expenditure in Year 1($ 0.50 Million)

** Similarly balance of CA in Year 2 ($2.80) – Capital Expenditure in Year 2($ 0.80 Million)

(d) Determination of Present Value of Cash Inflows

$ Million

Particulars	Years							
	1	2	3	4	5	6	7	8
Revenue (A)	8.00	10.00	15.00	22.00	30.00	26.00	23.00	20.00
Less: Expenses								
Variable Costs	3.20	4.00	6.00	8.80	12.00	10.40	9.20	8.00
Fixed cash operating cost	1.60	1.60	1.60	1.60	2.00	2.00	2.00	2.00
Advertisement Cost	0.50	1.50	1.50	3.00	3.00	3.00	1.00	1.00
Depreciation	2.63	2.35	2.30	2.33	2.50	2.50	2.35	2.15
Total Expenses (B)	7.93	9.45	11.40	15.73	19.50	17.90	14.55	13.15

EBIT (C) = (A) - (B)	0.07	0.55	3.60	6.27	10.50	8.10	8.45	6.85
Less: Taxes@30% (D)	0.02	0.16	1.08	1.88	3.15	2.43	2.53	2.06
NOPAT (E) = (C) - (D)	0.05	0.39	2.52	4.39	7.35	5.67	5.92	4.79
Gross Cash Flow (F) = (E) + Dep	2.68	2.74	4.82	6.72	9.85	8.17	8.27	6.94
Less: Investment in Capital Assets								
plus Current Assets (G)	0	0.30	3.00	3.90	5.10	1.70	0.90	0.40
Free Cash Flow (H) = (F) - (G)	2.68	2.44	1.82	2.82	4.75	6.47	7.37	6.54
PVF@13% (I)	0.885	0.783	0.693	0.613	0.543	0.480	0.425	0.376
PV (H)(I)	2.371	1.911	1.261	1.729	2.579	3.106	3.132	2.46

Total present value = $ 18.549 million

(e) Determination of Present Value of Continuing Value (CV)

$$CV = \frac{FCF_9}{k-g} = \frac{\$6.54\,\text{million}(1.05)}{0.13-0.05} = \frac{\$6.867\,\text{million}}{0.08} = \$85.8375\ \text{million}$$

Present Value of Continuing Value (CV) = $85.8376 million X $PVF_{13\%,8}$ = $85.96875 million X 0.376 = $32.2749 million

(i) Value of Firm

	$ Million
Present Value of cash flow during explicit period	18.5490
Present Value of Continuing Value	32.2749
Total Value	50.8239

(ii) Value of Equity

	$ Million
Total Value of Firm	50.8239
Less: Value of Debt	8.0000
Value of Equity	42.8239

Question 61

The Nishan Ltd. has 35,000 shares of equity stock outstanding with a book value of Rs.20 per share. It owes debt ₹ 15,00,000 at an interest rate of 12%. Selected financial results are as follows.

Income and Cash Flow		*Capital*	
EBIT	*₹ 80,000*	*Debt*	*₹ 1,500,000*
Interest	*1,80,000*	*Equity*	*7,00,000*
EBT	*(₹ 1,00,000)*		*₹ 2,200,000*
Tax	*0*		
EAT	*(₹ 1,00,000)*		
Depreciation	*₹ 50,000*		
Principal repayment	*(₹ 75,000)*		
Cash Flow	*(₹ 1,25,000)*		

Restructure the financial line items shown assuming a composition in which creditors agree to convert two thirds of their debt into equity at book value. Assume Nishan will pay tax at a rate of 15% on income after the restructuring, and that principal repayments are reduced proportionately with debt. Who will control the company and by how big a margin after the restructuring?

Answer

Creditors would convert ₹ 10,00,000 in debt to equity by accepting

₹ 1,000,000/₹ 20= 50,000 shares of stock.

The remaining ₹ 500,000 of debt would generate interest of

₹ 500,000×0.12 = ₹ 60,000

Repayment of principal would be reduced by two thirds to ₹ 25,000 per year.

The result is as follows

Income and Cash Flow		Capital	
EBIT	₹ 80,000	Debt	₹ 500,000
Interest	60,000	Equity	₹ 1,700,000
EBT	₹ 20,000		₹ 2,200,000
Tax	3,000		
EAT	₹ 17,000		
Depreciation	50,000		
Principal repayment	(25,000)		
Cash Flow	₹ 42,000		

After the restructuring there will be a total of (35,000+50,000) 85,000 shares of equity stock outstanding. The original shareholders will still own 35,000 shares (approximately 41%), while the creditors will own 50,000 shares (59%). Hence the creditors will control the company by a substantial majority.

Question 62

ABC (India) Ltd., a market leader in printing industry, is planning to diversify into defense equipment businesses that have recently been partially opened up by the GOI for private sector. In the meanwhile, the CEO of the company wants to get his company valued by a leading consultants, as he is not satisfied with the current market price of his scrip.

He approached consultant with a request to take up valuation of his company with the following data for the year ended 2009:

Share Price	*₹ 66 per share*
Outstanding debt	*1934 lakh*
Number of outstanding shares	*75 lakh*
Net income (PAT)	*17.2 lakh*
EBIT	*245 lakh*
Interest expenses	*218.125 lakh*
Capital expenditure	*234.4 lakh*
Depreciation	*234.4 lakh*
Working capital	*44 lakh*
Growth rate 8% (from 2010 to 2014)	
Growth rate 6% (beyond 2014)	
Free cash flow	*240.336 lakh (year 2014 onwards)*

The capital expenditure is expected to be equally offset by depreciation in future and the debt is expected to decline by 30% in 2014.

Required:

Estimate the value of the company and ascertain whether the ruling market price is undervalued as felt by the CEO based on the foregoing data. Assume that the cost of equity is 16%, and 30% of debt repayment is made in the year 2014.

Answer

i. Computation of tax rate

EBIT	=	₹ 245 lakh
Interest	=	₹ 218.125 lakh
PBT	=	₹ 26.875 lakh
PAT	=	₹ 17.2 lakh
Tax paid	=	₹ 9.675 lakh
Tax rate	=	₹ 9.675 /26.875 = 0.36 =36%

ii. Computation for increase in working capital

Working capital (2009) = ₹ 44 lakh

Increase in 2010 = ₹ 44 X 0.08 = ₹ 3.52 lakh

It will continue to increase @ 8% per annum.

iii. Weighted average cost of capital

Present debt = ₹ 1934 lakh

Interest cost = ₹ 218.125 lakh / ₹ 1934 = 11.28 %

Equity capital = 75 lakh X₹ 66 = ₹ 4950 lakh

$$Kc = \frac{4950}{1934+4950} \times 16\% + \frac{1934}{1934+4950} \times 11.28\,(1-0.36) = 11.51 + 2.028 = 13.54$$

iv. As capital expenditure and depreciation are equal, they will not influence the free cash flows of the company.

v. Computation of free cash flows upto 2012

Year	*2010*	*2011*	*2012*	*2013*	*2014*
	₹	*₹*	*₹*	*₹*	*₹*
EBIT (1-t)	169.344 lakh	182.89 lakh	197.52 lakh	213.32 lakh	230.39 lakh
Increase in working capital	3.52 lakh	3.80 lakh	4.10 lakh	4.43 lakh	4.78 lakh
Debt repayment	-	-	-	-	1934 × 0.30 = 580.2 lakh
Free cash flows	165.824 lakh	179.09 lakh	193.41 lakh	208.89 lakh	-354.59 lakh
PVF @ 13.54%	0.8807	0.7757	0.6832	0.6017	0.53
PV of free cash flow @ 13.54%	146.04 lakh	138.92 lakh	132.14 lakh	125.69 lakh	-187.93 lakh

Present value of free cash flows upto 2014 = ₹ 354.86 lakh

vi. Cost of capital (2014 Onwards)

Debt = 0.7 X ₹ 1934 = ₹ 1353.80 lakh

Equity = ₹ 4950 lakh

$$Kc = \frac{4950}{4950+1353.80} \times 16\% + \frac{1353.80}{4950+1353.80} \times 11.28\,(1-0.36)$$

= 12.56 + 1.55% = 14.11%

viii. Continuing value

$$\frac{240.336}{0.1411-0.06}\times(1/1.1354)^5$$

= ₹ 1,570.556 lakh

(a) Value of the firm = PV of free cash flows upto 2014 + continuing value

= ₹ 354.86 lakh + ₹ 1,570.556 lakh

= ₹ 1925.416 lakh

(b) Value per share = (Value of Firm – Value of Debt)/ Number of Shares

= (₹ 1925.416 lakh – ₹ 1353.80 lakh) / 75 lakh

= ₹ 7.622<₹ 66 (present market price)

Therefore, the share price is overvalued in the market.